

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2018
Course Name	Thermodynamics
Course Code	ENR TECH 3TD3
Date(s) and Time(s) of lectures	Thursday at 6:30pm – 9:30pm
Program Name	Power & Energy Engineering Technologies, Manufacturing Engineering Technology
Calendar Description	Introduction to thermodynamics, properties of pure substances, first and second law of thermodynamics, entropy, vapor power cycles, refrigeration cycles, and combined power cycles.
Instructor(s)	Dr. Reyad Al-Taie E-Mail: altaier@mcmaster.ca

2. COURSE SPECIFICS

Course Description			
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	24
	L	Laboratory, workshop or fieldwork	3
	T	Tutorial	12
	DE	Distance education	
	Total Hours		39
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 978-0-07-339817-4	Thermodynamics: An Engineering Approach	Yunus A. Cengel and Michael A. Boles McGraw Hill Inc.
	Other Supplies	Source	
	Lecture notes	Power Point Presentation posted on Avenue	
Prerequisite(s)	ENG TECH 3MA3 and registration in Power & Energy Engineering Technologies or Manufacturing Engineering Technologies		
Corequisite(s)	None		
Antirequisite(s)	MAN TECH 3TF3		
Course Specific Policies	<p>All students must have completed WHMIS 1A00 prior to participating in any labs. If WHMIS 1A00 has not been completed, please complete it online by March 9, 2018.</p> <p>The approved calculator for all courses in the B.Tech. Program is the CASIO FX991.</p> <p>The instructor reserves the right to choose the format of any deferred midterms or deferred final exams (i.e. format may be written or oral).</p> <p>Please note that announcements concerning any type of graded material may be in any format (e.g., announcements made only in class). Students are responsible for completing the graded material regardless of whether they received the announcement or not.</p>		

Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
3. SUB TOPIC(S)		
Week 1	<p>Basic concepts and definitions:</p> <ul style="list-style-type: none"> • Thermodynamics and energy • Closed and open systems • Forms of energy • Properties of the systems • State of equilibrium • Processes and cycles • Temperature and the Zeroth Law of Thermodynamics • Problems 	Chapter 1
Week 2	<p>Properties of Pure Substance:</p> <ul style="list-style-type: none"> • Pure Substance • Phase of Pure Substance • Phase Change Processes of Pure Substance • Property Diagrams for Phase Change Processes • Property Tables • The Ideal-Gas Equation of State • Compressibility Factor – A Measure of Deviation From Ideal-Gas Behaviour • Problems 	Chapter 3
Week 3	<p>The First Law of Thermodynamics: Closed Systems</p> <ul style="list-style-type: none"> • Introduction of The First Law of Thermodynamics • Heat Transfer • Work • Mechanical Forms of Work • The First Law of Thermodynamics • Problems 	Chapter 4
Week 4	<p>The First Law of Thermodynamics: Control Volumes</p> <ul style="list-style-type: none"> • Thermodynamics Analysis of Control Volume • The Steady-Flow Process • Steady Flow Engineering Devices • Unsteady Flow Processes • Problems 	Chapter 5

Week 5	The Second Law of Thermodynamics <ul style="list-style-type: none"> • The introduction to The Second Law of Thermodynamics • Thermal-Energy Reservoirs • Reversible and Irreversible Processes • The Cannot Cycle • Problems 	Chapter 6
Week 6	Mid Term 1 Exam	
Mid-term Recess: Monday, February 19 to Sunday, February 25, 2018		
Week 7	Entropy <ul style="list-style-type: none"> • What is Entropy? • Property Diagrams Involving Entropy • The T ds Relations • The Entropy Change of Substance • The Entropy Change of Ideal Gases • Problems 	Chapter 7
Week 8	Gas Power Cycles <ul style="list-style-type: none"> • Bryton Cycle – the Ideal Cycle for Gas-Turbine Engines • The Brayton Cycle with Regeneration • The Brayton Cycle with Reheating and Intercooling • Problems 	Chapter 9
Week 9	Vapour Power Cycles <ul style="list-style-type: none"> • The Carnot Vapour Power Cycles • Rankine Cycle – The Ideal Cycle for Vapour Power Cycles • Deviation of Actual Vapour Power Cycles From The Idealized One • The Ideal Reheat Rankine Cycle • The Ideal Regenerative Rankine Cycle • Problems 	Chapter 10
Week 10	Mid Term 2 Exam Combined Power Cycles <ul style="list-style-type: none"> • Combined Gas-Vapour Power Cycle • Problems 	Chapter 10
Week 11	Laboratory	Chapter 11
Week 12	Refrigeration Cycles <ul style="list-style-type: none"> • Refrigerators and Heat Pumps • The Reversed Carnot Cycle • Heat Pump Systems Problems	
Week 13	Geothermal and Basic Heat Transfer	Chapter 3 and Lecture Notes
Classes end: Monday, April 9, 2018 Final examination period: Wednesday, April 11 to Thursday, April 26, 2018 All examinations MUST be written during the scheduled examination period.		
List of experiments		
Lab 1		
Lab 2		
Lab 3		
Lab 4		
Lab 5		

Lab 6	
Mid-term Recess: Monday, February 19 to Sunday, February 25, 2018	
Lab 7	
Lab 8	
Lab 9	
Lab 10	
Lab 11	Temperature Measurement Tools and Instrumentation
Lab 12	

Note that this structure represents a plan and is subject to adjustment term by term.

The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Assignments / Quizzes	10%
Mid-term Exam 1	15%
Mid-term Exam 2	15%
Project	10%
Labs	10%
Final examination (tests cumulative knowledge)	40%
TOTAL	100%

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. To provide a sound basis for subsequent courses in Fluid Mechanics and Heat Transfer.
2. To prepare students to use Thermodynamics in engineering practice.
3. To have the understanding, as well as the tools, to deal with such increasingly important and complete matters such as Energy and the Environment.
4. Use Thermodynamic Fundamentals in the Analysis of Power Engineering Systems.
5. Sufficient material exists to provide the students with a broad background in applied Thermodynamics.

6. POLICIES

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is an on-line self-reporting tool for Undergraduate Students to report absences for:

- 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
 - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
 - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.
- 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:
 - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All

submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>