SUR4530/6934 *Geodesy and Geodetic Positioning*

OVERVIEW

Geodesy is relevant for many surveying tasks today, may it be through the definition of a geodetic datum for geodetic control, computed satellite orbits for deriving GPS positions, the approximation of the earth through an ellipsoid as it is used for the State Plane Coordinate System, or for high accuracy measurements over spatially extended areas that need to take into account earth curvature. This course will explain the fundamentals of Geodesy which are relevant for the practicing surveyor both for plane surveying (topographic surveys, cadastral surveying, engineering surveying) and geodetic surveys (determination of the earth's surface and gravity field over a region that typically spans a country or group of countries). Students will learn the concepts of the ellipsoid, geodetic coordinates, gravity, geodetic datums, satellite orbits, code and carrier phase observations in Global Navigation Satellite Systems (GNSS), and GNSS data collection and processing.

- Fall semester, 3 credits
- 100% online, synchronous and asynchronous component
- http://elearning.ufl.edu/

Course Prerequisites: SUR 3103C Geomatics or instructor consent

Instructors:

Adam Benjamin, Ft. Lauderdale Research & Education Center, Davie West Bldg.
phone: (954) 577-6378; e-mail: abenjamin1@ufl.edu

Dr. Hartwig Henry Hochmair, Ft. Lauderdale Research & Education Center, Davie West Bldg.
phone: (954) 577-6317; e-mail: hhhochmair@ufl.edu

- Please use the Canvas message/Inbox feature for fastest response.
- Students are also welcome to arrange a video conference meeting to go over any questions.

Lectures:

Tue: 9:35am-11:30am (per. 3+4), Thu: 9:35am-10:25am (per. 3) via Adobe Connect
Note: Part of the lectures will be pre-recorded. Links to lecture recordings will be posted in Canvas.

First day of class: 8/22/17. Last day of class: 12/5/17

Recommended textbooks:

- Elithorp, J. A. and Findorff, D. D. (2009). Geodesy for Geomatics and GIS Professionals (2nd ed.). Acton, MA: XanEdu Custom Publishing
- van Sickle, J. (2015). GPS for Land Surveyors (4th Ed.): CRC Press.

LEARNING OUTCOMES

The course objective is to provide the students with an understanding of geodetic science as it pertains to the practice of Geomatics. This involves and understanding of different representations of the earth, including its gravity field, and their relationship to the required accuracy of the final map product. Required accuracy determines also best practice

guidelines for measurement procedures.

At the completion of the course, the student should be able to:

- apply trigonometric computations on spherical and spheroidal earth models
- convert point coordinates between different geodetic datums and height systems
- assess how irregularities of the Earth's shape and gravity field affect the accuracy of geodetic measurements
- apply online geodetic tools for datum and height conversions and GNSS baseline solutions
- explain theoretical concepts of surveys with GNSS
- apply best practices for surveys with GNSS
- conduct independent research on advanced topics in Geodesy and Geodetic Positioning
- demonstrate written communication skills in interpreting computational results

COURSE LOGISTICS

Throughout the semester, the students will be given approximately 5 home assignments and 5 quizzes. For each assignment a due date and time is given, which is usually the beginning of the next class.
This course is a distance education course taught partly as pre-recorded lectures and partly as live lectures using the virtual classroom software Adobe Connect. Lecture materials can be downloaded from the Canvas website.

The Canvas system should be used as the platform for written communication between students and the instructor. Questions and suggestions to the whole class can also be posted under the Discussions tab. Any short-term changes concerning lectures or other course components will be announced through Canvas. Feel free to call the instructors with any questions.

Technology Requirements:

- A computer or mobile device with high-speed internet connection
- A headset and/or microphone and speakers; a web cam is suggested
- A Web browser with the latest updates for Adobe Connect

Using Adobe Connect:

Live lectures (as announced) and office hour meetings (per individual student requests) will be conducted with the Adobe Connect web conferencing software. Sessions can be joined by clicking a link posted by the instructor on Canvas. Adobe Connect only requires an internet connection and a web browser. More details can be found here.

GRADING:

Grading items:

Item	***Percentage***
Home assignments (UG %; G %)	30%; 25%
Online quizzes	10%
Participation in online discussions (UG %; G %)	10%; 5%
Mid-term exam	20%
Capstone assignment (graduate students only)	10%
Final exam (cumulative)	30%
Total	**100%**

Grading scale:

Grade	*Percentage*	*Grade*	*Percentage*
A	90.0-100.0	C+	73.0-74.9
A-	87.0-89.9	C	67.0-72.9
B+	85.0-86.9	C-	65.0-66.9
B	77.0-84.9	D	50.0-64.9
B-	75.0-76.9	E	0-49.9

The capstone assignment consists of advanced tasks relating to topics taught throughout the semester. Completing the tasks requires independent research efforts (e.g., finding resources on the Internet, trying alternative software packages) that go beyond class materials provided in lecture. The additional tasks involve mathematical computations, use of software, and written essays that combine lectured theoretical concepts with critical thinking. The capstone assignment counts 10% of the total course grade. A minimum point score is not required on the capstone assignment to receive a final course grade.

For information on current UF policies for assigning grade points, see
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

COURSE CONTENT

Week	Topic	Book chapter
Week 1, Aug 22	Introduction Latitude and longitude	EF ch. 1 EF ch.-2
Week 2, Aug 29	Geometry of the sphere Earth's gravity field	EF ch. 3 EF ch. 4
Week 3, Sep 5	~~Geometry of the ellipsoid~~ ~~Geodetic perspective on the USPLSS~~	~~EF ch. 5~~ ~~EF ch. 6~~
Week 4, Sep 12	Geometry of the ellipsoid Geodetic perspective on the USPLSS ~~Geodetic coordinate systems~~	EF ch. 5 EF ch. 6 ~~EF ch. 7~~
Week 5, Sep 19	Geodetic coordinate systems ~~Geodetic datums~~	EF ch. 7 ~~EF ch. 8~~
Week 6, Sep 26	Geodetic datums ~~The Geoid~~ ~~Reduction of observations~~	EF ch. 8 ~~EF ch. 9~~ ~~EF ch. 10~~
Week 7, Oct 3	Guest lecture (Geodesy)~~ – attendance req'd.~~ *Exam review & Q/A –* *live discussion 10/5 (TH) @ 9:35am*	
Week 8, Oct 10	**Mid-term exam (Oct 10) – [EF ch. 1-8]** The Geoid Reduction of observations	 EF ch. 9 EF ch. 10
Week 9, Oct 17	Satellite coordinate systems Overview of GPS	EF ch. 11 VS:Ch. 1
Week 10, Oct 24	Error budget Receivers and survey methods	VS:Ch. 2+4
Week 11, Oct 31	Mathematical models for solutions Dilution of precision	VS:Ch. 2+4 VS:Ch. 3
Week 12, Nov 7	Dilution of precision (cont'd) Planning a GPS Survey	VS:Ch. 3 VS:Ch. 6
Week 13, Nov 14	*GPS projects (guest lect.) – attendance req'd*	
Week 14, Nov 21	RTK and DGPS surveying (no class on Nov 23)	VS:Ch. 7
Week 15, Nov 28	Data processing Other GNSS and future GPS trends	VS Ch. 8
Week 16, Dec 5	*GNSS paper presentations*	

EXAM DATES:

Mid-term exam: Tue 10/10/17 from 9:35am-11:30am; Final exam: Thu 12/14/17 from 12:00pm-2:00pm

POLICIES

This syllabus represents current plans and objectives for this course. As the semester progresses, changes may need to be made to accommodate timing, logistics, or to enhance learning. Such changes, communicated clearly, are not unusual and should be expected.

Late submissions and make-up requests:

It is the responsibility of the student to access on-line lectures, readings, quizzes, and exams and to maintain satisfactory

progress in the course.

- A 10% penalty per day will be applied to late assignments. A late submission on the due date results also in a 10% deduction.
- Assignments will not be accepted if handed in more than seven days after the due date.
- Quizzes cannot be taken past the deadline.
- Exceptions to the late policy are only allowed per university policy.

Computer or other hardware failures, except failure of the UF e-Learning system, will not excuse students for missing assignments. Any late submissions due to technical issues MUST be accompanied by the ticket number received from the Helpdesk when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail your instructor within 24 hours of the technical difficulty if you wish to request consideration.

For computer, software compatibility, or access problems call the HELP DESK phone number—352-392-HELP = 352-392-4357 (option 2).

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Semester Evaluation Process:
Student assessment of instruction is an important part of efforts to improve teaching and learning.

At approximately the mid-point of the semester, the School of Forest Resources & Conservation will request anonymous feedback on student satisfaction on various aspects of this course. These surveys will be sent out through Canvas and are not required, but encouraged. This is not the UF Faculty Evaluation!

At the end of the semester, students are expected to provide UF with feedback on the quality of instruction in this course using a standard set of university and college criteria (UF Faculty Evaluations). These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.

Netiquette: Communication Courtesy Semester Evaluation Process:
All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. Failure to do so may result in loss of participation points and/or referral to the Dean of Students' Office. http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdfStudent

Academic Honesty Policy:
As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity*."

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment*."

It is assumed that you will complete all work independently in each course unless them instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct or

appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated.

Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code

University Policy on Accommodating Students with Disabilities:
Students requesting accommodation for disabilities must first register with the Dean of Students Office (http://www.dso.ufl.edu/drc/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

Software use:
All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

GETTING HELP
For issues with technical difficulties for e-learning in Canvas, please post your question to the Technical Help Discussion in your course, or contact the UF Help Desk at:

- Learning-support@ufl.edu | (352) 392-HELP - select option 2 | http://elearning.ufl.edu
- Library Help Desk support http://cms.uflib.ufl.edu/ask
- SFRC Academic Hub https://ufl.instructure.com/courses/303721

Student Life, Wellness, and Counseling Help:
- Counseling and Wellness resources http://www.counseling.ufl.edu/cwc/
- U Matter, We Care http://www.umatter.ufl.edu/
- Career Resource Center http://www.crc.ufl.edu/
- Other resources are available at http://www.distance.ufl.edu/getting-help for online students

Student Complaint Process:
The School of Forest Resources & Conservation cares about your experience and we will make every effort to address course concerns. We request that all of our online students complete a course satisfaction survey each semester, which is a time for you to voice your thoughts on how your course is being delivered.

If you have a more urgent concern, your first point of contact should be the SFRC Academic Coordinator or the Graduate/Undergraduate Coordinator for the program offering the course. You may also submit a complaint directly to UF administration:

- Students in online courses: http://www.distance.ufl.edu/student-complaint-process
- Students in face-to-face courses: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

NOTE - This syllabus is tentative and subject to change. As with all classes, you are responsible to know the course schedule, readings & labs, and check for short term changes in the topics, dates, etc.