A. **COURSE INFORMATION**

- **Course number/section:** GISC 4340.001/W01–Geospatial computing & adjustment
- **Class meeting time:** TR 8:00-9:15am
- **Class location:** CI 229
- **Course Website:** BlackBoard @ tamucc.edu

B. **INSTRUCTOR INFORMATION**

- **Instructor:** George Zhou
- **Office location:** CBI-113
- **Office hours:** T 9:30-12:00; R 9:30-12:00
- **Telephone:** 361-825-3529
- **E-mail:** Guoqing.Zhou@tamucc.edu
- **Appointments:** Email to make an appointment.

C. **COURSE DESCRIPTION**

The purpose of this course is to provide students with the basic theory and mechanics of error theory, error propagation, and least squares adjustment, spatial statistics and their applications in the geospatial data statistics analysis such as traditional surveying of distances, angles, azimuths, differential leveling, photogrammetry aerial triangulation, traverse, and GPS data processing, network adjustment.

This course will also introduce major principals of data snooping and blunder detection skills, special data adjustment models, and explore post-adjustment analysis through the use of various statistical tests, and error ellipse computation and analysis, as well as spatial statistics commonly used in ArcGIS software.

D. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**

After finished this course, student should be familiar with

1. Theoretical issues in error, error propagation, least squares adjustment.
2. Application of least squares adjustment to a range of geomatics needs, such as photogrammetry, GPS, and leveling.
3. Geospatial data statistics analysis in ArcGIS software including spatial prediction e.g., optimal prediction, ordinary and universal kriging, cokriging; autoregressive models, and spatial regression, e.g., linear and generalized linear models with correlated data; and spatial point patterns, such as random, aggregated and regular patterns, etc.
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.

E. INSTRUCTIONAL METHODS AND ACTIVITIES

All lectures will be presented live in the classroom and recorded for posting online. In-person students will attend live lectures while online students will watch lecture on their own time. The instructor may also post additional videos for students to review before or after class, as assigned.

F. PREREQUISITES AND COREQUISITES


SPECIAL NOTE

This course requires students to have a rather good mathematical background. If you have no such a background, please obtain the permission when registering this course. Meanwhile, all of students are required to attend each class because a lot of formula will be derived in class. The applications, examples of the formula will be explained in class. If the remote site cannot attend this class, you have to watch the archived video. If you feel that the material is overwhelming you, please speak up and we will try to come to a solution that allows everyone to work at a suitable pace.

G. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Title: Adjustment Computation: Spatial Data Analysis (5th Ed.)
Author: Carles D. Ghilani
Publisher: Wiley

Optional Textbook(s) or Other References

Title: GeoComputation, 2th Ed.
Authors: Robert J. Abrahart and Linda See
Publisher: CRC Press
ISBN: 978-1-4665-0428-1
REQUIRED PROJECT
All students are required to conduct a project for problem-solving using LSA method. In order to get the project done in reasonable amount of time, each student is required to write a proposal including topic and schedule in the first four weeks. The practice includes GPS data processing, photogrammetry data processing, etc. using LSA or other methods. Alternatively, Instructor will assist/give you some topics that you can choose one.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Student learning outcomes will be assessed through three examinations a number of lab assignments, and a class project. Labs will be graded based on: completeness, correctness, and documentation.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
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<tbody>
<tr>
<td>Attendance</td>
<td>10%</td>
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<tr>
<td>Assignment</td>
<td>35%</td>
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<tr>
<td>Mid-term Exam</td>
<td>15%</td>
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<tr>
<td>Project</td>
<td>10%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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The following grading scale will be assigned as indicated below:

100 – 91 A  
> 90 - 80 B  
> 79 - 70 C  
> 69 - 60 D  
> 60 F

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Homework (HW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19 Jan. (R)</td>
<td>Syllabus</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>CH 1: Introduction (p. 1-11)</td>
<td></td>
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<tr>
<td>2</td>
<td>24 Jan (T)</td>
<td>CH 2: Observations (p. 12-32)</td>
<td></td>
<td>HW 2 Due: Feb. 2</td>
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<tr>
<td></td>
<td>26 Jan. (R)</td>
<td>CH 3: Random Error (p. 33 - 48)</td>
<td></td>
<td>CH 2/: 2, 6, 9 (STATS software, downloaded)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>CH 3/: 6, 8, 10</td>
</tr>
<tr>
<td>3</td>
<td>Jan. 31 (T)</td>
<td>[App. A]: Intro. to Matrix (p. 550-564)</td>
<td></td>
<td>HW 3 Due: Feb 9</td>
</tr>
<tr>
<td>Week</td>
<td>Dates</td>
<td>Assignments</td>
<td>Notes</td>
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<tr>
<td>4</td>
<td>Feb. 7 (T) Feb. 9 (R)</td>
<td>CH 6: Prop. of Error (p. 86-102)</td>
<td>HW 4: Due: Feb 16 CH 6/: 3, 4, 8, 14,</td>
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<tr>
<td>5</td>
<td>Feb. 14 (T) Feb. 16 (R)</td>
<td>CH 10: Weighted Observation (p. 165 - 175)</td>
<td>HW 5: Due: Feb 23 CH 10/: 3, 4, 8, 14</td>
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<tr>
<td>6</td>
<td>Feb. 21 (T) Feb. 23 (R)</td>
<td>CH 11: Principle of LSA –I (p. 178-204) Due for Proposal of Project</td>
<td>HW 6: Due: Mar 2 CH 11/: 1, 5, 10, 14</td>
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<td>7</td>
<td>Feb. 28 (T) Mar. 2 (R)</td>
<td>Principle of LSA –II (Handout)</td>
<td>HW 7: Due: Mar. 9 see the last page of PPT</td>
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<tr>
<td>8</td>
<td>Mar. 7 (T) Mar. 9 (R)</td>
<td>Week 8 / Mar 7 Exam 1</td>
<td>Exam 1: Week 1-8</td>
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<tr>
<td>9</td>
<td>Mar. 14 (T) Mar. 16 (R)</td>
<td>Spring Break – No Class</td>
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<tr>
<td>10</td>
<td>Mar. 21 (T) Mar. 23 (R)</td>
<td>CH 12: App. of LSA for Level Net (p.210-227)</td>
<td>HW 8: Due: Mar 30 CH 12/: 1, 6, 10</td>
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<tr>
<td>11</td>
<td>Mar. 28 (T) Mar. 30 (R)</td>
<td>CH 14/Ch15/Ch16/Ch17: Application of LSA in Surveying (p. 240 – 366)</td>
<td>No Homework</td>
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<tr>
<td>12</td>
<td>Apr. 4 (T) Apr. 6 (R)</td>
<td>CH 20: Constraint LSA (p. 416 – 434)</td>
<td>HW 9: Due: Apr 6 CH 20/: 6</td>
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<tr>
<td>13</td>
<td>Apr. 11 (T) Apr. 13 (R)</td>
<td>CH 19: Error Ellipse (p. 397 – 415) CH 21: Blunder Detection(p. 435 – 462)</td>
<td>HW 10: Due: Apr 13 CH 19/: 1, 3 CH 21/: 1, 5, 11</td>
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<tr>
<td>14</td>
<td>Apr. 18 (T) Apr. 20 (R)</td>
<td>Spatial Statistic Analysis (Handout)</td>
<td>No Homework</td>
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<tr>
<td>15</td>
<td>Apr. 25 (T) Apr. 27 (R)</td>
<td>Spatial Statistic Analysis in ArcGIS (Handout)</td>
<td>Project Due: May 6</td>
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<tr>
<td>16</td>
<td>May 2 (T)</td>
<td>Project Presentation Final Class</td>
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<td></td>
<td>May 4-5</td>
<td>Final Exam</td>
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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 attend regular class and lab meetings. Online students are expected to regularly log in to the course website, watch lectures, and submit assignments.

Late Work
All assignments must be completed on time. Submission of an assignment after the due date is accepted, but with a penalty of 30% of the grade for the first 24 hours late, and 10% each
additional 24 hours.

**Extra Credit**
No extra credit options are available for this course. No exceptions.

**Food in Class**
Do not eat food during class or lab. Food is forbidden in computer labs.

**E-mail**
Consider e-mail as official correspondence warranting professional language. Professional e-mails 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 excuses for late submission. Students should, given the complexity of the tasks they will pursue, be sure that they maintain adequate backup copies of all aspects of their work. Additionally, plan ahead so that you will have time to use the on-campus computers and printers if necessary. You may NOT submit papers/assignments by e-mail. 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 e-mailed paper/assignment to be submitted until you have received a reply confirming that I have received the paper/assignment.

**Communication about Life Events**
It is 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. Communicating with the instructor about these life events in an unreasonable time frame is not acceptable and will not change the outcome of missed work nor will it be a valid reason to receive an ‘Incomplete’ designation for the course.

**Originality of Work**
Every assignment for this class must be your own work. You may ask for clarification and assistance but you may not copy or use anyone else’s work for any reason in this course, unless explicitly stated in a lab assignment.

**Note to Online Students**
Lecture recordings will be made available online immediately 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 the Island Online on a weekly basis. You are responsible for installing and testing the GIS software and keeping your home computer in good working order.
Online Exam Proctoring
For students taking the course online, you will take your tests remotely and they will be proctored by a service called Examity®. To use Examity®, you will need to make sure you meet the following technical requirements, in addition to the technical requirements set forth elsewhere in this syllabus:

- You must take your exam on a computer with a webcam and a microphone (both built-in and external are fine.)
- You must take your exam from a location that with sufficient internet speed: at least 700KBPS upload and download speed. You can test your internet speed at http://www.speedtest.net.

If you have any questions or concerns, you can contact Examity’s technical support team 24/7 via email at support@examity.com or phone at (855)-392-6489.

Examity involves third party charges. Exam-proctoring charges may range from $3 - $31.50 per exam. Students may be required to schedule exams at least 24 hours in advance or incur late scheduling charges. All costs for exams are the responsibility of the student. Students will also be responsible for providing webcams to be used in test proctoring.

Semester Project
Each student is required to individually develop a project by the end of the semester. The project is expected to develop a Google Map Application using JavaScript.

Each student must: 1) submit a one-page project proposal by the 11th week; 2) present and demonstrate the project during a scheduled project presentation time; and 3) submit a final project report, including PowerPoint slides and your code by the end of the semester.

The project proposal must include the objective of the project, GIS data and main functions.

Each student will have 10 minutes for presentation and 5 minutes for questions to demonstrate your application. In addition to the essential information described in your GIS application, a live demonstration of your application must accompany the presentation.

It’s a good idea to browse online sources to see what JavaScript have been developed for Google Maps Applications. This will give you a sense of the scope and complexity of the program. However, you must acknowledge the sources of any codes that you borrow in your application. You will fail this class if you commit any form of plagiarism on the final project.

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/) 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, and the College of Science and Engineering Grade Appeals webpage at 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.

**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.