EXPANDED COURSE DESCRIPTION

EARTH, SPACE SCIENCE AND ENGINEERING

Lassonde School of Engineering
Earth and Space Science and Engineering

LE / ESSE 2361 3.0 SECTION M
SPACE SYSTEMS ENGINEERING
FALL 2018 / WINTER 2019

Last Modified Date: 08/20/2018

COURSE CALENDAR DESCRIPTION

The objective of this course is to provide the student with an introduction to systems engineering with an emphasis on the following topics: the systems engineering process, requirements, design fundamentals, subsystem fundamentals, trade studies, integration, technical reviews, and case studies. The course is also intended to prepare the student for the payload/mission design courses (LE/ESSE 4360 3.00 and LE/ESSE 4361 3.00) which are more application oriented.

INSTRUCTOR(S)

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<th>Name</th>
<th>Section / Format / Term</th>
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<td>Chesser, Hugh</td>
<td>Sec. M / LECT / W</td>
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ADDITIONAL INFORMATION

TOPICS AND CONCEPTS

The course introduces the student to the systems engineering process as applied to space missions. Topics covered include mission geometry/system behaviour, an introduction to the space, launch and ground segments and systems engineering techniques.

COURSE SYLLABUS

The course is a single semester course divided roughly into 3 sections:

1. **Mission geometry/space system behaviour**
   - Intro to STK – orbits, time, geocentric/geodetic coordinates
   - Basic orbit dynamics (some nonKeplerian effects), propulsive maneuvers, attitude dynamics
   - Payload observation metrics – ground sampling distance, resolution

2. **Mission elements**
   - Space segment – spacecraft systems – power, comm, obc, acs, structure, thermal
   - Launch – rockets available, trajectories, typical specs
   - Ground segment – ground station construction, mission controllers

3. **Systems engineering**
   - Spec writing/interpretation – developing requirements, concept of operations, documentation
   - Trade studies
   - Project management – risk, cost analysis, space mission typical phases, technical reviews

COURSE OVERVIEW

After the course the student should be able to:

- Recall the formal development of space missions, including all mission elements and typical development phases.
• Describe the process of systems engineering and the role it plays in the development, manufacture, integration, test and operation of space missions
• Perform system/element trade studies by quantifying the performance of design alternatives using commonly used tools such as STK.
• Document system requirements in terms of interfaces, interactions, deployments, etc – again using commonly available tools (Visual Paradigm and/or others).

GRADED ASSESSMENT
Student achievement is assessed based on assignments, tests and a final exam. Students are also asked to obtain their basic STK certification.

MARKS
Assignments – 15%
STK Certification – 5%
Tests – 30%
Exam – 50%

TEXTBOOKS
• Macdonald, M., Badescu, V., The International Handbook of Space Technology, Springer 2014

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