TAFT COLLEGE
West Kern Community College District

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Geology (GEOL) 1500 Introduction to Geology (4 Units) CSU:UC
[formerly Geology 10]

Advisory: Eligibility for English 1500 strongly recommended

Total Hours: 48 hours lecture; 48 hours lab (96 hours total)

Catalog Description: An introduction to the principles of geology with emphasis on Earth processes. This course focuses on the internal structure and origin of the Earth and the processes that change and shape it. The laboratory component focuses on the identification of rocks and minerals, topographic and geologic map exercises demonstrating the work of water, wind, ice and gravity and effects of tectonic activity. Field trips are required to certain local points of geological interest.

Type of Class/Course: Degree Credit

Text: McGeary, David, Charles C. Plummer, and Diane H. Carlson. *Physical Geology. Earth Revealed.* 4th ed. Boston: McGraw, 2001. Print.

Busch, Richard M. *Laboratory Manual in Physical Geology.*7th ed. Upper Saddle River: Prentice, 2006. Print.

Tarbuck, Edward J., and Frederick K. Lutgens. *Earth, A, Introduction to Physical Geology.* 11th ed. Upper Saddle River: Prentice, 2015. Print.

Ruhle, James L. *Geology Laboratory Manual for Distance Learning*. Dubuque: Kendall, 1998. Print.

Additional Required Materials: None

Course Objectives:

By the end of the course, a successful student should be able to:

1 Explain and practically apply the principles of the scientific method,
2 Demonstrate a conceptual understanding of fundamental concepts, principles, and interactions of Earth's systems applicable to the geological sciences,
3 Demonstrate an understanding of plate tectonics and the Earth's resources,
4 Apply understanding of the internal and external processes that shape and form the Earth,
5 Demonstrate an understanding of the rock cycle and identify and describe the basic properties of rocks and minerals,

6 Demonstrate an understanding of the Earth through the identification and evaluation of minerals,
7 Demonstrate an understanding of the Earth through the identification and evaluation of igneous, sedimentary and metamorphic rocks,
8 Demonstrate an understanding of how geological environments are formed, changed and eroded through time,
9 Demonstrate an ability to communicate complex course concepts effectively in writing and diagrams and apply critical thinking and problem solving skills to make informed decisions in life, and
10 Demonstrate the ability to read and interpret topographic and geologic maps and answer questions pertaining to geologic processes.

Course Scope and Content: (Lecture)

Unit I — An Introduction to Geology
- A. The science of geology
- B. Geologic time
- C. The nature of scientific inquiry
- D. Earth's spheres
- E. Earth as a system
- F. Early evolution of Earth
- G. Earth's internal structure
- H. The face of Earth
- I. Rocks and the rock cycle

Unit II — Plate Tectonics: A Scientific Revolution Unfolds
- A. Continental drift: an idea before its time
- B. The great debate
- C. Continental drift and paleomagnetism
- D. A scientific revolution begins
- E. What drives plate motions

Unit III — Matter and Minerals
- A. Minerals: building blocks of rocks
- B. Atoms: building blocks of minerals
- C. Why atoms bond
- D. Isotopes and radioactive decay
- E. Crystals and crystallization
- F. Physical properties of minerals
- G. How are minerals named and classified
- H. The Silicates
- I. Important nonsilicate minerals

Unit IV — Magma, Igneous Rocks, and Intrusive Activity
- A. Magma: the parent material of igneous rock
- B. Igneous processes and compositions
- C. Igneous textures
- D. Naming igneous rocks
- E. Origin of magma
- F. How magmas evolve
- G. Partial melting and magma composition

H. Intrusive igneous activity

Unit V — Volcanoes and Volcanic Hazards
- A. The nature of volcanic eruptions
- B. Materials extruded during an eruption
- C. Volcanic structures and eruptive styles
- D. Living in the shadow of a composite cone
- E. Other volcanic landforms
- F. Plate tectonics and volcanic activity

Unit VI — Weathering and Soil
- A. Earth's external processes
- B. Weathering
- C. Mechanical weathering
- D. Chemical weathering
- E. Rates of weathering
- F. Soil
- G. Controls of soil formation
- H. Soil profile
- I. Classifying soils
- J. Soil erosion

Unit VII — Sedimentary Rocks
- A. The importance of sedimentary rocks
- B. Origins of sedimentary rock
- C. Detrital sedimentary rocks
- D. Chemical sedimentary rocks
- E. Coal – an organic sedimentary rock
- F. Diagenesis and lithification
- G. Classification of sedimentary rocks
- H. Sedimentary environments and structures

Unit VIII — Metamorphism and Metamorphic Rocks
- A. What is metamorphism
- B. What drives metamorphism
- C. Metamorphic textures
- D. Common metamorphic rocks
- E. Metamorphic environments
- F. Metamorphic zones
- G. Interpreting metamorphic environments

Unit IX — Geologic Time
- A. Time scale
- B. Relative dating
- C. Correlation of rock layers
- D. Fossils: evidence of past life
- E. Dating with radioactivity
- F. Geologic time scale
- G. Difficulties in dating the geologic time scale

Unit X — Crustal Deformation
- A. Structural geology: a study of Earth's architecture
- B. Deformation, stress, and strain
- C. How rocks deform
- D. Structures formed by ductile deformation
- E. Structures formed by brittle deformation
- F. Mapping geologic structures

Unit XI — Earthquake and Earthquake Hazards
- A. What is an earthquake
- B. Faults, faulting, and earthquakes
- C. Seismology: the study of earthquake waves
- D. Locating the source of an earthquake
- E. Measuring the size of earthquakes
- F. Earthquake belts and plate boundaries
- G. Earthquake destruction
- H. Can earthquakes be predicted
- I. Seismic risk on the San Andreas Fault
- J. Evidence for plate tectonics at plate boundaries

Unit XII — Earth's Interior
- A. Gravity and layered planets
- B. Probing Earth's Interior
- C. Seismic waves
- D. Earth's layers
- E. Earth's temperature
- F. Earth's three-dimensional structure

Unit XIII — Mass Wasting: The Work of Gravity
- A. Landslides
- B. Mass wasting and landform development
- C. Controls and triggers of mass wasting
- D. Classification of mass wasting process
- E. Slump
- F. Rockslide
- G. Debris flow
- H. Permafrost
- I. Submarine landslides

Unit XIV — Running Water and Groundwater
- A. The hydrologic cycle
- B. Running water
- C. Streamflow
- D. Stream channels
- E. Base level and graded streams
- F. Shaping stream valleys
- G. Depositional landforms
- H. Drainage patterns
- I. Floods and flood control

Unit XV Glaciers and Glaciation
- A. Glaciers: a part of two basic cycles
- B. Formation and movement of glacial ice
- C. Glacial erosion
- D. Glacial deposits
- E. Landforms made of stratified drift
- F. Effects of Ice-age glaciers
- G. Glacial theory and the Ice age
- H. Causes of glaciation

Unit XVI Deserts and Wind
- A. Distribution and causes of dry lands
- B. Geologic processes in arid climates
- C. Evolution of desert landscape
- D. Transportation of sediment by wind
- E. Wind erosion
- F. Wind deposits

Unit XVII Shorelines
- A. Coastal zone
- B. Waves and wave erosion
- C. Sand movement on the beach
- D. Shoreline features
- E. Stabilizing the shore
- F. Erosion problems along U.S. coasts
- G. Hurricanes
- H. Coastal classification
- I. Tides

Unit XVIII Renewable and Nonrenewable Resources
- A. Traditional Fossil Fuels
- B. Oil Sands, Oil Shale, and Gas Hydrates
- C. Nuclear Energy
- D. Renewable Energy Sources
- E Mineral Resources
- F. Igneous and Metamorphic Processes
- G. Mineral Resources Related to Surface Processes
- H. Nonmetallic Mineral Resources

Course Scope and Content: (Laboratory)

Unit I Introduction to Physical Geology
- A. The Earth as a System
- B. The Scientific Method
- C. Density of Various Rock Types

Unit II The Plate Tectonic Model and Tectonic Boundaries
- A. Identification of 14 Tectonic Plates
- B. Convergent, Divergent, and Transform Boundaries

C. Mechanisms of Plate Tectonics

Unit III Mineral Properties and Identification
A. Recognition of Various Mineral Properties
B. Identification of 36 Unknown Minerals
C. Mineral Families

Unit IV The Rock Cycle and Classification of Rocks
A. Recognition of Five Reservoirs in the Rock Cycle
B. Classification of Igneous Rocks based on Texture and Composition
C. Identification of 12 Unknown Igneous Rocks

Unit V Volcanoes and Volcanic Hazards
A. Viscosity and Factors that Control Viscosity
B. Shield, Cinder Cones, and Composite Cones
C. Volcanic Hazards

Unit VI Weathering and Soil Profiles
A. Types of Weathering
B. Soil Taxonomy
C. Identification of Soil Horizons

Unit VII Sedimentary Rocks and Sedimentary Environments
A. Classification of Sedimentary Rocks based on Texture and Composition
B. Identification of 12 Unknown Sedimentary Rocks
C. Sedimentary Environments

Unit VIII Metamorphism and Metamorphic Rocks
A. Agents of Metamorphism
B. Classification of Metamorphic Rocks based on Texture and Composition
C. Identification of 12 Unknown Metamorphic Rocks

Unit IX Relative and Numerical Age Dating
A. Relative Age Dating Principles
B. Numerical Age Dating Procedures
C. Construct Geologic History of Various Sequences of Rock and Strata

Unit X Faults and Folds – Crustal Deformation
A. Agents of Crustal Deformation
B. Faults Types and Recognition
C. Fold Types and Recognition

Unit XI Earthquakes and Epicenter Locating
A. Seismology
B. Reading Seismograms
C. Epicenter Location

Unit XII Earth's Interior
A. Fate of Seismic Waves in Interior
B. Identification of Layers in Earth by Composition

C. Identification of Layers in Earth by Physical Properties

Unit XIII Mass Wasting: The Work of Gravity
A. Erosional Processes
B. Identification of Mass Wasting Processes
C. Hazards and Mitigation Associated with Mass Wasting

Unit XIV Streams and Groundwater
A. Erosional and Depositional Features Associated with Streams
B. Porosity and Permeability in Groundwater
C. Calculations using Groundwater Flow Laws

Unit XV Topographic and Geologic Maps
A. Use of Topographic Maps
B. Use of Geologic Maps
C. Construction of Block Diagrams

Unit XVI Energy and Mineral Resource
A. Contrast Renewable and Nonrenewable Resource
B. Evaluating Solar and Wind Energy Potential
C. Mapping of Ore Deposits

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying
2. Answering questions
3. Completing required reading
4. Problem solving activity or exercise

Methods of Instruction:

1. Lecture-discussion periods (two hours per week)
2. Lab exercise periods (three hours per week)
3. Term project - special studies or a term paper
4. Field Trips

Methods of Evaluation:

1. Substantial writing assignments, including:
   a. term or other paper
   b. written work

2. Computational or non-computational problem-solving demonstrations, including:
   a. exams

b. homework problems
c. quizzes
d. laboratory reports

3. Other examinations, including:
   a. multiple choice
   b. matching items
   c. completion

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.

1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Supplemental Data:

TOP Code:	191400: Geology
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable(funds not used)
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course

Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course
Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program
Eligible for Credit by Exam:	NO
Eligible for Pass/No Pass:	C: Pass/No Pass
Taft College General Education:	CSB1: CSU Area B1 CSB3: CSU Area B3 IG5A: IGETC Area 5A IG5C: IGETC Area 5C LNS: Local GE Natural Science