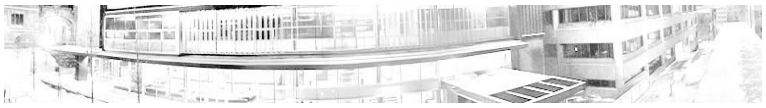
McGill Faculty of Engineering



CHEE 315: Heat and Mass Transfer (Winter 2018)

Class Schedule

T TR 11:35-12:55, Arts W-120, Jan 8 – April 16

Instructor

Phillip Servio, PhD
Office: Wong 4110
Phone: 398-1026
Email: phillip.servio@mcgill.ca
Office hours: W 10:30-11:30 or by appointment

Tutorials

F 10:35-11:25, Arts W-120, Jan 8 – April 16

Teaching Assistants

Marwan Zalouk	marwan.zalouk@mail.mcgill.ca
Adel Omar Hussein Al-Amodi	adel.al-amodi@mail.mcgill.ca
Mandana Tavakolian	mandana.tavakolian@mail.mcgill.ca

Teaching assistants will provide limited assistance with course material during the tutorials and will be responsible for lab supervision.

Communication

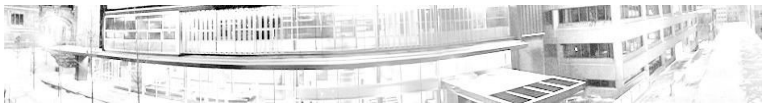
My personal website (accessible via http://www.hydratetech.com/teaching/hmt) will be used to distribute course materials, including lecture slides and reading assignments. If you need to reach me, please send an email to phillip.servio@mcgill.ca. I will try to respond within 24-48 hours. If you have questions about the material, please come to my designated office hours or schedule an appointment. Specific questions about problems or theory will not be answered through email.

Course Description

Transport of heat and mass by diffusion and convection; transport of heat by radiation; boiling; evaporation; mathematical formulation of problems and equipment design for heat and mass transfer; laboratory exercises.

Course Materials

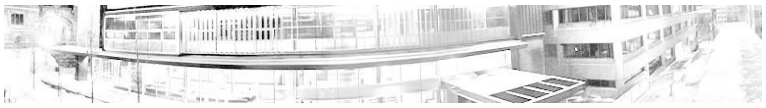
All necessary material, e.g., lecture notes, readings, etc., will be posted on my website or given in class.



Topics

- Please note that the topics listed in the table below *may be shifted around or removed and additional material may be added*.

Week	Topics
1	○ *Introduction* ○ *Modes of Heat & Mass Transfer*
2	○ *Conduction* ○ *Series & Parallel*
3	○ *Cylindrical & Spherical* ○ *Generation 1* ○ *Generation 2*
4	○ *Extended Surfaces 1* ○ *Extended Surfaces 2*
5	○ *Differential Balances* ○ *Transient (Lumped Capacitance)*
6	○ *Transient Heat Diffusion with Generation* ○ *Transient Heat Diffusion in a Cylinder*
7	○ *Combined Flux* ○ *Concentration Distributions*
8	○ *Diffusion through a Spherical Shell* ○ *Diffusion with Chemical Reaction*
9	○ *Transient Diffusion* ○ *Convection (Heat & Mass)*
10	○ *Convection Boundary Layer* ○ *Dimensionless Groups*
11	○ *Internal Flow* ○ *Energy Balance for Flow in a Tube*
12	○ *Pipe Constant T_∞* ○ *Heat Exchangers 1*
13	○ *Heat Exchangers 2* ○ *Review*



Reference Material

Books

- "Fundamentals of Heat and Mass Transfer", Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt, John Wiley and Sons, 8th edition (2017).

Instructional Methods

The course will involve lectures, laboratories and tutorials. *Students are not permitted to record audio or video or take photos of class content!*

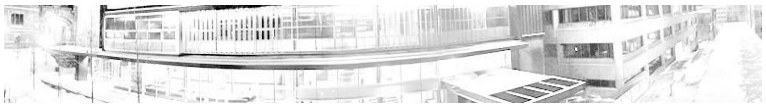
Evaluation and Assessment

The students will be responsible for participating in laboratories and submitting their lab reports in PDF format electronically. Any late submissions will be penalized 10% per day. There will be 2 midterm examinations and 1 final exam. *All weight of missed examinations will be carried to the final exam for the course*. Under no circumstances will there be make up exams. Requests to review midterm exams must be made within 2 weeks of grading.

Mark Distribution

Lab reports	10%	
Midterm examination 1	20%	Tuesday, February 13, 2018.
Midterm examination 2	20%	Tuesday, March 20, 2018.
Final examination	50%	

McGill Faculty of Engineering



CHEE 315

Course Title: **Heat and Mass Transfer**

Credits: **3**

Contact Hours: **(3-2-4)**

Course Prerequisite(s): **CHEE 314**

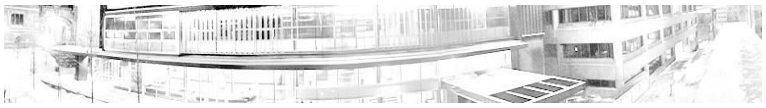
Course Corequisite(s): **N/A**

Course Description: **Transport of heat and mass by diffusion and convection; transport of heat by radiation; diffusion; convective mass transfer; drying; absorption; mathematical formulation of problems and equipment design for heat and mass transfer; laboratory exercises.**

Canadian Engineering Accreditation Board (CEAB) Curriculum Content

CEAB curriculum category content	Number of AU's	Description
Math	**0**	Mathematics include appropriate elements of linear algebra, differential and integral calculus, differential equations, probability, statistics, numerical analysis, and discrete mathematics.
Natural science	**0**	Natural science includes elements of physics and chemistry, as well as life sciences and earth sciences. The subjects are intended to impart an understanding of natural phenomena and relationships through the use of analytical and/or experimental techniques.
Complementary studies	**0**	Complementary studies include the following areas of study to complement the technical content of the curriculum: engineering economics; the impact of technology on society; subject matter that deals with central issues, methodologies, and thought processes of the arts, humanities and social sciences; management; oral and written communications; healthy and safety; professional ethics, equity and law; and sustainable development and environmental stewardship.
Engineering science	**49**	Engineering science involves the application of mathematics and natural science to practical problems. They may involve the development of mathematical or numerical techniques, modeling, simulation, and experimental procedures. Such subjects include, among others, applied aspects of strength of materials, fluid mechanics, thermodynamics, electrical and electronic circuits, soil mechanics, automatic control, aerodynamics, transport phenomena, elements of materials science, geoscience, computer science, and environmental science.
Engineering design	**0**	Engineering design integrates mathematics, natural sciences, engineering sciences, and complementary studies in order to develop elements, systems, and processes to meet specific needs. It is a creative, iterative, and open-ended process, subject to constraints which may be governed by standards or legislation to varying degrees depending upon the discipline. These constraints may also relate to economic, health, safety, environmental, societal or other interdisciplinary factors.

Accreditation units (AU's) are defined on an hourly basis for an activity which is granted academic credit and for which the associated number of hours corresponds to the actual contact time: one hour of lecture (corresponding to 50 minutes of activity) = 1 AU; one hour of laboratory or scheduled tutorial = 0.5 AU. Classes of other than the nominal 50-minute duration are treated proportionally. In assessing the time assigned to determine the AU's of various components of the curriculum, the actual instruction time exclusive of final examinations is used.



Graduate Attributes

This course contributes to the acquisition of graduate attributes as follows:

Graduate attribute	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
Level descriptor	D	D	D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = Not applicable; I = Introduced; D = Developed; A = Applied

KB- *Knowledge Base for Engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.*

PA *- Problem Analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.*

IN *-Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.*

DE- *Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations.*

ET- *Use of Engineering Tools: An ability to create, select, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.*

IT *-Individual and Team Work: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.*

CS- *Communication Skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.*

PR *- Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.*

IE *-Impact of Engineering on Society and the Environment: An ability to analyse social and environmental aspects of engineering activities. Such abilities include an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society; the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.*

EE- *Ethics and Equity: An ability to apply professional ethics, accountability, and equity.*

EP- *Economics and Project Management: An ability to appropriately incorporate economics and business practices including project, risk and change management into the practice of engineering, and to understand their limitations.*

LL *- Life-Long Learning: An ability to identify and to address their own educational needs in a changing world, sufficiently to maintain their competence and contribute to the advancement of knowledge.*

Policies

Academic Integrity

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. (see http://www.mcgill.ca/students/srr/honest for more information). (approved by Senate on 29 January 2003)

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

(approved by Senate on 21 January 2009)

Grading Policy

In the Faculty of Engineering, letter grades are assigned according to the grading scheme adopted by the professor in charge of a particular course. This may not correspond to practices in other Faculty and Schools in the University. In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.