Bachelor of Technology Partnership

Course Outline

1. COURSE INFORMATION

Session Offered	2011 to 2016	
Course Name	Strength of Material	
Course Code	ENG TECH 3ML3	
Program Name	Civil Engineering and Infrastructure Technology Manufacturing Engineering Technology	
Calendar Description	Stresses under combined loads, generalized Hooke's Law; two and three dimensional stresses, stress transformation, principal stresses, Mohr's circle; deflections by integration; energy methods, Castagliano's theorem; columns; yield criteria.	
Instructor	Dr. Eu-Gene Ng	Phone: 905 525 9140 ext. 27916 E-Mail: nge@mcmaster.ca Office Hours & Location (if applicable): ETB 216

2. COURSE SPECIFICS

Course Description

Definitions of normal stress, shearing stress, normal strain, shearing strain; shear force and bending moment diagrams; members subjected to axial loading; members subjected to torsional loading; Stress-Strain Analysis: Stress and strain, transformations, principal stresses, graphical representation by Mohr's circles of biaxial and triaxial cases, generalized Hooke's law including thermal strains, equations of equilibrium and compatibility, plane strain and plane stress problems, Euler critical loads for columns, Energy Methods: Strain energy principles, Castigliano's theorem. Applications to cases of axial, bending, and torsional loadings. Applications to statically indeterminate problems.

Instruction Type

Code	Type	Hours per term
C	Classroom instruction	36
L	Laboratory, workshop or fieldwork	
T	Tutorial	6
DE	Distance education	
	Total Hours	42

Resources

ISBN	Textbook Title & Edition	Author & Publisher
ISBN978-0-07-352938-7	Mechanics of Materials 5th Edition	Beer F.P., Johnston E.R., Dewolf J.T., Mazurek D.F.
Other Supplies	**Source**	

Prerequisite(s)	
Corequisite(s)	
Antirequisite(s)	
Course Specific Policies	This course will be using a range of software. 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 accounts, and program affiliation may become apparent to all other students in the same 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 such disclosure please discuss this with the course instructor. The instructor may also use other software including: e-mail, Avenue, LearnLink, web pages, capa, Moodle, Thinking Cap, etc.
Departmental Policies	Students must maintain a GPA of 3.5 on a 12 point scale to continue in the program. 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. 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. Announcements made in class or placed on Avenue are considered to have been communicated to all students including those not in class.

3. SUB TOPIC(S)		
Week 1	- Stress and Strain under Axial Loading o Normal strain under axial loading (Chp 2.2) o Stress strain diagram (Chp 2.3) o Hooke's Law; Modulus of Elasticity (Chp 2.5) o Deformations of members under axial loading (Chp 2.8)	
Week 2	- Stress and Strain under Axial Loading o Statically indeterminate problems and superposition method (Chp 2.9) o Problems involving temperature changes (Chp 2.10)	
Week 3	- Stress and Strain under Axial Loading o Strain energy (Chp 11.2) o Strain energy density (Chp 11.3) o Elastic strain energy for normal stresses (Chp 11.4) - Pure Bending o Symmetric member in pure bending (Chp 4.2) o Deformation in a symmetric member in pure bending (Chp 4.3)	
Week 4	- Pure Bending o Unsymmetric bending (Chp 4.13) o Eccentric symmetric bending (Chp 4.12)	
Week 5	- Pure Bending o Eccentric unsymmetric bending (Chp 4.14) o Bending of members made of several materials (Chp 4.6)	
Week 6	- Analysis and Design of Beams o Shear and bending moment diagrams (Chp 5.2)	
Week 7	- Analysis and Design of Beams o Relations among load, shear and bending moment (Chp 5.3) o Design of prismatic beams for bending (Chp 5.4) - Deflection of Beams o Equation of the elastic curve (Chp 9.3)	

	o Direct Determination of the elastic curve from the load distribution (Chp 9.4)	
Do not count	Mid-term recess (row used only for the Winter semester)	
Week 8	- Transformations of Stress and Strain o Transformation of plane stress (Chp 7.2) o Principal stresses, maximum shearing stress (Chp 7.3) o Mohr's circle for plane stress (Chp 7.4)	
Week 9	- Transformations of Stress and Strain o Application of Mohr's circle to the three dimensional analysis of stress (Chp 7.6) o Yield criteria for ductile materials under plane stress (Chp 7.7)	
Week 10	- Shearing Stresses in Beams and Thin Walled Members o Shear on the horizontal faced of a beam element (Chp 6.2) o Determination of the shearing stresses in a beam (Chp 6.3) o Longitudinal shear on a beam element of Arbitrary Shape (Chp 6.6)	
Final Examination	Final Exam Marking Scheme for Final Exam	

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	Weight
Assignments/Quizzes	10%
Term Test 1	30%
Term Test 2	30%
Labs	
Participation	
Final Examination	30%
TOTAL	**100%**

Course results determined on a percentage scale will be converted to an official letter grade, as indicated in the Undergraduate Calendar. The results of all courses attempted will appear on your transcript as letter grades.

5. LEARNING OUTCOMES

1. Demonstrate the capabilities to apply mathematics and engineering fundamentals to analyze and calculate complex structure stress field, strain distribution as well as deflection..
2. Select appropriate models and methods and identify assumptions, constraints and boundary conditions.
3. Discuss the concept of strain and the relationship between stress and strain in different types of materials and able to solve the deformations of structural components under axial, transverse and torsion loadings.
4. Evaluate the transformation of stress under a rotation of axes and its application to the solution of engineering problems; examine the principal stresses in beams, transmission shafts that are subjected to combined loading.

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/Anti-Discrimination%20policy.pdf

Academic Integrity

Attention is drawn to the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office. Any student who infringes one of these resolutions will be treated according to the published policy.

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and 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, specifically Appendix 3, located at:
http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf

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

The McMaster Student Absence Form is a self reporting tool for **Undergraduate Students** to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately regarding the nature of the accommodation.

If you are absent more than 5 days or exceed 1 request per term you MUST visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence. http://www.mcmaster.ca/msaf/

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. 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 will be expected to submit their work electronically to Turnitin.com and in hard copy so that it can be checked for academic dishonesty. 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/

Protection of Privacy Act (FIPPA)

The Freedom of Privacy 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

The Centre for Student Development is committed to the continuous improvement of accessibility for students with disabilities. Students are encouraged to contact CSD as early as possible before each term starts to become familiar with the services offered and to confirm their accommodations.

Students must forward a copy of the CSD 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 CSD accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. http://csd.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://judicialaffairs.mcmaster.ca/pdf/SCC.pdf