

## ***SUR 4530/6536 Geodesy and Geodetic Positioning***

### **1. OVERVIEW**

Geodesy is relevant for many surveying tasks today, may it be through the approximation of the earth through an ellipsoid as it is used for the State Plane Coordinate System, the use of satellite navigation systems to observe structural deformations, or for high accuracy measurements over spatially extended areas that need to take into account earth curvature and gravity anomalies. This course explains the fundamentals of Geodesy which are relevant in the survey practice both for plane surveying (cadastral surveying, engineering surveying, construction 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 ellipsoid, gravity, geodetic datums, reduction of measurements, satellite orbits, code and carrier phase observations in Global Navigation Satellite Systems (GNSS), and GNSS data collection and processing.

- Fall semester 2023, 3 credits.
- In-person for the Gainesville campus, synchronous lectures through Zoom for remote students (<https://ufl.zoom.us/my/chunli>).
- <http://elearning.ufl.edu/>

**Course Prerequisites:** SUR 3103C Geomatics or instructor consent.

**Instructor:**

Dr. Chunli Dai, 406B Reed Lab, Gainesville, FL.  
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**Teaching assistant:**

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

**Time and location:**

**Lectures:** Thursdays, 9:35 am to 10:25 AM (Period 3), Fridays, 9:35 am to 11:30 AM (Periods 3 and 4), at Reed Lab 302.

First day of class: August 24, 2023. Last day of class: December 2, 2023.

**Office hours:** Thursdays, 10:30 am to 11:30 AM. Other times by appointment.

**Exam dates:**

**Mid-term exam:** Friday, October 13, 2023, 9:35 am to 11:30 AM (Honorlock).

**Final exam:** Monday, December 11, 2023, 3 pm to 5 pm (Honorlock).

**Recommended textbooks (not required):**

- 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.

**2. LEARNING OUTCOMES**

The course objective is to provide the students with competencies to apply geodetic science as it pertains to the practice of Geomatics. 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
- identify best practices for surveys with GNSS
- conduct independent research on advanced topics in Geodesy and Geodetic Positioning
- demonstrate written and oral communication skills in interpreting computational results

**3. COURSE LOGISTICS**

- For each graded item (assignment, quiz, discussion post) a due date and time is given, which is usually the beginning of the next class.
- Assignments are graded based on timeliness, correctness of computations and interpretation of numerical results; quizzes are graded based on correctness of multiple-choice questions, and discussion items are graded based on creativity, completeness, and technical correctness.
- There is a 1-week turnaround for assignment and discussion grading. Quizzes are auto-graded instantaneously in Canvas.
- Lecture materials can be downloaded from weekly modules on the Canvas website.

The Canvas system should be used as the primary 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 with a high-speed internet connection and a supported browser (Google Chrome) for the online exams through Honorlock.
- For remote students: headset and microphone.

- For Zoom: A supported web browser on a supported operating system (Windows, Mac OS, Linux); and minimum bandwidth.

**Using Zoom:**

Live lectures and office hour meetings (per individual student requests) will be conducted with the Zoom conferencing software. Sessions can be joined by clicking a link posted by the instructor on Canvas.

Synchronous online sessions will be recorded. By sharing your video, screen, or audio during any synchronous online class sessions, you are consenting to be recorded for the benefit of students who cannot attend live as well as for class review during the current semester. If you have special circumstances or concerns about privacy, it is your responsibility to discuss them with your instructor.

**4. GRADES AND GRADING SCALE**

Item	Percentage
Timeliness and quality of assignments (UG: 7 assignments @4% each; G: 8 assignments @ 3.5% each)	28%
Online quizzes (7 quizzes @2% each)	14%
Online discussions (5 discussions @2% each)	10%
Attendance (1 event where attendance required)	4%
Mid-term exam	20%
Final exam (cumulative)	24%
<b>Total</b>	<b>100%</b>

Graduate students will be given a capstone home assignment (HG) which 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 the 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 as an additional regular assignment. A minimum point score is not required on the capstone assignment to receive a final course grade.

**Final grading** follows University standards based on the following scale (<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>):

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
<b>Course Score</b>	93.0-100	90.0-92.9	87.0-89.9	83.0-86.9	80.0-82.9	77.0-79.9	73.0-76.9	70.0-72.9	67.0-69.9	63.0-66.9	60.0-62.9	0-59.9
<b>Grade Points</b>	4	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0

**5. COURSE SCHEDULE**

Week	Topic	Details
Week 1, Aug 24	Introduction (D1) Latitude and longitude Geometry of the sphere (H1)	EF ch. 1 EF ch. 2 EF ch. 3
Week 2, Aug 31	Earth's gravity field (Q1) Geometry of the ellipsoid (H2)	EF ch. 4 EF ch. 5
Week 3, Sep 7	Geodetic perspective on the USPLSS (D2) Geodetic coordinate systems (H3)	EF ch. 6 EF ch. 7
Week 4, Sep 14	Geodetic datums (Q2)	EF ch. 8
Week 5, Sep 21	Geoid Reduction of observations (H4)	EF ch. 9, EF ch. 10
Week 6, Sep 28	Future US geodetic datums (D3)	Online resource
Week 7, Oct 5 (No Friday class)	Satellite coordinate systems (H5)	EF ch. 11
Week 8, Oct 12	Overview of GPS (Q3) Mid-term exam (10/13)	VS ch. 1
Week 9, Oct 19	Error budget (D4) Receivers and survey methods (Q4)	VS ch. 2+4
Week 10, Oct 26	Mathematical models for solutions (Q5) Dilution of precision	VS ch. 2+4 VS ch. 3
Week 11, Nov 2	Planning a GPS Survey (H6)	VS ch. 6
Week 12, Nov 9 (No Friday class)	Differential GNSS – RTK and DGPS (Q6)	VS ch. 7
Week 13, Nov 16	Data processing (Q7) Other GNSS (H7)	VS ch. 8
Week 14, Nov 30	GNSS student presentations (HG) Final exam Q&A – attendance required.	

D: Discussion, Q: Quiz, H: Home assignment

EF: Elithorp and Findorff; VS: van Sickle

**Date with attendance required:**

Friday 12/1, 9:35 am – 11:30 am: Student group presentations, Final exam Q&A

## 6. POLICIES AND REQUIREMENTS

This syllabus represents the current plans and objectives for this course. As the semester progresses, changes may need to be made to accommodate timing, and logistics, or to enhance learning.

**Guidelines** for preparing homework assignments:

- a) You may work together and discuss the assignments, but you must prepare your own report, which includes your own discussions, your own derivations of equations, and your own graphical illustrations.
- b) The lab report must be type-written. Good English needs to be practiced.
- c) Label and define everything. Symbols that you use in your text must be properly defined. Axes in plots need to be properly labeled. Units must be denoted for all numerical values, including plotted values.
- d) Graphical illustrations (plots) need to be legible. Spend time to make your plots meaningful and informative. Use appropriate ranges on the abscissa and ordinate axes to show the important parts of what should be plotted.

### **Late submissions and make-up requests:**

It is the responsibility of the student to access online materials (lectures, readings, quizzes, assignments, discussions, exams) to maintain satisfactory progress in the course.

- A 10% penalty will be applied to the late assignments.
- The Canvas submission portal will close at the due date/time. Therefore, if handing in late, please send your homework document through Canvas e-mail as an attachment to the instructor.
- Assignments will not be accepted if handed in more than seven days after the due date.
- Exams can only be taken during the designated times.
- Exceptions to the late policy are only allowed per university policy.
- Any late submission 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 should document the time and date of the problem. You must email your instructor within 24 hours of the technical difficulty if you request consideration.

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

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/UGRD/academic-regulations/attendance-policies/>

### **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 professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-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 a loss of participation points and/or referral to the Dean of Students' Office.

**Academic Honesty Policy:**

As a student at the University of Florida, you have committed yourself to upholding 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 the 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 with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. Click [here](#) to get started with the Disability Resource Center. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

**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.

**Class recordings:**

Policies regarding student in-class recordings and publishing them are detailed here: <https://aa.ufl.edu/policies/in-class-recording/>

**7. CAMPUS RESOURCES**

**Student Life, Wellness, and Counseling Help:**

- *U Matter, We Care:* If you or someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392- 1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center:* [Visit the Counseling and Wellness Center website](#) or call 352-392- 1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center:* Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](#).
- *University Police Department:* [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- Career Resource Center <https://career.ufl.edu/>
- GatorWell Health Promotion Services <https://gatorwell.ufsa.ufl.edu/>

**Academic Resources:**

- 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](mailto:Learning-support@ufl.edu) | (352) 392-HELP - select option 2 | <http://elearning.ufl.edu> | <https://helpdesk.ufl.edu/>
- SFFGS Academic Hub <https://ufl.instructure.com/courses/303721>
- [Career Connections Center:](#) Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- [Library Support:](#) Various ways to receive assistance with respect to using the libraries or finding resources.
- [Teaching Center:](#) Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- [Writing Studio:](#) 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

- Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information.](#)
- On-Line Students Complaints: [View the Distance Learning Student Complaint Process.](#)