

Vanguard University
School for Professional Studies
Degree Program

**“FUNDAMENTALS OF EARTH
SCIENCE”
PSCI 215**

Student Guide

MODULE DESCRIPTION

This 8 week course provides students a thorough introduction to important elements, interrelationships and processes within geologic, oceanic, atmospheric and extraterrestrial physical systems. The course begins with an introduction to minerals and rocks- the building materials making up the earth, and progresses to a discussion of the earth surface, forces shaping the earth, oceanic processes, the atmosphere and finishes with a view of how the earth is placed within the universe. Within the context of each module, essential processes are integral to the action and function of each physical system will be discussed and explored. In coursework completed outside of class, students will review additional materials and processes to gain a better understanding of how the presence and activity of physical elements affects biological life on earth.

A strong emphasis is placed upon understanding and practicing the scientific method and critical thinking skills. Students will become familiarized with these processes using in-class discussions, critiquing written materials, problem solving, and analyzing data from laboratory experiments. Within each learning modality (reading, discussion, writing, data analysis), emphasis is placed on real-world applications. In this way, non-science students may learn, critique and apply important scientific concepts, which may assist them in achieving a better of the world in which they live- and have the responsibility to protect and nurture.

LEARNING OUTCOMES

Students will learn (most for the first time) many of the most important materials, forces and processes at work within physical systems. Such novel understanding will enable them to gain a greater appreciation for the myriad wonders within the world around them, and how they (as individuals) may play an integral role within creation. Such understanding may assist them in making better decisions regarding quality and quantity of life for themselves, society at large, and their children. More specifically, over the semester students will investigate:

- * Minerals, the rock cycle, and types of rocks (igneous, sedimentary, metamorphic)
- * The hydrologic cycle and its impact upon groundwater, glaciers, and deserts
- * Earthquakes, plate tectonics, and volcanic eruptions
- * Ocean floor topography and general oceanic processes (waves, erosion)
- * The structure of the atmosphere & the impact of solar radiation on wind, cloud formation, and weather patterns
- * Astronomical bodies and basic processes governing our solar system

TEXTS AND MATERIALS

Required texts:

Lutgens, F.K., Tarbuck, E.J. (2005) Foundations of Earth Science (4th ed.). Pearson/Prentice Hall Publishers. ISBN: 0-13-144750-5

Lutgens, F.K., Tarbuck, E.J., Pinzke, K.G. (2000) Applications & Investigations in Earth Science (5th ed.). Pearson/Prentice Hall Publishers. ISBN: 0-13-11288-7

Minton, Scott. Fundamentals of Earth Science Student Handbook. *To be handed out on the first day of class.*

Recommended texts:

None

Materials:

A one-time lab fee of \$200 is required to supply each laboratory with needed materials (perishable and non-perishable).

COURSE POLICIES **ATTENDANCE POLICY**

Because each course meets only five to eight times, it is important that students not miss class unless it is unavoidable. To receive the full participation points students must arrive on time to class with a working knowledge of each sessions assignments and they must actively engage in class discussions.

Students who miss more than five class hours in any given course will automatically receive a failing grade and need to retake the course to obtain a passing grade. If an instructor deems that a student's absence, beyond the 5 hours was under extremely unavoidable and unusual circumstances (i.e. hospitalization, death in the family, major auto accident), the professor may file an academic petition on behalf of the student to the Program Chair. If the academic petition is approved, the instructor may give the student a "W" (Withdrawal) grade in place of a failing grade. The student will be required to re-take the course.

Students who miss the first two class sessions, or the first five hours of a course, will automatically be dropped and be required to retake the course.

ACADEMIC DISHONESTY (incl. Plagiarism)

Academic dishonesty, either cheating or plagiarism (presenting the words or opinions of others as one's own work), is regarded as a serious violation of both the academic and moral standards of Vanguard University. Dishonesty in any class assignment can result in: loss of credit for the assignment, loss of credit for the entire course, and referral to the Director and/or Provost. It is

the prerogative and responsibility of the instructor to determine if academic dishonesty has occurred and the seriousness of the infraction. The Office of the Provost is to be notified of instances of academic dishonesty.

A student commits plagiarism if he/she submits as his/her own work:

1. Part or all of an assignment copied from another person's assignments, notes, or computer file.
2. Part or all of an assignment copied or paraphrased from a book, magazine, pamphlet, or website.
3. A sequence of ideas transferred from another source which the student has digested, integrated, and reorganized, and for which he/she fails to give proper acknowledgement.

A student is an accomplice in plagiarism if he/she

1. Allows his/her paper or other assignments, in outline or finished form, to be copied and submitted as the work of another.
2. Lends his/her computer disk to another student or otherwise allows his/her computer files to be copied for the purposes of plagiarism.
3. Prepares a written assignment for another student and allows it to be submitted as another's work.

DISABILITY SERVICES

For students with documented medical or psychological disabilities, please contact the Coordinator of Disability Services to request reasonable accommodations. The Coordinator of Disability Services is located in the Counseling Center on the second floor of the Scott Academic Center and can be reached at extension 4489 or by email at disabilityservices@vanguard.edu

For students with a documented learning disability who would like to request appropriate accommodations, please contact the Director of Learning Skills, located upstairs in Scott Academic Center at extension 2540 or by email at disabilityservices@vanguard.edu

DIVERSITY STATEMENT

The School for Professional Studies intends to foster a Christ-centered community that promotes appreciation and respect for individuals, enhances the potential of all members, and values differences in gender, race, abilities, and generation. As such, we endeavor to communicate with honesty, to speak with encouraging and edifying words, and to create a safe environment in our classes and interactions.

GRADED HOMEWORK/ASSIGNMENTS

If an instructor chooses to submit graded papers or assignments to the SPS office, students may pick-up their work at the SPS Office Front Desk. Graded work is not kept 5 weeks beyond the last class session. Please note: the SPS office is not responsible for unclaimed or lost papers or assignments.

If a student chooses to submit their paper or assignment to the SPS office, this must be arranged between the instructor and student prior to submission. The SPS Office will gladly forward the

completed paper or assignment to the instructor, however the SPS office is not responsible for unclaimed or lost papers or assignments.

LATE WORK

No late work is accepted. Exceptions may be made between the instructor and student.

STUDENT EVALUATION

Percentages	Points	Grade	Significance	GPA
93-100%	930-1000	A	Exceptional	4.00
90-92.9%	900-929	A-		3.67
87-89.9%	870-899	B+		3.33
83-86.9%	830-869	B	Above Average	3.00
80-82.9%	800-829	B-		2.67
77-79.9%	770-799	C+		2.33
73-76.9%	730-769	C	Average	2.00
70-72.9%	700-729	C-		1.67
67-69.9%	670-699	D+		1.33
63-66.9%	630-669	D	Below Average	1.00
60-62.9%	600-629	D-		0.67
00-59.9%	000-599	F	Failure	0.00

OVERVIEW

COURSE EVALUATION: "How you get your grade"

* **Format for all assigned coursework**

ALL MATERIAL MUST BE TYPED

Paper = standard white notebook paper

Font = 12 point Times (or) Times New Roman (or) Geneva **ONLY**

Exceptions = for the laboratory section- any drawings or graphs can be neatly hand-written

General Format for all assignments

Top R of page:

Your name

Course (catalog number)

Assignment description

Class week that assignment was due (eg., Week 4)

1) **EXAMS** (400 pts)

[5] In-class closed book mini-exams (20pts each)

20 Multiple-choice questions (on each exam)

Exam questions cover information within previous lecture **ONLY**

[2] Take-home (open book) exams (100 pts each)

These are designed to help you accumulate knowledge of the physical world beyond that covered in class

EXAMS MUST BE TAKEN AND TURNED IN ON A SHORT-FORM SCANTRON (#882-E)

NO LATE exams will be accepted – unless prior approval has been obtained

Exam 1 = Covers book chapters 1-8

Exam 2 = Covers book chapters 9-16

[1] Comprehensive (closed book) final exam (100 pts)

Questions are taken directly from the 2 take-home exams (50% from each exam)

2) **ARTICLE CRITIQUES** (100 pts)

[5] Article Critiques (20 pts each)

Articles have been scanned into the syllabus

Format

Top R of page:

Your name

Course (catalog number)

Assignment description

Class week that assignment was due

Title

L justified

Place under the information located in the upper R of page

TYPE THE HEADING 'Title :' then write the article's title

Outline

TYPE THE HEADING 'Outline'

Under this heading- outline the articles main points

Use at least 3 levels of hierarchy

Length = a minimum of a half-page (**single-spaced**)

Example

1. Rats are important to science
 - a. Rat are used as astronauts
 - i. Rats really can't fly
 - ii. Rats are excellent pilots
 - b. Rats are used to test ecological theory
 - i. Rats prey on deer
 - ii. Rats compete with ants for food

Critique

TYPE THE HEADING 'Critique'

Under this heading- address the major points in the article in the following manner

1. Analyze the strength of the statement/argument
 - Is there sufficient evidence to support the claim?
 - If so, what is this evidence?
 - Is it compelling enough to believe? Why?
2. Which statements/arguments are weak?
 - What supportive evidence is missing?
 - What type of evidence would convince you that the statement was true?

Length = a minimum of 1 page (**double spaced**)

3) **FINAL ARTICLE CRITIQUE** (100 pts)

Situation = on the last day of class, the instructor will provide you with an article in class.

You will proceed to (1) outline the article, then (2) critique the articles contents

Required length = 2 pages

4) **LABORATORY INVESTIGATIONS** (400 pts)

[60 pts per week]

Each investigation begins on a NEW page

Most are completed during class... some may require additional work at home

Goal = to apply a principle or concept currently being discussed in lecture

Format (FOLLOW THIS EXACTLY)

Each report must be typed

Top R of page = student information

Your name

Course (catalog number)

Assignment description

Class week that assignment was due (eg., Week 4)

CHAPTER QUESTIONS

IF QUESTIONS ARE TO BE ANSWERED IN THE LAB...

Type out the QUESTION (in **bold** typeface) and answer using the following format:

Example:

Q1: The center of the earth is called ___?

A1: Core

EXPERIMENTAL INVESTIGATIONS

IF AN EXPERIMENT IS CONDUCTED IN THE LAB...

Write up the experiment using the following format:

Title the investigation

Write the title at the top of the page & centered in middle of page

This original pithy single sentence should effectively describe the intent or purpose of the experiment

USE THESE HEADINGS....

I. Hypothesis

A short straightforward sentence predicting what you think will happen

Your educated guess on what will happen

The hypothesis cannot be changed once the experiment begins

DO THIS BEFORE STARTING INVESTIGATION

II. Materials & Methods

List all materials & equipment

Sketch the apparatus (if necessary)

Summarize the procedure used to complete the investigation

Use a step-by-step description

Example

1. Weighed a 100g rat
2. Placed rat in helium filled balloon
3. ...

III. Results

Summarize (analyze) your raw data (your actual measurements) into a table or graph

Tables

Tabular analysis = provide a table of means (averages) of some variable that was measured

Graphs

Graphical analysis = convert your raw data into a graph (eg., bar graph, pie graph, line graph)

** If any data was obtained from an outside source (ie., another student) you must make a clear note

IV. Discussion

Interpret your results **with respect to the scientific principle under investigation**

Example = by dropping the rhino off the roof, and noting that the rhino fell in a straight line, we supported Newton's first law (of inertia)- which states that a body will remain at rest, or continue in a straight line path- unless acted upon by an outside force.

POINT SUMMARY

I. COURSE CONTENT

Exams	400
Article critiques (5)	100
Laboratory exercises	400
In-class article critique	100

TOTAL 1000

NOTE = REGARDING DUE DATES

Without prior arrangement with the instructor- late assignments will be rejected without grading

EDUCATIONAL TARGETS AND GOALS

Intellectual Engagement

Students will...

- * learn to think critically and evaluate evidence rationally, by class assessment exercises, book critiques and laboratory write-ups
- * acquire and continue to use skills for learning, by processing new types of information
- * utilize research methods for the expansion of knowledge and problem solving, by engaging in laboratory experiments
- * integrate learning with Christian faith and living, by investigating the complexity of environmental factors and processes
- * develop the ability to communicate the fruits of learning and research clearly and effectively during classroom discussions

Spiritual Formation

Students will...

- * understand Christian existence as a journey that integrates human experience with personal faith by learning that caring for the environment is a daily responsibility
- * develop and maintain a biblically based and theologically sound Christian lifestyle of personal and social responsibility

Professional Excellence

Students will...

- * understand current theories and practices in their respective academic disciplines in the context of the liberal arts and sciences, by discussing opposing viewpoints
- * develop lifelong skills for communicating and performing professionally, by engaging in writing projects and oral communication with peers
- * achieve technological competence in acquiring and processing information, by using scientific instrumentation and summarizing its use and application
- * acquire interpersonal ability to work harmoniously with others during group activities
- * internalize a strong sense of professional ethics

Aesthetic Expression

Students will...

- * understand various sources of aesthetic sensitivity and expression as inherent human endowments and part of God's creation; by delving deep into the complexities of the natural world
- * develop interpretive frameworks of aesthetic truths and values for personal wholeness and community enrichment, by learning how to share with others concepts and techniques that can add rich quality to their lives

Responsible Stewardship

Students will...

- * appreciate the value of environmental resources - by learning that there is a very limited supply and that daily activities by each human has a direct impact on their sustainability
- * exhibit the responsibilities of citizenship in the context of the environment and society
- * promote the church's mission through caring for God's creation

Sociocultural Responsiveness

Students will...

- * demonstrate a capacity to challenge personal prejudices, appreciate cultural diversity, and learn from other cultures by the way they view nature and the physical world
- * develop a commitment to pursue peace, justice, and reconciliation in a pluralistic society: and
- * celebrate the differences of race, ethnicity, gender, and age within the biblical vision of inclusiveness and the equal value of people

STUDENT ASSIGNMENTS

WEEK ONE

None due
Plagiarism policy

WEEK TWO

Lab write-up from week 1 due

WEEK THREE

In-class mini exam 1
Lab write-up from week 2 due
1st Article critique due
Take-home exam 1 due

WEEK FOUR

In-class mini exam 2
Lab write-up from week 3 due
2nd Article critique due

WEEK FIVE

In-class mini exam 3
Lab write-up from week 4 due
3rd Article critique due

WEEK SIX

In-class mini exam 4
Lab write-up from week 5 due
4th Article critique due
Take home exam 2 due

WEEK SEVEN

In-class mini exam 5
Lab write-up from week 6 due
5th Article critique due

WEEK EIGHT

Article critique (in class)
Comprehensive closed book exam (in class)

LOGISTICS CHART

Hour	Week 1	Week 2	Week 3	Week 4	Week 5
1	Discussion = introduction & minerals & rocks	Discussion = landscapes	Discussion = plate tectonics	Discussion = geologic time	Discussion = oceans
2	Discussion = introduction & minerals & rocks	Discussion = landscapes	Discussion = plate tectonics	Discussion = geologic time	Discussion = oceans
3	* General measurements * Rocks & topographic maps	* Water's effect on the earth's surface	* Earthquakes	* Geologic ages & maps	* Ocean waves & topography
4	* Rocks & topographic maps	* Water's effect on the earth's surface	* Earthquakes	* Geologic ages & maps	* Ocean waves & topography

LOGISTICS CHART - CONTINUED -

Hour	Week 6	Week 7	Week 8
1	Discussion = the atmosphere	Discussion = the solar system	Article critique
2	Discussion = the atmosphere	Discussion = the solar system	Comprehensive Final
3	* Atmospheric pressure & weather maps	* Astronomical observations	Comprehensive Final
4	* Atmospheric pressure & weather maps	* Astronomical observations	Comprehensive Final

WEEKLY CLASS OVERVIEW

WEEK 1

Assignments Due

NONE

Sign and return plagiarism policy

In progress

Begin take-home Exam 1

LEARNING ACTIVITIES

Learning objective

To become aware of the contents of the Course Syllabus - with emphasis on requirements, testing, grading policies and student responsibilities

To learn about the composition of minerals and 3 basic types of rocks (igneous, sedimentary, metamorphic).

Class activities

Hours 1-2

Explain the course syllabus and evaluation protocol. Answer questions. Discuss Earth Materials

Hours 3-4

Explore the use of the metric system, and practice various forms of scientific measurement.

Learn to identify igneous, sedimentary and metamorphic rocks

Learn to use topographic maps

WEEK 2

Assignments Due

Week 1 lab write-up

In progress

Week 2 lab write-up

Take-home Exam 1

Article 1 critique

LEARNING ACTIVITIES

Learning objectives

Understand the processes shaping landscapes shaped by running water, frozen water and arid climates

Class activities

Hours 1-2

Discuss the basic processes of sediment movement via running water in streams and rivers

Understand how glaciers are formed, and how they move sediment and create landforms

Explore the differences in sediment movement between wind and water, and how these entities shape landforms in deserts

Hours 3-4

Explore concepts related to the hydrologic cycle and glacial landscapes

WEEK 3

Assignments Due

In-class mini exam 1
Week 2 lab write-up
Article 1 critique
Take home exam 1

In progress

Week 3 lab write-up

Article 2 critique

Take home exam 2

LEARNING ACTIVITIES

Learning objectives

Explore the concepts of plate tectonics, earthquakes and mountain formation

Class activities

Hours 1-2

Discuss the basic mechanism and theory of plate tectonics

Examine how earthquakes are measured, and what effects they have on the landscape

Discuss how mountains are constructed along convergent plate boundaries

Hours 3-4

Study the use of seismograms and the global distribution of earthquakes

WEEK 4

Assignments Due

In-class mini exam 2

Week 3 lab write-up

Article 2 critique

In progress

Take-home Exam 2

Week 4 lab write-up

Article 3 critique

LEARNING ACTIVITIES

Learning objectives

Explore the history, underlying assumptions and applications of the geologic time scale

Class activities

Hours 1-2

Discuss the birth of geology, relative dating principles, and radioactive dating theory and techniques

Hours 3-4

Perform studies that emphasize the geologic time scale

Investigate the mechanism of carbon dating

WEEK 5

Assignments Due

In-class mini exam 3

Week 4 lab write-up

Article 3 critique

In progress

Week 5 lab write-up

Take-home Exam 2

Article 4 critique

LEARNING ACTIVITIES

Learning objectives

Explore the geologic structure of oceans – and the movement of water within ocean basins

Class activities

Hours 1-2

Discuss the composition and arrangement of oceanic plates, and the process and ramifications of sea-floor spreading.

Investigate how waves are created and travel. Discuss the formation of surface and deep currents and tides. Learn how these forces work to influence weather, climate and biogeographic distributions.

Hours 3-4

Calculate the motion of continental plates

Investigate the motion of oceanic waves

WEEK 6

Assignments Due

In-class mini exam 4

Week 5 lab write-up

Article 4 critique

Take-home Exam 2

In progress

Week 6 lab write-up

Article 5 critique

Study for comprehensive final

LEARNING ACTIVITIES

Learning objective

Explore the dynamic structure and movement of the atmosphere

Class activities

Hours 1-2

Discuss the basic structural make-up and changes that occur within the atmosphere as a result of solar radiation input

Use the structure of the atmosphere as a basis for understanding local weather and global climate

Hours 3-4

Use instruments to measure humidity

Perform experiments to create clouds and tornadoes

WEEK 7

Assignments Due

In-class mini exam 5

Week 6 lab write-up

Article 5 critique

In progress

Week 7 lab write-up

Prepare for final exam

Prepare for article critique

LEARNING ACTIVITIES

Learning objective

To gain an understanding of how our solar system formed, its components and the death of stars.

Explain Kepler's Laws and Newton's Universal Law of Gravitation. Show how this concept helps explain tides and gravitational fields

Class activities

Hours 1-2

Discuss the basic structural make-up of planets and stars

Explore theories pertaining to the formation of stars, planets, the solar system and the universe

Develop an understanding for the forces acting upon and within planetary systems (gravity, fusion)

Hours 3-4

Explore the concepts of space-time and the formation of planets

Map the solar system

WEEK 8

Assignments Due

Week 7 lab write-ups

LEARNING ACTIVITIES

Learning objective

Practice analytical thinking skills by critiquing an article espousing a controversial topic related to earth science

Re-affirm knowledge gained over the semester by completing a comprehensive exam

Class activities

Article critique

Comprehensive final exam