Structural Geology – GEOL 4421
Department of Physical and Environmental Sciences
Fall 2020

A. COURSE INFORMATION

Course number/section: GEOL 4421.001
Class meeting time: MW 02:00 – 03:15 pm
Class location: BH 201
Lab meeting time: Monday 10:00 – 11:50 am
Lab location: CS 226
Course Website: https://bb9.tamucc.edu/webapps/portal/frameset.jsp

B. INSTRUCTOR INFORMATION

Instructor: Dr. Valeriu Murgulet
Office location: CS 205
Office hours: Tuesday 11:00 am – 01:00 pm; Wednesday 09:00 am – 12:00 pm or by appointment
Telephone: (361) 825-6023
e-mail: valeriu.murgulet@tamucc.edu
Appointments: Please email instructor directly for an appointment, or if you have any questions or concerns.

C. COURSE DESCRIPTION

Catalog Course Description
Geometric and quantitative description of deformation of the Earth’s crust, mechanics of brittle and crystal-plastic deformation processes of Earth materials, introduction to continuum mechanics of geologic systems, crustal deformation from micro-scale to global tectonics. Laboratory introduces principles of three-dimensional data representation and analysis, geologic map interpretation, cross-section techniques, and problems in stress and strain analysis.

Extended Course Description
Geology 4421 is an introduction to the study of structures found in the lithosphere, their description, nomenclature, and the geologic processes that form them. The course also introduces the student to numerical and graphical quantitative solution of structural problems. After a brief review of both non-tectonic and tectonic geological structures, the course will cover the basics of structural analysis (stress, strain and the relationship between the two). In the second half of the course, we will focus on the description and analysis of the chief classes of tectonic structures (faults, folds, shear zones, microstructures). The course will conclude with a look at plate tectonic processes from a structural perspective. Laboratory exercises will complement the material presented during the lectures.
D. **PREREQUISITES AND COREQUISITES**

**Prerequisites**
Prerequisites for this course are GEOL 3411, MATH 2413, and PHYS 1401 or 2425.

**Corequisites**
SMTE-0094.W01 - Geology Lab Safety Seminar

E. **REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES**

**Required Textbook(s)**
*Structural Geology, 2nd Edition* by Haakon Fossen, Cambridge University Press

**Supplies**
The lab exercises (and partially the lectures) will require the use of some basic drafting supplies. The following is a list of what is needed. Please bring these items with you to each lab session. Some supplies may be available for student use while in CS 226.

- Stereonets (will be provided)
- Mechanical pencil, lead size of 0.5 mm or finer (required)
- Colored pencils (at least six colors, required)
- 12” ruler with mm markings (required)
- Protractor (required)
- Triangle (optional)
- Compass (required)
- Tracing paper (one tablet, can be shared, required)
- Graph paper (one tablet, can be shared, required)
- Calculator
- Eraser (most important)

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 familiarity with the principles of structural analysis,
2) discuss the main types of geologic structures and their analysis,
3) apply various laboratory techniques to solve structural problems,
4) and apply the principles of structural geology within a broader context.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

We will use a variety of instructional methods in this course, including lectures, discussions, and hands-on exercises.

H. MAJOR COURSE REQUIREMENTS AND GRADING

The student learning outcomes described in Section F will be measured through the assignments listed below.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>FINAL GRADE (%)</th>
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</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>15</td>
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<tr>
<td>Exam 2</td>
<td>15</td>
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<tr>
<td>Final exam</td>
<td>20</td>
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<tr>
<td>Quizzes</td>
<td>15</td>
</tr>
<tr>
<td>Lab Mid-term Exam</td>
<td>10</td>
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<tr>
<td>Lab Assignments</td>
<td>15</td>
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<tr>
<td>Presentation</td>
<td>10</td>
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</tbody>
</table>

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>TEXTBOOK CHAPTER/ LECTURE TOPIC AND EXAM/PAPER DUE DATES</th>
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<tbody>
<tr>
<td>08/19</td>
<td>Chapter 1: Structural Geology and Structural Analysis</td>
</tr>
<tr>
<td>08/24</td>
<td>Chapter 2: Deformation</td>
</tr>
<tr>
<td>08/31</td>
<td>Chapter 3: Strain in Rocks; Chapter 4: Stress</td>
</tr>
<tr>
<td>09/07</td>
<td>Chapter 5: Stress in the Lithosphere</td>
</tr>
<tr>
<td>09/14</td>
<td>Chapter 7: Fracture and Brittle Deformation; Chapter 8: Joints and Veins</td>
</tr>
<tr>
<td>09/21</td>
<td>Chapter 9: Faults; Exam 1</td>
</tr>
<tr>
<td>09/28</td>
<td>Chapter 10: Kinematics &amp; Paleostress in the Brittle Regime</td>
</tr>
<tr>
<td>10/05</td>
<td>Chapter 11: Deformation at the Microscale; Chapter 12: Folds and Folding</td>
</tr>
<tr>
<td>10/12</td>
<td>Chapter 13: Foliation and Cleavage</td>
</tr>
<tr>
<td>10/19</td>
<td>Chapter 14: Lineations; Chapter 15: Boudinage</td>
</tr>
<tr>
<td>10/26</td>
<td>Chapter 16: Shear Zones and Mylonites; Exam 2</td>
</tr>
<tr>
<td>11/02</td>
<td>Chapter 17: Contractional Regimes; Chapter 18: Extensional Regimes</td>
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<tr>
<td>11/09</td>
<td>Chapter 19: Strike-slip, Transpression, and Transtension</td>
</tr>
<tr>
<td>11/16</td>
<td>Chapter 22: A Glimpse of a Larger Picture</td>
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</table>
11/23 | Presentations
12/02 | **Final Exam** (comprehensive): 01:45 pm – 04:15 pm

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

### LAB CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>LAB MANUAL CHAPTER/ TOPIC</th>
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<tbody>
<tr>
<td>08/19</td>
<td>Attitudes of Lines and Planes</td>
</tr>
<tr>
<td>08/24</td>
<td>Outcrop Patterns and Structure Controls I</td>
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<tr>
<td>08/31</td>
<td>Outcrop Patterns and Structure Controls II</td>
</tr>
<tr>
<td>09/07</td>
<td>Interpretation of Geologic Maps</td>
</tr>
<tr>
<td>09/14</td>
<td>Stereographic Projections I</td>
</tr>
<tr>
<td>09/21</td>
<td>Stereographic Projections II</td>
</tr>
<tr>
<td>09/28</td>
<td>Stereographic Projections III</td>
</tr>
<tr>
<td>10/05</td>
<td><strong>Mid-Term Exam</strong></td>
</tr>
<tr>
<td>10/12</td>
<td>Faults</td>
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<tr>
<td>10/19</td>
<td>Dynamic and Kinematic Analysis of Faults</td>
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<tr>
<td>10/26</td>
<td>Brittle Failure</td>
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<tr>
<td>11/02</td>
<td>TBD</td>
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<tr>
<td>11/09</td>
<td>TBD</td>
</tr>
<tr>
<td>11/16</td>
<td>TBD</td>
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<tr>
<td>11/23</td>
<td>TBD</td>
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### J. COURSE POLICIES

#### COVID-19

**Face Coverings** - (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Extra masks will be made available if needed.
Attendance/Tardiness
The grade you will receive for this course is based on your performance on exams, quizzes and exercises and lab assignments.

Late Work and Make-up Exams
Not accepted.

Grades of "INCOMPLETE" will be given only for certifiable medical reasons or in other extraordinary circumstances. Requests for incompletes must be made in writing and must include:

- Documentation
- Advanced notice
- Date that coursework will be submitted

If the coursework is not submitted by that date, the Incomplete will become permanent.

Related Issues
There is a reliance on technologies in this course that impacts the need to have assignments done on time. Having ample time to complete an assignment will be the responsibility of the student. It is also the student's responsibility to find solutions to technical problems with sufficient time to complete the required tasks. Do not wait until a due date is near to discover/report lack of access to software, inability to connect to a network, etc. While the instructor will help wherever possible, it is the students' responsibility to maintain his or her network. However, technical problems can originate on the TAMU-CC campus, in which case you will not be responsible to complete work that you cannot complete due to TAMU-CC network or software problems. You are responsible for contacting me as soon as you detect a problem so that we can arrange a way for you to meet the course objectives.

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/](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.C0.03, 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 required 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.C0.03, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.c0.03_student_grade_appeals.pdf](http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.c0.03_student_grade_appeals.pdf). 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/

- Civil Rights Complaints

Texas A&M University-Corpus Christi is committed to fostering a culture of caring and respect that is free from discrimination, relationship violence and sexual misconduct, and ensuring that all affected students have access to services. For information on reporting Civil Rights complaints, options and support resources (including pregnancy support accommodations) or university policies and procedures, please contact the University Title IX Coordinator, Sam Ramirez (Samuel.ramirez@tamucc.edu) or Deputy Title IX Coordinator, Rosie Ruiz (Rosie.Ruiz@tamucc.edu) x5826, or visit website at Title IX/Sexual Assault/Pregnancy.

Limits to Confidentiality. Essays, journals, and other materials submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees, including instructors, are not able to maintain confidentiality when it conflicts with their responsibility to report alleged or suspected civil rights discrimination that is observed by or made known to an employee in the course and scope of their employment. As the instructor, I must report allegations of civil rights discrimination, including sexual assault, relationship violence, stalking, or sexual harassment to the Title IX Coordinator if you share it with me.

These reports will trigger contact with you from the Civil Rights/Title IX Compliance office who will inform you of your options and resources regarding the incident that you have shared. If you would like to talk about these incidents in a confidential setting, you are encouraged to make an appointment with counselors in the University Counseling Center.

- 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.
I. 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.

M. Technical Support and Requirements

Blackboard Learning System Help: http://iol.tamucc.edu

“Help” At the bottom of the Blackboard Course Management Control Panel in the course menu on the left hand column of the course interface. Phone: Help Desk (361) 825-2825

Island Online Student Resources Webpage:

https://distance-education.tamucc.edu/student_resources.html

Getting Technical Help

If you are having difficulties accessing course materials from your home computer, first let your instructor know, then contact the IOL Helpdesk at (361)825-2692 or submit a request via email to iol.support@tamucc.edu

Technology Requirements

To prepare your computer for using Blackboard 9.1, go to https://iol.tamucc.edu/techreq.php for computer requirements.

- To view .pdf files you will need the Adobe Reader. Download it at: http://get.adobe.com/reader/
- To view flash (.flv) files from sites such as You Tube, download the Flash player at http://get.adobe.com/flashplayer/

Navigating Blackboard 9.1

Once you are in the course, read the “Announcements” on the home page. Check this each time
you enter your course. You will see a **Course Menu** on the left of the page. The menu is a list of links that connect to materials and tools associated with the course. Blackboard has several features and tools for communicating content delivery that you should use almost daily. Links to information about how to use these tools include: **Bb Help**, which contains a complete guide to learning how to use the many tools and features in Blackboard, and **Bb Video Tutorials**, which links to a page with videos to show you how to do tasks such as submitting an assignment.

**Library resources** (including print, electronic, and human) can be accessed through the Mary and Jeff Bell Library website that supports electronic searches of articles, books, journals, course reserves, and databases. It includes information such as Ask a Librarian, research tools, remote access information and tutorials, information about plagiarism and copyright, and interlibrary loan (http://rattler.tamucc.edu/distlearn/). The library is a member of TexShare which provides you with a card that allows you to checkout materials from libraries across Texas. Librarians’ contact information is also on the website and you are encouraged to contact librarians for assistance.

**In the event of a campus evacuation** I will make every effort to continue teaching your course. Should such an event occur, I will continue to interact with you by using the Blackboard **Announcement, Messages, Collaboration, Discussions, Blogs, Journals, and/or Wikis** tools. If you have access to the Internet, you will be able to continue your coursework by posting assignments and interacting with me as well as each other online. You will also be able see your grades on assignments, quizzes, and tests using the **My Grades** tool.

**Delivery of instructor feedback** – During the week (exclude weekends), Instructor response to online requests usually occurs within a 24-hour period, but you can expect a response within 3 days.

**Student login expectations** - Students are required to login often – once every three days at a minimum. It is recommended that students check daily for announcements and updates.

**Faculty availability to support students** - I maintain a consistent web presence and am available to meet online in the Blackboard asynchronous or synchronous environment or via phone.

**N. 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.