



**UBC - Department of Mechanical Engineering**  
**MECH 572 – Convection Heat Transfer Section: 201**  
**3 Credits**

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**INSTRUCTOR:** Dr. N. Atabaki, P.Eng.,

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**OFFICE HOURS:**

Tuesdays 16:00 to 17:00 RH 104  
or by appointment (e-mail)

**LECTURES:** [MECH 572 201](#)

Option 1: Wednesdays: 17:00 to 20:00 RH102

**COURSE WEBSITE:**

<http://www.mech.ubc.ca/~mech572>

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**PREREQUISITES:** Undergraduate Heat Transfer

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**COURSE DESCRIPTION**

This course is designed to introduce students to the fundamentals of convection heat transfer. Topics: Review of modes of heat transfer (conduction, convection, radiation). Fundamentals of convection heat transfer; laminar external forced convection; laminar internal forced convection; introduction to turbulent fluid flow and heat transfer; turbulent external forced convection; turbulent internal forced convection; natural convection; boiling; condensation; introduction to two-phase flow.

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**COURSE OBJECTIVES**

Describe the physical mechanisms responsible for convection heat transfer. State/explain the significance of the basic “laws” of heat transfer. Present mathematical models for convection heat transfer problems. Derive the governing equations. Introduce boundary layer theory, nondimensionalization, and scaling. Present (where possible) exact, integral, and similarity solutions. Present the basic concepts of turbulence modeling. Introduce empirical correlations. Applications (to simple yet practical problems).

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**GRADING POLICY**

**Homeworks (10%)** 8 to 10 Problem sets

**Two Mini-projects (40%)**

**Final Exam (50%)** Date and location of the final exam will be determined later.

**REFERENCE BOOKS**

1. **Handbook of Heat Transfer Fundamentals**  
W.M. Rohsenow, J.P. Hartnett, and E.N. Ganic, 2<sup>nd</sup> Edition, McGraw-Hill, 1985.
2. **Analysis of Heat and Mass Transfer**  
E.R.G., Eckert, and R.M., McGraw-Hill, 1972.
3. **Convective Heat and Mass Transfer**  
W.M., Kays, M.E., Crawford, and B. Weigand, McGraw-Hill, 2005.
4. **Convective Heat Transfer**  
A. Bejan, 3<sup>rd</sup> Edition, Wiley, 2004.
5. **Principles of Heat Transfer**  
F., Kreith, and M.S., Bohn, 6<sup>th</sup> Edition, Brooks/Cole, Pacific Grove, California, 2001.
6. **Fundamentals of Heat and Mass Transfer**  
F.P., Incropera, and D.P., DeWitt, 5<sup>th</sup> Edition, Wiley, 2001.
7. **Principles of Engineering Thermodynamics**  
M.J., Moran, and H.N., Shapiro, 5<sup>th</sup> Edition, Wiley, 2004.
8. **Viscous Fluid Flow**  
F.M., White, 3<sup>rd</sup> Edition, McGraw-Hill, 2006.
9. **Convective Boiling and Condensation**  
J.C., Collier, and J.R., Thome, , 3<sup>rd</sup> edition, Oxford University Press, 1994.
10. **One-Dimensional Two-Phase Flow**  
G.B., Wallis, McGraw-Hill, 1969.
11. **Boiling and Condensation**  
V.P., Carey, in The CRC Handbook of Thermal Engineering, Chapter 3, Section 3.4, F. Kreith, CRC Press, 2000.
12. **Boundary Layer Theory**  
H. Schlichting, 6<sup>th</sup> Edition, McGraw-Hill, 1965.

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**REFERENCE JOURNALS**

1. **Journal of Heat Transfer**, *trans. ASME*
2. **International Journal of Heat and Mass Transfer**
3. **AIChE Journal**
4. **International Journal of Heat and Fluid Flow**
5. **Heat and Mass Transfer**
6. **AIAA Journal of Thermophysics and Heat Transfer**
7. **International Communications in Heat and Mass Transfer**
8. **Journal of Fluid Mechanics**