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, SC/ENG 2002 3.00 or permission of the instructor.

Course Listed Courses: ENG 3330, ENG 3330

INSTRUCTOR(S)

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<th>Name</th>
<th>Section / Format / Term</th>
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<tr>
<td>Chesser, Hugh G</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 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

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
- Counselling and Disability Services - http://cds.info.yorku.ca/

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