Geodetic Science – GISC 3325.001/W01
School of Engineering and Computing Sciences
Spring 2016

A. COURSE INFORMATION

Course number/section: GISC 3325.001/W01
Class meeting time: MW 02:00-02:50 PM (LEC)
                   W 03:30-05:20 PM (LAB)
Class location:    EN 104 (LEC)
                   CI 229 (LAB)
Course Website:   Blackboard (https://bb9.tamucc.edu)

B. INSTRUCTOR INFORMATION

Instructor: Hongzhi Song
Office location: CI 327
Office hours: M 3:00-5:00 PM, TR 11:00-12:30 PM
Telephone: 361-825-3622
e-mail: hongzhi.song@tamucc.edu
Appointments: By request.

C. COURSE DESCRIPTION

Catalog Course Description

D. PREREQUISITES AND COREQUISITES

Prerequisites
GISC 2470

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Supplies
- Matlab (http://www.mathworks.com/products/matlab/)
- Adobe PDF viewer (e.g. Adobe Acrobat Reader).
F. Student Learning Outcomes and Assessment

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Demonstrate ability to perform and understand the results of computations of positions, distances and azimuths on a variety of reference surfaces.

2. Demonstrate understanding of the relationships between Ground, Grid, Mark-to-Mark and Geodetic Distances. Students will reduce data to the different systems and submit solutions in lab exercises.

3. Describe the relationships between height systems: Ellipsoidal, Geoidal and Orthometric.

4. Perform computations using data from the three systems.

5. Explain the worldwide 3-D coordinates systems associated with modern positioning with special emphasis on the National Spatial Reference System (NSRS) used in the United States. Work will include all major modern horizontal and vertical datums used in the United States. Students will be required to transform data between different systems.

6. Describe gravity measurements and their use in surveying and geodesy. This will lead to discussions of geodetic leveling as well as geoid modeling. We will study both purely gravimetric and hybrid models using both gravimetry and other data sources. Students will analyze the utility of various geoid models over a specified geographic areas as a lab exercise.

7. Perform the reduction of field observations for use in the computation of ellipsoidal coordinates and the transformation of earth-centered coordinates into local geodetic horizon systems. The reduction of field observations for use in verifying equipment performance / calibration will be performed as a lab exercise.
8. Describe current Federal Geodetic Control Subcommittee (FGCS) requirements for submitting data for inclusion into the NSRS. Students will be required to create a project plan that will meet FGCS standards and specifications.

9. Create datum transformations using both web-based tools as well as your own algorithms.

10. Calculate GPS data reductions from observations to vectors.

11. Explain the role of GPS in modern geodesy.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

In-person students will attend live lectures and labs while online students will watch lecture recordings/view lecture notes and complete labs on their own time.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Student learning outcomes will be assessed through three examinations, quizzes, participations and attendance, project, and a number of lab assignments/homework.

- Exams (35%) – There will be two in-class exams worth 10% of the final grade each, and a final exam worth 15% of the final grade. Please note the dates of the exams on the course schedule below and plan accordingly. Exams may only be made up with an approved University excuse and will be different from the in-class version of the exam. If you have a conflict with an exam date, please let me know as soon as you know about the conflict.

- Lab Assignments/Homework (35%) - As part of this class, you will have many homework assignments. These assignments are all individual efforts unless otherwise specified.

- Quizzes, Participation, and Attendance (15%) – You are expected to attend class, participate, and complete the assigned readings. In order to encourage and reward these behaviors, regular quizzes (on-line and in-class) will be given. You will also participate in-group and individual activities on a regular basis that will count towards your final grade. There are no make-ups for missed daily grades and it is your responsibility to consult the course website to determine what was covered during any days you miss and obtain notes from a classmate. Be sure to make use of office hours to meet with me to discuss any issues you have with the material or class assignments.

- Final Project (15%) - As part of this class, you will have to work on a final project assignment. The final project is a team effort.

- Grade Scale: A (90-100%)  B (80-89%)  C (70-79%)  D (60-69%)  F (<60%)
<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams (2)</td>
<td>20</td>
</tr>
<tr>
<td>Homework/Lab Assignments</td>
<td>35</td>
</tr>
<tr>
<td>Quizzes and Participation</td>
<td>15</td>
</tr>
<tr>
<td>Final Project</td>
<td>15</td>
</tr>
<tr>
<td>Final Exam</td>
<td>15</td>
</tr>
</tbody>
</table>

I. COURSE CONTENT/SCHEDULE

The following is a rough outline and is subject to change. See the course website for the most up to date information.

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
<th>CHAPTER(S)</th>
<th>ASSIGNMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>History of geodesy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>System of Natural Coordinates</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Great Circle computations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Earth’s Gravity Field</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td>4</td>
<td>Gravity and related issues</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>OPUS and an introduction to GPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>More GPS and exam review</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>OPUS solution components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The Earth as an Ellipse Class</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Geometry of the Ellipse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ellipsoidal geometry</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Ellipsoid of Revolution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Horizontal Datum in the United States</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>NAD 83 (1986) to NAD 83 (1993) aka HARN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>NAD 83 (NSRS 2007)</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Vertical Datum in the US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Geodetic Reference Systems</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td>11</td>
<td>Geoid Modeling (hybrid and gravimetric)</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Global Navigation Satellite Systems (GNSS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ITRF, WGS and related issues</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>WGS 84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Computations</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>State Plane Coordinate System</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GPS Project design and implementation
Geodetic Leveling

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

Attendance/Tardiness
- Students are expected to be in attendance, punctual, and prepared for class. Online students are expected to regularly log in to the course website, watch lectures, and submit assignments.

Late Work and Make-up Exams
- All assignments must be completed on time. Submission of an assignment after the due date is accepted, but with a penalty of 20% of the grade for the first 24 hours late, and 5% each additional 24 hours. Make-up Exams and assignments are not permitted except for official documentation, exceptional reasons.

Extra Credit
- Extra Credit questions/problems will be given in some of the tests and homework.

Cell Phone Use
- Please refrain from the use of electronic devices during class, as it is distracting to not only you, but also to your instructor and peers. Silence your phones and put them away so you are not tempted to stray off task.

Laptop Use
- Laptops will be permitted for particular activities as deemed appropriate.

Food in Class
- No food are allowed during lab.

Missed Exam
- If you have a conflict with an exam date, please let me know as soon as you know about the conflict.

Participation
- In-group and individual activities on a regular basis will count towards your final grade

Others
• **All work submitted for grading must be the student's own work.** Plagiarism will result in a score of 0 (zero) for the work or dismissal from the course and the Dean of Students office will be notified. No copying from another student's work of any type is allowed. It is the student's duty to allow no one to copy his or her work. Anyone found cheating and/or copying, in the exams or assignments, in the instructor's opinion, may receive an automatic F for the course.

• **Email.** Consider email as official correspondence warranting professional language. Professional emails include elements such as a short descriptive subject line, salutation, complete inquiry in the body of the message, your full name, and course and section number. Unprofessional emails will result in a non-response and request for proper correspondence.

• **Technological Excuses.** Hard drive crashes and other computer woes will not be accepted as excises for late submission. Students should, given the complexity of the tasks they will purse, be sure that they maintain adequate backup copies of all aspects of their work. Additionally, plan ahead, do not wait last minute to do the work. You may NOT submit assignments by email. If for some reason you feel you have to do this, you must ask for, and receive, permission ahead of time; furthermore, you may not consider an emailed assignment to be submitted until you have received a reply confirming that I have received the assignment.

• **Communication about Life Events.** It is the your (student’s) responsibility to keep up with the course instruction, assignments, and examinations. Should a life event interrupt your ability to meet these responsibilities, you must inform the instructor about this as soon as possible and within a reasonable amount of time so that a course of action can be determined.

• **Note to Online Students.** Lecture recordings will be made available online after the in-class meeting. It is your responsibility to watch the recordings in every week so you stay up with the course. Laboratory assignments will be completed on your home computer and must be submitted digitally to Blackboard on time. You are responsible for installing and testing the software during the first week of class and keeping your home computer in good working order.

### K. COLLEGE AND UNIVERSITY POLICIES

• **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

• **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under
Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation **WILL NOT** automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must be submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.
• **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

[http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

• **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

### L. OTHER INFORMATION

• **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

• Students are expected to be in attendance, punctual, and **prepared** for class.
• Assigned readings and quizzes, as discussed in class and usually found in Blackboard, should be completed before coming to the next class. You are expected to **read** the textbooks. Quizzes will be frequent and will cover the material assigned in the readings.
• Please ask questions on any material that you do not understand; if I cannot explain it to your satisfaction, please see me during my office hours.
• Monitor and use your Islander email regularly.
• Demonstrate integrity, maturity, and ethical behavior.
GENERAL DISCLAIMER
I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.