Angelo State University
Physical Oceanography GEOL 3308
TR 9:30am -10:45am VIN 146

Instructor: Mrs. Jessica Garza
Email: jgarza85@angelo.edu
Office Hours: M Noon-1pm, W 11am-Noon, WRF variable, OR by appointment.

COURSE OBJECTIVES
GEOL 3308 Physical Oceanography is an introduction to oceanographic concepts, including the physical geologic setting of the ocean, atmospheric influences and the atmosphere-ocean interface, tropical processes, coastal geologic processes, thermodynamic processes related to waves and currents, and biological oceanography. Prerequisite: Mathematics 1314 or equivalent. Some topics include:
- How do you escape a rip current?
- What does El Nino have to do with the sinking of the Titanic?
- Why are some southern geographic locations colder than their northern neighbors?
- Why are Plankton so important to us and the Earth?
- Which whales have a moustache?

REQUIRED MATERIALS
✓ Access to a printer.
✓ ASU email account that you check regularly.
✓ Blackboard course site at ASU Blackboard.
✓ Colored Pencils.

TEXTBOOK: No required textbook or access codes for this class. All reading material will be accessible from open educational resources (OER) and provided for you by the instructor.

GRADING
<table>
<thead>
<tr>
<th>Description</th>
<th>Category</th>
<th>Total % grade</th>
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<tbody>
<tr>
<td>Assignments, Quizzes, In-Class Activities</td>
<td>Class Work</td>
<td>35</td>
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<tr>
<td>Group Project and Paper</td>
<td>Project</td>
<td>15</td>
</tr>
<tr>
<td>Exam #1 &amp; #2</td>
<td>Exam</td>
<td>30</td>
</tr>
<tr>
<td>Comprehensive Final Exam</td>
<td>Final Exam</td>
<td>20</td>
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GRADING SYSTEM
<table>
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<tr>
<th>Percentage Range</th>
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<tr>
<td>100-90%</td>
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<tr>
<td>89-90%</td>
<td>B</td>
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<tr>
<td>79-70%</td>
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<td>69-60%</td>
<td>D</td>
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<td>59-0%</td>
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LECTURE: A typical class meeting will combine lectures, discussions, group activities, multimedia presentations, and other demonstrations and activities to give you an opportunity to learn concepts in as active a manner as possible.

STUDENT EXPECTATIONS:
- Be prepared for lecture (complete assigned work prior to class, print any relevant handouts).
- Actively participate in class.
- Take responsibility for your own learning (seek help when needed).
- Be respectful of others.
ATTENDANCE POLICY
Attendance and possible quizzes will be completed within the first 5 mins of all lecture meetings. You are expected to attend all scheduled class meetings. Missed lecture activity points CANNOT be made up. Please inform me well ahead of time if you will need to be absent for any reason including religious holidays. NOTE: You are NOT automatically dropped if you stop attending class.

CELL PHONES AND OTHER ELECTRONIC DEVICES: You may use a laptop or tablet to take notes during class. Please do not disturb others with their use. The use of any electronic device not authorized by the instructor during a test may result in the forfeiture of your grade for that test. All electronic devices should be turned off and stored out of sight during tests.

CLASS PREPARATION ASU EMAIL AND BLACKBOARD: Since class announcements will be routinely distributed via email and Blackboard, you will need to regularly check your ASU email account and our course Blackboard site (daily). All course correspondence will be through your ASU email account and Blackboard. Please see the email policy in Bb for more details. ASU provides Internet and email services to you at any of the computer labs on campus. Call 942-2911 to set this up if necessary.

MODIFICATIONS TO THE SYLLABUS
This syllabus, including grade evaluation and course schedule, is subject to modification. The faculty member reserves the option to make changes as necessary to this syllabus and the course content. If changes become necessary during this course, the faculty will notify students of such changes by email, course announcements and/or via a discussion board announcement. It is the student’s responsibility to look for such communications about the course on a daily basis.

GENERAL POLICIES RELATED TO THIS COURSE: All students are required to follow the policies and procedures presented in these documents:
- Angelo State University Student Handbook
- Angelo State University Catalog

ACADEMIC INTEGRITY: Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU. The College of Science and Engineering adheres to the Statement of Academic Integrity.

PLAGARISM: Plagiarism is a serious topic covered in ASU’s Academic Integrity policy in the Student Handbook. Plagiarism is the action or practice of taking someone else’s work, idea, etc., and passing it off as one’s own. Plagiarism is literary theft. In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list. Papers are subject to be evaluated for originality via Turnitin. Resources to help you understand this policy better are available at the ASU Writing Center.

COPYRIGHT POLICY: Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

INCOMPLETE GRADE POLICY: (OP 10.11 Grading Procedures)
It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required.

STUDENT ABSENCE FOR OBSERVANCE OF RELIGIOUS HOLY DAYS: “A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence.” Please see ASU Operating Policy 10.19.

COURSE EVALUATION: Students are provided the opportunity and are strongly encouraged to participate in a course evaluation at the end of the semester.

COUNSELLING SERVICES
Our mental health is just as important as our physical health, particularly now that we are being socially distant. Humans are social creatures who need contact with other people to stay mentally healthy. During this time, it is more important than ever to seek help if you need it. You can always call or email me if you need to talk about something, but I also strongly encourage you to reach out to the ASU Counseling Services, who are available for help anytime you need it. You can find them in the University Health Clinic building or by calling 325-942-2371 Monday through Friday from 9am-3pm. Need help outside those hours? For emergencies call 911 or the ASU Crisis Helpline at 325-486-6345. You can also call the ASU Crisis Helpline for non-emergency issues as well.

STUDENTS WITH DISABILITIES:
1. “Angelo State University is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments Act of 2008 (ADAAA), and subsequent legislation.”

2. The Office of Student Affairs is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability, and it is the student’s responsibility to initiate such a request by contacting the Office of Student Affairs, University Center, Room 112 at (325) 942-2047 or (325) 942-2211(TDD/FAX) or by e-mail at studentservices@angelo.edu to begin the process. The Office of Student Affairs will establish the particular documentation requirements necessary for the various types of disabilities.

Reasonable accommodations will be made for students determined to be disabled or who have documented disabilities.

TITLE IX: The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU’s Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:
Michelle Boone, J.D.
Director of Title IX Compliance/Title IX Coordinator
Mayer Administration Building, Room 210
325-942-2022
michelle.boone@angelo.edu

You may also file a report online 24/7 at www.angelo.edu/incident-form.

If you are wishing to speak to someone about an incident in confidence you may contact the University Health Clinic and Counseling Center at 325-942-2173 or the ASU Crisis Helpline at 325-486-6345.

For more information about Title IX in general you may visit www.angelo.edu/title-ix.

GEOLOGIC EXHIBITION ORGANIZATION (GEO): GEO, the student organization of all interested in geology (not just majors/minors), meets almost every Wednesday @ 6:00PM. GEO is a student chapter of the American Association of petroleum Geologists (www.aapg.org). Sigma Gamma Epsilon, the national honor society of the earth sciences is related to GEO.

YOU CAN MAJOR OR MINOR IN GEOLOGY @ ASU! See the BS in Geoscience requirements at https://www.angelo.edu/physics/geoscience_degree.php. A Geology Minor requires 18 hours of geology courses. Good and rewarding careers exist for geologists, geophysicists, hydrogeologists, secondary science teachers, and petroleum engineers. Talk to your professor and read: http://www.angelo.edu/dept/physics/Geosciences/geoscience_careers.php.

FINAL NOTE: It is my goal to make this class both interesting and informative for you. With a reasonable amount of effort, it should be possible for everyone to meet the course objectives and earn a passing grade. With additional effort, aptitude, and investment of time, students may earn even higher course grades. If at any time you run into difficulties with the material, or need assistance or clarification, please do not hesitate to ask for help. I am here for you, and I will be glad to entertain any reasonable requests.

SCHEDULE: All information is subject to change. See Blackboard to confirm all work assigned for the week.
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<tr>
<th>Unit</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Syllabus; Ocean Introduction</td>
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<td>2</td>
<td>Plate Tectonics</td>
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<td>3</td>
<td>Marine Provinces</td>
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<td>4</td>
<td>Marine Sediments</td>
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<td>5</td>
<td>Water and Sea Water</td>
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<td>6</td>
<td>Air-Sea Interaction</td>
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<td>7</td>
<td>Ocean Circulation</td>
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<td>8</td>
<td>Waves</td>
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<td>9</td>
<td>Tides</td>
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<td>10</td>
<td>Coastal Ocean and Pollution</td>
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<td>11</td>
<td>Biological Productivity and Marine Life</td>
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<tr>
<td>12</td>
<td>Animals of the Pelagic</td>
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<tr>
<td>13</td>
<td>Animals of the Benthic</td>
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<td></td>
<td>Beach Project Presentations</td>
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<td>Final Exam Week</td>
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*(Final Exam - comprehensive with a focus on topics from unit 11-13)*

Due to the diversity of the subject matter, it is not possible to cover all areas with equal emphasis. The core point is to gain an understanding and appreciation of the dynamic processes and systems that exist within our world's oceans.
Oceanography Course Outline

Unit 1. Introduction to Oceans
1. What is Oceanography?
2. Syllabus
4. Get to Know your Oceans
   a. Ocean statistics and maps Exercise
5. History of Oceans Lecture
6. Get to Know your Oceans continued
   a. Hypsography Exercise
   b. Geographic Locations Exercise

Unit 2. Plate Tectonics
1. PT Basics and definitions
2. PT Discovery: Magnetism and Sea Floor Spreading
3. Marine Features related to PTS:
   a. ridges, hotspots, atolls

Unit 3. Marine Provinces
1. Marine Provinces
   a. Continental Margins: Active vs. Passive
      i. Shelf
      ii. Slope
      iii. Rise
   b. Deep Ocean Basins
      i. Abyssal Plains
   c. Mid Ocean Ridge
2. Bathymetry Techniques

Unit 4. Marine Sediments
1. Classifications
   a. Lithogenous
      i. Transport, source, composition
      ii. Deposits
      iii. Grain size
   b. Biogenous
      i. Composition
      ii. Deposits
      iii. Factors
2. Hydrogenous
3. Cosmogenous
4. Sediment Distributions
   i. Global
   ii. Along Marine Provinces

Unit 5. Seawater Chemistry
1. Atomic Structure Review
2. Water’s Unique Properties
   a. Water Molecule & Polarity
   b. Surface tension & Cohesion
   c. Hydrogen Bonding
   d. Universal Solvent
   e. Density
   f. Heat capacity
3. Global thermostatic effects
   a. Heat & Temperature Definitions
      1. Phase Changes
         i. Energy Transformations
         ii. Latent Heat
      2. Seawater Salinity
         i. Processes affecting salinity variations
3. Ocean acidity
4. pH scale
5. Carbonate Buffering System
6. Ocean acidification
   a. Effects on Marine Life

Unit 6. Air-Sea Interactions
1. Earth’s Revolution
   a. Revolutions characteristics
      i. elliptical orbit
      ii. plane of the ecliptic
      iii. inclination
      iv. axial orientation
   b. Solar Declination
      i. key parallels
      ii. key dates
      iii. e.g. June Solstice
2. Distribution of Energy
   a. Latitude→Sun angle
   b. Reflection→Albedo
   c. Global Distribution of Energy
   d. Results of Imbalance
3. The Atmosphere
   a. Composition of Atmosphere
      i. permanent vs variable gases
      ii. greenhouse effect
   b. Vertical Temp. Profile
      i. Troposphere
      ii. Temp vs elevation
   c. Air Pressure
      i. Distribution of air pressure (vertical)
      ii. distribution of air pressure (horizontal)
      iii. e.g. thermal circulations: sea breeze
   d. Coriolis Effect
      i. Influences
      ii. Hemisphere
      iii. Latitude
      iv. Wind speed
4. Global Atmospheric Winds
   a. Three-cell model
      i. Surface Pressure
      ii. Circulations cells
      iii. Resulting Wx
      iv. Surface winds
      v. Surface boundaries/belts
5. Tropical Cyclones
   a. Origins
   b. Conditions
   c. Formation
   d. Earth’s Heat Budget

Unit 7. Ocean Circulation
1. Gyres
   a. ocean surface currents
   b. boundary classification
   c. climate
2. Factors affecting surface circulation (review Coriolis)
   a. Ekman spiral and transport
   b. Geostrophic flow
      i. ideal vs actual
   c. Western Intensification
      i. western vs. eastern boundary current
3. Upwelling vs. Downwelling
   a. Causes
i. Convergence
ii. Divergence e.g. Equator and Antarctica
iii. coastal eg. California

4. Indian Ocean circulation
   a. Monsoon
      i. summer vs. winter

5. Pacific Ocean circulation
   a. Normal conditions
   b. El Nino

6. Thermohaline Circulation
   a. Temp
   b. density

Unit 8. Waves
1. Interfaces
   a. Types
      i. Air-air
      ii. Air-water
      iii. Water-water

2. Motion
   a. Types
      i. Longitudinal
      ii. Transverse
      iii. Orbital

3. Wave characteristics
   a. Anatomy =terms and wave base
   b. Deep water waves
   c. Shallow water waves

4. Generation
   a. Development
   b. Factors
   c. Patterns
      i. Constructive
      ii. Destructive
      iii. Mixed

5. Shoaling
   a. Surf zone
   b. Refraction
   c. Reflection

6. Tsunamis
   a. Causes
   a. Location
b. Characteristics

Unit 9 Tides
1. Overview
2. Forces
3. Bulges
   a. Moon
   b. Sun
4. Monthly Tidal Cycle
5. Complications
   a. Declination and Orbits
   b. Idealized
   c. Reality
6. Tidal Patterns and Charts
7. Coastal Phenomena
   a. Coastal tidal currents
   b. Tidal Bores
   c. Grunion

Unit 10: The Coast and Pollution
1. Beach terminology
2. Wave motion
   a. Perpendicular
   b. Parallel
      i. longshore action
3. Seasonal beaches
4. Shorelines
   a. Erosional
   b. Depositional
5. Hard stabilization
   a. Types
   b. Solutions
      i. climate Δ hazards of sea level rise
6. Coastal Waters
   a. Characteristics
      i. salinity & temperature
   b. Estuary types
      i. coastal wetlands
   c. Coastal pollution
      i. definitions & types
      ii. plastic pollution
Unit 11: Bio Productivity and Marine Life
1. Classes & #s
   a. Plankton
   b. Nekton
   c. Benthos
2. Adaptations
3. Productivity
   a. Geography & Seasons
   b. Energy Flow
      i. Overfishing (End of Line 25 min version)

Unit 12 Pelagic Organisms
1. Shark Reef
2. Buoyancy
3. Pelagic classes
   a. Plankton
   b. Nekton
      i. Fins
4. Marine Mammals
   a. Sirena
   b. Carnivora
   c. Cetacea

Unit 13 Benthic Organisms
1. Distribution
2. Rocky Shore Communities
   a. Intertidal zonation
3. Sediment Covered Communities
4. Coral Reefs