EXPANDED COURSE DESCRIPTION
EARTH, SPACE SCIENCE AND ENGINEERING
Lassonde School of Engineering
Earth and Space Science and Engineering
LE / ESSE 3610 3.0 SECTION A
GEODETIC CONCEPTS
FALL 2020 / WINTER 2021

Last Modified Date: 09/04/2020

COURSE CALENDAR DESCRIPTION
Date Submission: 2017-12-05
Geodesy. Reference systems, frames and datums; time systems; the natural system of coordinates; terrestrial, celestial and orbital coordinate systems. Coordinate system transformations. Relative three dimensional positioning; the inertial frame of reference. Positions on the ellipsoid and mapping plane. Height systems. Prerequisites: LE/ESSE 2615 3.00; LE/ESSE 2620 3.00; SC/MATH 2015 3.00. Corequisite: LE/ESSE 3620 3.00.

INSTRUCTOR(S)

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<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
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<tr>
<td>Pagiatakis, Spiros D</td>
<td>Sec. A / LECT / F</td>
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ADDITIONAL INFORMATION

Required Resources
2. From time to time, special notes and/or readings will be posted on the course’s LMS.

Optional Course Materials

Course Description
This course will provide the fundamentals of geodetic theory and computations aiming at the determination of positions of points and objects in a 4-D space. Geodesy therefore is the science concerned with determination of time-varying size, shape, physical surface and gravity field of the Earth. Geodesy provides the fundamental theory and scientific framework of geomatics.

The course will systematically develop the fundamental reference coordinate systems with respect to which the positions of points and objects will be determined. We will be particularly concerned with the rigorous definition of the coordinate systems as well as with the transformations among them. This will require the knowledge of the Earth’s geometry and motions in a 4-D space. Using astronomical observations is therefore fundamental in achieving this goal.

We will introduce the mathematical shape of the Earth, known as reference ellipsoid, with respect to which all physical positions of points and objects will be determined; such objective will involve complex mathematical models that will eventually “flatten” the Earth on the mapping plane, a flat surface (map) on which the 4-D positions of the points and objects will be represented. The processes of representing 4-D positions on a map are known as map projections that constitute a fundamental and valuable tool in all mapping operations.
Finally, we will discuss the latest developments in the definition of reference coordinate systems, reference frames and datums as they are used internationally. We will then focus on the systems used in Canada; this will be core knowledge for practicing geodesy and geomatics across the country.

Course Learning Outcomes (CLOs)

Upon the completion of this course, students are expected to learn and retain the following concepts and skills:
1. Develop knowledge and understanding of the different coordinate systems, including time systems, and the transformations among them.
2. Become familiar with the different geodetic positioning techniques, their concepts, capabilities and accuracy.
3. Develop knowledge and skills on geodetic positioning on the reference ellipsoid and mapping plane.
4. Extend knowledge of fundamental reference coordinate systems to modern reference systems, reference frames and datums as they are presently used internationally.
5. Become familiar with the IERS international standards for high accuracy spatial positioning.

Evaluation Scheme
Laboratory 1: 5%
Laboratory 2: 5%
Laboratory 3: 5%
Laboratory 4: 5%
Laboratory 5: 5%
Midterm: 15%
Class/Lab participation: 10%
Final: 50%

Reminders
• If you are using a personal e-mail address, please identify yourself as a student registered in this course by providing your student number in your signature block. You are responsible for ensuring you are receiving official course information in an efficient and timely manner.
• All students are expected to familiarize themselves with the following information:
  • General information (http://calendars.registrar.yorku.ca/2013-2014/policies/index.htm)
  • Senate policy on academic honesty and the academic integrity website (http://www.yorku.ca/secretariat/policies/document.php?document=69) and (http://www.yorku.ca/tutorial/academic_integrity/)
  • Academic Integrity - http://lassonde.yorku.ca/academic-integrity
  • Copyright - Course materials are designed for use only in the course. Copying this material for distribution (e.g. uploading material to a commercial third-party website) may lead to a charge of misconduct under York’s Code of Student Rights and Responsibilities and the Senate Policy on Academic Honesty and/or legal consequences if copyright law has been violated http://www.copyright.info.yorku.ca.
  • Ethics review process for research involving human participants (http://www.yorku.ca/research/support/ethics/)
  • Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities (http://www.yorku.ca/secretariat/policies/document.php?document=68)
  • Additional resources related to add/drop courses, student life, academic resources, campus services, …etc. can be found at this link: http://www.yorku.ca/yorkweb/cs.htm

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/

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

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