EXPANDED COURSE DESCRIPTION
Lassonde School of Engineering
Earth and Space Science and Engineering
LE / PHYS 3330 3.0 SECTION M
MATERIALS FOR SPACE APPLICATIONS
FALL 2018 / WINTER 2019

Last Modified Date: 08/20/2018

COURSE CALENDAR DESCRIPTION
This course covers the behavior of materials relevant to the engineering of spacecraft. Material responses to thermal, mechanical, vacuum, electrical and ionizing radiation stresses are discussed. Engineering analysis tools and environment models are also covered. Prerequisites: SC/CHEM 1000 3.00, SC/PHYS 1010 6.00 or SC/PHYS 1800 3.00 and SC/PHYS 1801 3.00, or SC/ISCI 1310 6.00, or a minimum grade of C in SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00, SC/ENG 2002 3.00 or permission of the Instructor.

Course Listed Courses: ENG 3330

INSTRUCTOR(S)

<table>
<thead>
<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
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<tbody>
<tr>
<td>Chesser, Hugh</td>
<td>Sec. M / LECT / W</td>
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ADDITIONAL INFORMATION

TOPICS AND CONCEPTS
The course details the response of materials to the various environments encountered by spacecraft. Approaches by spacecraft designers to eliminate, reduce or mitigate these effects are discussed. After reviewing the microstructure of metals, polymers, ceramics, glasses and hybrid materials, we go on to explore thermal, vacuum, plasma, ionizing radiation and launch effects. The latter unit of the course includes a vibration experiment simulating a test performed on an actual spacecraft component.

COURSE SYLLABUS
The course is a single semester course covering the response of various material types to the space environment. The lectures and associated tutorials are divided up between these various environmental effects which include:
1. Review of material microstructure
2. Thermal effects – heat fluxes, response of materials to temperature fluctuations and UV degradation
3. Vacuum effects – outgassing, contamination, tribology
4. Plasma effects – magnetic fields, Debye shielding, Spacecraft charging
5. Ionizing Radiation – radiation environment, damage mechanisms
7. Quality Assurance

COURSE OVERVIEW
After the course the student should be able to:
• Recall the important space environmental effects on spacecraft and its materials
• Describe the material responses to these space effects and techniques used to eliminate, reduce or mitigate the effects.
• Quantify the severity of the environmental effect using software tools such as SPENVIS
• Analyze the effectiveness of a design using tools such as NASTRAN or SPENVIS.

GRADED ASSESSMENT
Student achievement is assessed based on assignments, quizzes, vibration lab write-up and a final exam.

MARKS
Assignments – 20%
Quizzes – 20%
Lab Write-up – 20%
Exam – 40%

TEXTBOOKS

LAND ACKNOWLEDGEMENT
We acknowledge our presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the New Credit First Nation. This territory is subject of the Dish With One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.

• The Indigenous Framework for York University: A Guide to Action can be found here: http://indigenous.info.yorku.ca/
• Meaning of a land acknowledgement: http://healthydebate.ca/opinions/indigenous-land-acknowledgements

ACADEMIC INTEGRITY LINKS
• Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
• Academic Integrity - http://lassonde.yorku.ca/academic-integrity

STUDENT LINKS
• Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
• Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs
• Academic Accommodation for Students with Disabilities - http://secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-with-disabilities-policy/
• Counselling and Disability Services - http://cds.info.yorku.ca/
• York University’s Policies on Sexual Violence - http://secretariat-policies.info.yorku.ca/policies/sexual-violence-policy-on/
• York University’s Policies on Gender/LGBTQ*/Positive Space - http://rights.info.yorku.ca/lgbtq/

Many courses utilize Moodle, York University’s course website system. If your course is using Moodle, click here to access it.

Moodle @ York University