Advanced Topics: Geophysics GEOL 5490
Department of Physical and Environmental Science
Spring 2020

A. COURSE INFORMATION

Course number/section: GEOL 5490.001
Class meeting time: Tuesday & Thursday, 11:00 – 12:15
Class location: BH-201
Lab Location: CI-222
Lab meeting time: Tuesday, 12:30-02:20
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Mohamed Ahmed
Office location: Natural Resources Center (NRC) # 3101
Office hours: Monday & Wednesday at 2:00 – 4:30 or by appointment.
Telephone: 361-825-3278
e-mail: mohamed.ahmed@tamucc.edu
Appointments: Arranged, a head of time, via e-mail.

C. COURSE DESCRIPTION

Catalog Course Description
Introduction to quantitative techniques to assess physical properties and processes of the Earth. Topics include earthquake seismology, refraction and reflection seismology, gravimetry, magnetism, electrical methods, and radioactivity of Earth materials. Application of geophysical methods to the study of the Earth, in oil and gas exploration, and in economic and environmental geology.

Extended Course Description
This provides a general overview of geophysical techniques. After a successful completion of this course the student should be familiar with of geophysical techniques and data used to characterize the subsurface. Almost every geophysical, geological, and environmental profession will require dealing with geophysical data. This course is providing basics, strengths, and limitations of such data.

D. PREREQUISITES AND COREQUISITES

Prerequisites
PHYS 1401 - General Physics I or PHYS 2425 – University Physics I
PHYS 1402 - General Physics II or PHYS 2426 – University Physics II
MATH 2413 - Calculus I

Corequisites
None.
E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Optional Textbook(s) or Other References


Supplies
Scientific Calculator; USB-thumb-flash drive; Pencil, eraser, colored pencils, and ruler.

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 understanding of the theory of plate tectonics, processes by which plate tectonics produced the features seen on Earth today, and evidences for plate tectonics from geophysical data,
2. Acquire a thorough understanding of the principles and basics of different geophysical techniques.
3. Identify geophysical techniques, design field surveys, and setup the acquisition parameters to solve geological and environmental problems,
4. Analyze and interpret different types of geophysical data for geological and environmental applications.
5. Define typical "pitfalls" in acquisition, processing, and interpretation of different geophysics data.
G. INSTRUCTIONAL METHODS AND ACTIVITIES

- **Homework:**
  Homework is due one week after being assigned. Late homework (up to two weeks after being assigned) will be graded at 50% value. Care should be taken to assure that a neat, organized, understandable, and concise product is the result of your work.

- **Labs:**
  Hands-on experiences on collecting geophysical data in the field and processing real field data in the computer lab. Professional conduct and a professional write-up of field exercises are crucial and will be treated as such in grading. In some cases, we will conduct other exercises during the laboratory period, using public-domain data. Your participation and your written labs will be considered in this grade.

- **Quizzes and Mid-term Exam:**
  Two quizzes and a mid-term exam will be given.

- **Paper & Presentation:**
  Paper and presentation related to the application of geophysical techniques in solving geological and environmental problems. A 5-pages, excluding figures, research paper should include an abstract, background, research rational, objectives, methods and approaches, results, discussion and conclusions, and references. More details will be provided in class.

- **Final Exam:**
  A comprehensive final exam will be given. This exam may include problems worked in homework and on mid-term exams. Additional vocabulary and essay questions (not identical to homework and exams) are likely.

Each student is expected to take all exams at the designated time and place, unless prior arrangements have been made with the instructor. The use of a calculator is allowed. Students who miss an exam will receive a grade of zero. Make-up exams will be given contingent providing presentation of approved medical excuse, or by pre-excused permission of the instructor. No exceptions. The format of make-up exams may differ from that of the regular exam. All exams are closed book; however, the use of a calculator is permitted. Students who want to appeal a grade should do it in writing, at latest one day after the exam was returned. Please note the date of the final exam. No final exam will be given at an earlier date. Disability accommodations must be documented and approved by the Office of Disability Services.
H. MAJOR COURSE REQUIREMENTS AND GRADING

- COURSE GRADING

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
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<tbody>
<tr>
<td>Quizzes 1 &amp; 2 and Mid-term Exam</td>
<td>20</td>
</tr>
<tr>
<td>Lab Assignments</td>
<td>25</td>
</tr>
<tr>
<td>Homework</td>
<td>20</td>
</tr>
<tr>
<td>Paper &amp; Presentation</td>
<td>10</td>
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<tr>
<td>Final Exam</td>
<td>25</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
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</tbody>
</table>

- GRADING POLICY
  A: 90-100%; B: 80-89.9%; C: 70-79.9%; D: 60-69.9%; F: 0-59.9%

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
<th>CHAPTER</th>
<th>LAB</th>
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<tbody>
<tr>
<td>1</td>
<td>Syllabus; Introduction; Overview of geophysical techniques; Interpretation Methods and Constraints; Whole Earth Knowledge.</td>
<td>1</td>
<td>Lab 1: Dealing with geophysical data in Excel</td>
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<tr>
<td>2</td>
<td>Plate Tectonics; Major Divisions of the Earth; Lithosphere/Asthenosphere System; Types of Plate Boundaries; Manifestations Along Plate Boundaries; Plate Tectonic Constraints offered by Geophysical Observations.</td>
<td>2</td>
<td>Lab 2: Accuracy and precision of geophysical data</td>
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<tr>
<td>3</td>
<td>Seismic Waves; Controlled Source Seismic Techniques.</td>
<td>3</td>
<td>Lab 3: Seismic Survey – Part 1</td>
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<tr>
<td>4&amp;5</td>
<td>Seismic Refraction Interpretation; Interpretation Models; Tectonic Interpretation of Seismic Refraction Profiles.</td>
<td>4</td>
<td>Lab 4: Seismic Survey – Parts 2 &amp; 3</td>
</tr>
<tr>
<td>6&amp;7</td>
<td>Seismic Reflection; Acquisition; Processing; Seismic Waveform.</td>
<td>5</td>
<td>Lab 5: Gravity Survey – Parts 1&amp;2</td>
</tr>
<tr>
<td>8</td>
<td>Structural and Tectonic Interpretation of Seismic Reflection Profiles; Appearance of Structures on Reflection Profiles; Seismic Expression of Tectonic Settings.</td>
<td>6</td>
<td>Lab 6: Magnetic Survey – Part 1</td>
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<tr>
<td>9</td>
<td>Earthquake Seismology; Characteristics of Earthquakes; Earthquakes and Plate Tectonics; Seismic Waves as Probes of Earth's Interior.</td>
<td>7</td>
<td>Lab 7: Magnetic Survey – Part 2</td>
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<tr>
<td>10&amp;11</td>
<td>Gravity Method; Earth's Gravity Field; Gravity Anomalies; Measurement of Gravity; Isostasy;</td>
<td>8</td>
<td>Lab 8: GPR survey – Parts 1 &amp; 2</td>
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</tbody>
</table>
Gravity Modeling; Tectonic Settings and their Gravity Expressions.

12&13 Magnetic Method; Earth's Magnetic Field; Magnetization of Earth Materials; Interpretation of Induced Magnetic Anomalies; Paleomagnetic Studies. 9 Lab 9: Resistivity Survey – Parts 1 & 2

14&15 Heat Flow; Heat Within the Earth; Heat Flow Across Earth's Surface; Tectonics and Heat Flow. 10 Lab 10: EM Survey – Parts 1 & 2

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
Lecture attendance is strongly recommended. Poor attendance will result in missed lecture material and may reflect in less than desired class performance and/or unsuccessful class completion. It is the students’ responsibility to acquire class notes from peers if class is missed.

Late Work and Make-up Exams
Late homework (up to two weeks after being assigned) will be graded at 50% value.

Each student is expected to take all exams at the designated time and place, unless prior arrangements have been made with the instructor. Students who miss an exam will receive a grade of zero. Make-up exams will be given contingent providing presentation of approved medical excuse, or by pre-excused permission of the instructor. No exceptions. The format of make-up exams may differ from that of the regular exam. All exams are closed book; however, the use of a calculator is permitted. Please note the date of the final exam. No final exam will be given at an earlier date.

Cell Phone Use
Cell phone use is not allowed in the class.

Food in Class
No food or drinks are allowed in the class.

Missed Exam
Each student is expected to take all exams at the designated time and place, unless prior arrangements have been made with the instructor. Students who miss an exam will receive a grade of zero. Make-up exams will be given contingent providing presentation of approved medical excuse, or by pre-excused permission of the instructor. No exceptions.
The format of make-up exams may differ from that of the regular exam. All exams are closed book; however, the use of a calculator is permitted. Please note the date of the final exam. No final exam will be given at an earlier date.

**Participation**
Participation is highly encouraged and recommend during the class.

**Reading textbook:**
Reading of the Text is mandatory!

**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)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. **Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.** Should dropping the course be the best course of action, you must
initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. 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/

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.