Washtenaw Community College Comprehensive Report

GLG 114 Physical Geology
Effective Term: Fall 2023

Course Cover

College: Math, Science and Engineering Tech
Division: Math, Science and Engineering Tech
Department: Physical Sciences
Discipline: Geology
Course Number: 114
Org Number: 12330
Full Course Title: Physical Geology
Transcript Title: Physical Geology
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission:
Change Information:
Pre-requisite, co-requisite, or enrollment restrictions
Objectives/Evaluation
Rationale: To update current math level requirement to ensure success of students based on mathematics required in the course.
Proposed Start Semester: Winter 2023
Course Description: In this course, students examine the physical features and processes that have formed and are forming the landscape of the Earth. Emphasis is placed on learning the local geology of Michigan and the Great Lakes. Topics will include: topographic maps, minerals, rocks, soil erosion and formation, plate tectonics, earthquakes, volcanoes, mountain building, geologic time and dating, running water, lakes, groundwater, oceans, and glaciation.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 45 **Student:** 45
Lab: Instructor: 45 **Student:** 45
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90
Repeatable for Credit: NO
Grading Methods: Letter Grades
Audit
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 2

Requisites

General Education

MACRAO

MACRAO Science & Math
MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4
Assoc in Science - Area 4
Assoc in Arts - Area 4

Michigan Transfer Agreement - MTA

MTA Lab Science

Request Course Transfer

Proposed For:

Eastern Michigan University
Ferris State University
Grand Valley State University
Jackson Community College
Michigan State University
Oakland University
University of Detroit - Mercy
University of Michigan
Wayne State University
Western Michigan University
College for Creative Studies
Central Michigan University

Student Learning Outcomes

1. Recognize and identify introductory principles and concepts related to geology such as topographic maps, minerals, rocks, soil erosion and formation, plate tectonics, earthquakes, volcanoes, mountain building, geologic time and dating, running water, lakes, groundwater, oceans and glaciations, as well as the environmental concerns associated with each.

   Assessment 1

   Assessment Tool: Outcome-related departmental exams
   Assessment Date: Winter 2025
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Multiple-choice questions will be scored using the key. Essay and short answer questions will be scored using a departmentally-developed rubric.
   Standard of success to be used for this assessment: 70% of students will score an overall average of 72.5% or better on each assessment question.
   Who will score and analyze the data: Geology faculty

2. Apply appropriate principles, tools and concepts to solve problems, as well as construct and interpret maps, charts, diagrams and graphs related to geological concepts.

   Assessment 1

   Assessment Tool: Outcome-related laboratory exercises
   Assessment Date: Winter 2025
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Multiple-choice questions will be scored using the key. Essay and short answer questions will be scored using a departmentally-developed rubric.

Standard of success to be used for this assessment: 70% of students will score an overall average of 72.5% or better on each assessment question.
Who will score and analyze the data: Geology faculty

Course Objectives

1. Explain the nature of scientific inquiry and the scientific method.
2. Describe the theory or hypothesis (nebular hypothesis) for the origin of the solar system and Earth.
3. Summarize the components of the Earth system, and describe its interrelated spheres.
4. Differentiate the concepts of catastrophism and uniformitarianism.
5. Identify and locate features using topographic maps.
6. Describe basic subatomic particles, atomic mass, atomic number, and ions and their relationship to minerals and Earth materials.
7. Identify the structure of the silicon-oxygen tetrahedron, and explain the characteristics of the common silicate minerals.
8. Describe the chemical classification of minerals (such as silicates, carbonates, etc.).
9. Identify the physical and chemical properties of minerals.
10. Explain the difference between magma and lava, intrusive rocks and extrusive rocks, plutonic rocks and volcanic rocks.
11. Describe how the rate of cooling influences the size of crystals in igneous rocks.
12. Identify the different igneous rock textures (aphanitic, phaneritic, porphyritic, pegmatitic, vesicular, glass, and pyroclastic) and explain their origins.
13. Relate an understanding of Bowen's reaction series to melting and crystallization.
14. Compare and contrast the various compositional groups of magma (felsic, intermediate, mafic and ultramafic) and how they relate to igneous rocks.
15. Explain the relationship between igneous rocks and plate tectonic setting.
16. Describe the various origins of sedimentary rocks.
17. Classify the various environments in which sediment is deposited.
18. Identify the various sedimentary textures and compositions (detrital, chemical, biochemical).
19. Explain the importance of sedimentary rocks in the study of Earth history (geologic dating, fossils and ancient environments).
20. Compare and contrast the basic groups and principle characteristics of sedimentary rocks.
21. List the agents (or causes) of metamorphism and their effects.
22. Describe and identify various metamorphic textures, including foliation and layering.
23. Explain the relationship between metamorphism and plate tectonics.
24. Describe the progressive stages that metamorphic rocks undergo with increasing grade of metamorphism, including low and high-grade metamorphism.
25. Recognize and define the physical and chemical properties of common rocks and minerals.
26. Explain the rock cycle and the interrelationship of various types of rocks.
27. Summarize the difference between weathering and erosion.
28. Distinguish the differences between chemical and physical weathering.
29. Identify the different types of physical or mechanical weathering.
30. Explain the concept of the soil profile, and identify the factors influencing soil formation.
31. Create a soil profile and identify the texture of the soil.
32. List the factors that influence the type and rate of rock weathering.
33. Describe the causes and identify the various types of slow and rapid mass wasting processes, including creep, solifluction, rock fall, and slumps.
34. Identify key geological events that characterize each era and period in geologic time.
35. Explain Alfred Wegener’s continental drift hypothesis and how his work contributed to plate tectonic theory.
36. List and describe the evidence that supports plate tectonic theory, including ocean drilling and paleomagnetism along the mid-ocean ridges.
37. Draw the boundaries of the major plates of the Earth on a global map.
38. Explain the mechanisms and recent theories that drive plate motion.
39. Explain the tectonic processes and identify features associated with divergent plate boundaries, including oceanic ridge spreading centers and rift valleys, with major worldwide examples.

40. Explain the tectonic processes and identify features associated with convergent plate boundaries, including subduction zones, deep-ocean trenches, volcanic island arcs, continental volcanic arcs, continental collision, orogenesis, and emplacement of plutons, with major worldwide examples.
41. Explain the tectonic processes and identify features associated with transform plate boundaries, with major worldwide examples.
42. Describe what mantle plumes and hot spots are and how they differ from plate boundaries, as well as identify major worldwide examples of where they exist, such as Hawaii and Yellowstone National Park.
43. Explain the causes of earthquakes as related to the elastic rebound theory.
44. Differentiate and identify the basic types of earthquake waves.
45. Explain the difference between the focus and epicenter of an earthquake.
46. Relate the worldwide distribution pattern of earthquake activity to plate tectonics by mapping recent earthquake events on a global map.
47. Compare and contrast the various scales used to measure earthquakes, including Richter, Moment Magnitude and the Mercalli Scales.
48. Locate the epicenter of an earthquake using seismogram records and the triangulation method.
49. Describe how destruction is caused by earthquake activity, including tsunamis and liquefaction, as well as contributing factors such as soil properties and building construction.
50. Explain how faults are monitored and future earthquakes are predicted.
51. Describe the New Madrid Fault, and explain how an earthquake along that fault would affect the center of the North American plate, including Michigan.
52. Identify the composition, layers and discontinuities of the Earth's crust, and explain how seismic waves are used to determine these.
53. Identify the origins of each layer as related to meteorites and the formation of the Earth.
54. Explain how the Earth's magnetic field is generated.
55. Demonstrate an understanding of the factors that determine the nature of an igneous eruption.
56. Recognize and identify the various materials that may be emitted during a volcanic eruption.
57. Compare and contrast the three basic types of volcanoes (shield, composite, and cinder cone) as to size, shape, eruptive style, and plate tectonic setting, and classify well-known world volcanoes according to their basic type.
58. Identify the various types of intrusive igneous bodies (dike, sill, laccolith, stock, batholith), including their approximate sizes and geometrical relationship to surrounding rocks (concordant, discordant).
59. Describe the relationship between the geographic distribution of volcanic activity and the plate tectonic model by plotting the major volcanoes of the world on a global map.
60. Draw the various types of folds (anticlines, synclines, monoclines, basins, domes), and describe the type of stress that produced them.
61. Identify the different types of faults (normal, reverse, thrust, strike-slip), and demonstrate an understanding of the type of stress that produces them.
62. Demonstrate an understanding of the concept of isostasy and isostatic adjustment.
63. Identify the processes related to the hydrologic cycle.
64. Explain the processes of erosion, transportation and deposition of sediment by streams, and identify the features that form as a result of these processes.
65. Differentiate the types of transported stream load (bed load, suspended load, dissolved load), and relate the concepts of stream capacity, and stream competence.
66. Define the concepts of base level, discharge and gradient, as related to stream processes.
67. List the causes and types of floods and methods of flood control.
68. Demonstrate the concepts of porosity and permeability.
69. Explain the concept of the water table and the various factors which affect it.
70. Describe the environmental problems related to groundwater.
71. Explain the origin and list the major features of karst topography (sinkholes, caves, disappearing streams, etc.).
72. Differentiate the various theories describing the onset of ice ages, including plate tectonics and Milankovitch cycles.

73. Compare and contrast the formation, location, movement and landforms developed by alpine and continental glaciers.
74. Locate and explain the glacial processes that created Michigan landforms including: kames, kettles, moraines, drumlins, eskers, outwash plains and Great Lakes.
75. Identify the location and characteristics of the seafloor, including the continental margins (continental shelf, continental slope, continental rise).
76. Describe the characteristics and behavior of ocean waves (crest, trough, wavelength, wave height, wave period, wave refraction) and the factors which produce waves.
77. Explain the characteristics and causes of tides.
78. Identify and explain shoreline features and processes acting along the shoreline (erosion, deposition, beach drift and longshore currents).
79. State the major components of the atmosphere and their importance in weather and climate.
80. Discuss the changes in atmospheric composition and the potential response and impacts on the environment.
81. Differentiate between natural and anthropogenic causes of climate change.
82. Describe the ice-albedo feedback.

New Resources for Course

Course Textbooks/Resources

Textbooks

Earle, Steven. *OER - Physical Geology*, 2nd ed. BC Campus Open Ed, 2019, ISBN: 9781774200278.
Abke, R.; Deline,B., Fuks, K., Harris, R., Tefend, K.. *Laboratory Manual for Introductory Geology*, ed. University System of Georgia, University Press of North Georgia, 2017, ISBN: 9781940771.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom
Computer workstations/lab
Data projector/computer

Reviewer	Action	Date
Faculty Preparer:		
Emily Duff	*Faculty Preparer*	*Oct 25, 2022*
Department Chair/Area Director:		
Suzanne Albach	*Recommend Approval*	*Oct 25, 2022*
Dean:		
Tracy Schwab	*Recommend Approval*	*Oct 26, 2022*
Curriculum Committee Chair:		
Randy Van Wagnen	*Recommend Approval*	*Feb 08, 2023*
Assessment Committee Chair:		
Shawn Deron	*Recommend Approval*	*Feb 08, 2023*
Vice President for Instruction:		
Victor Vega	*Approve*	*Feb 09, 2023*

Washtenaw Community College Comprehensive Report

GLG 114 Physical Geology
Effective Term: Spring/Summer 2020

Course Cover

Division: Math, Science and Engineering Tech
Department: Physical Sciences
Discipline: Geology
Course Number: 114
Org Number: 12330
Full Course Title: Physical Geology
Transcript Title: Physical Geology
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Course Change
Change Information:
Consultation with all departments affected by this course is required.
Course description
Outcomes/Assessment
Other:
Rationale: This syllabus review will update the material needed to reflect the use of open educational resource material, as well as the scoring methods in the outcomes and assessments.
Proposed Start Semester: Winter 2020
Course Description: In this course, students examine the physical features and processes that have formed and are forming the landscape of the Earth. Emphasis is placed on learning the local geology of Michigan and the Great Lakes. Topics will include: topographic maps, minerals, rocks, soil erosion and formation, plate tectonics, earthquakes, volcanoes, mountain building, geologic time and dating, running water, lakes, groundwater, oceans, and glaciation.

Course Credit Hours

Variable hours: No
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Lecture Hours: Instructor: 45 **Student:** 45
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College-Level Math

Requisites

General Education

MACRAO

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MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4
Assoc in Science - Area 4
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Proposed For:

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Oakland University
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Wayne State University
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1. Recognize and identify introductory principles and concepts related to geology such as topographic maps, minerals, rocks, soil erosion and formation, plate tectonics, earthquakes, volcanoes, mountain building, geologic time and dating, running water, lakes, groundwater, oceans and glaciations, as well as the environmental concerns associated with each.

   Assessment 1

   Assessment Tool: Departmental exams
   Assessment Date: Winter 2022
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: All students
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   Who will score and analyze the data: Appropriate geology faculty will analyze the data.

2. Apply appropriate principles, tools and concepts to solve problems, as well as construct and interpret maps, charts, diagrams and graphs related to geological concepts.

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Course Objectives

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4. Differentiate the concepts of catastrophism and uniformitarianism.
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24. Describe the progressive stages that metamorphic rocks undergo with increasing grade of metamorphism, including low and high-grade metamorphism.
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26. Explain the rock cycle and the interrelationship of various types of rocks.
27. Summarize the difference between weathering and erosion.
28. Distinguish the differences between chemical and physical weathering.
29. Identify the different types of physical or mechanical weathering.
30. Explain the concept of the soil profile, and identify the factors influencing soil formation.
31. Create a soil profile and identify the texture of the soil.
32. List the factors that influence the type and rate of rock weathering.
33. Describe the causes and identify the various types of slow and rapid mass wasting processes, including creep, solifluction, rock fall, and slumps.
34. Identify key geological events that characterize each era and period in geologic time.
35. Explain Alfred Wegener’s continental drift hypothesis and how his work contributed to plate tectonic theory.
36. List and describe the evidence that supports plate tectonic theory, including ocean drilling and paleomagnetism along the mid-ocean ridges.
37. Draw the boundaries of the major plates of the Earth on a global map.
38. Explain the mechanisms and recent theories that drive plate motion.
39. Explain the tectonic processes and identify features associated with divergent plate boundaries, including oceanic ridge spreading centers and rift valleys, with major worldwide examples.
40. Explain the tectonic processes and identify features associated with convergent plate boundaries, including subduction zones, deep-ocean trenches, volcanic island arcs, continental volcanic arcs,

continental collision, orogenesis, and emplacement of plutons, with major worldwide examples.
41. Explain the tectonic processes and identify features associated with transform plate boundaries, with major worldwide examples.
42. Describe what mantle plumes and hot spots are and how they differ from plate boundaries, as well as identify major worldwide examples of where they exist, such as Hawaii and Yellowstone National Park.
43. Explain the causes of earthquakes as related to the elastic rebound theory.
44. Differentiate and identify the basic types of earthquake waves.
45. Explain the difference between the focus and epicenter of an earthquake.
46. Relate the world-wide distribution pattern of earthquake activity to plate tectonics by mapping recent earthquake events on a global map.
47. Compare and contrast the various scales used to measure earthquakes, including Richter, Moment Magnitude and the Mercalli Scales.
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50. Explain how faults are monitored and future earthquakes are predicted.
51. Describe the New Madrid Fault, and explain how an earthquake along that fault would affect the center of the North American plate, including Michigan.
52. Identify the composition, layers and discontinuities of the Earth's crust, and explain how seismic waves are used to determine these.
53. Identify the origins of each layer as related to meteorites and the formation of the Earth.
54. Explain how the Earth's magnetic field is generated.
55. Demonstrate an understanding of the factors that determine the nature of an igneous eruption.
56. Recognize and identify the various materials that may be emitted during a volcanic eruption.
57. Compare and contrast the three basic types of volcanoes (shield, composite, and cinder cone) as to size, shape, eruptive style, and plate tectonic setting, and classify well known world volcanoes according to their basic type.
58. Identify the various types of intrusive igneous bodies (dike, sill, laccolith, stock, batholith), including their approximate sizes and geometrical relationship to surrounding rocks (concordant, discordant).
59. Describe the relationship between the geographic distribution of volcanic activity and the plate tectonic model by plotting the major volcanoes of the world on a global map.
60. Identify and describe the five common types of mountains and how they are formed.
61. Draw the various types of folds (anticlines, synclines, monoclines, basins, domes), and describe the type of stress that produced them.
62. Identify the different types of faults (normal, reverse, thrust, strike-slip), and demonstrate an understanding of the type of stress that produces them.
63. Identify and solve problems related to strike and dip.
64. Demonstrate an understanding of the concept of isostasy and isostatic adjustment.
65. Identify the processes related to the hydrologic cycle.
66. Explain the processes of erosion, transportation and deposition of sediment by streams, and identify the features that form as a result of these processes.
67. Differentiate the types of transported stream load (bed load, suspended load, dissolved load), and relate the concepts of stream capacity, and stream competence.
68. Define the concepts of base level, discharge and gradient, as related to stream processes.
69. List the causes and types of floods and methods of flood control.
70. Demonstrate the concepts of porosity and permeability.
71. Explain the concept of the water table and the various factors which affect it.
72. Describe the environmental problems related to groundwater.
73. Explain the origin and list the major features of karst topography (sinkholes, caves, disappearing streams, etc.).
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76. Locate and explain the glacial processes that created Michigan landforms including: kames, kettles, moraines, drumlins, eskers, outwash plains and Great Lakes.
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78. Describe the characteristics and behavior of ocean waves (crest, trough, wavelength, wave height, wave period, wave refraction) and the factors which produce waves.
79. Explain the characteristics and causes of tides.
80. Identify and explain shoreline features and processes acting along the shoreline (erosion, deposition, beach drift and longshore currents).

New Resources for Course

Course Textbooks/Resources

Textbooks

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Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Computer workstations/lab

TV/VCR

Data projector/computer

Reviewer	Action	Date
Faculty Preparer:		
Suzanne Albach	*Faculty Preparer*	*Aug 17, 2019*
Department Chair/Area Director:		
Suzanne Albach	*Recommend Approval*	*Aug 17, 2019*
Dean:		
Victor Vega	*Recommend Approval*	*Sep 17, 2019*
Curriculum Committee Chair:		
Lisa Veasey	*Recommend Approval*	*Nov 04, 2019*
Assessment Committee Chair:		
Shawn Deron	*Recommend Approval*	*Nov 08, 2019*
Vice President for Instruction:		
Kimberly Hurns	*Approve*	*Nov 08, 2019*

Washtenaw Community College Comprehensive Report

GLG 114 Physical Geology
Effective Term: Fall 2012

Course Cover

Division: Math, Science and Health
Department: Physical Sciences
Discipline: Geology
Course Number: 114
Org Number: 12330
Full Course Title: Physical Geology
Transcript Title: Physical Geology
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Course Change
Change Information:
Total Contact Hours
Outcomes/Assessment
Rationale: This change is necessary to align this course with the federal mandate that defines minimum contact hours for science laboratory courses.
Proposed Start Semester: Fall 2012
Course Description: Students examine the physical features and processes that have formed and are forming the landscape of the Earth. Emphasis is placed on learning the local geology of Michigan and the Great Lakes. Topics will include: topographic maps, minerals, rocks, soil erosion and formation, plate tectonics, earthquakes, volcanoes, mountain building, geologic time and dating, running water, lakes, groundwater, oceans and glaciation.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 45 **Student:** 45
Lab: Instructor: 45 **Student:** 45
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90
Repeatable for Credit: NO
Grading Methods: Letter Grades
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Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Requisites

General Education

MACRAO
MACRAO Science & Math
MACRAO Lab Science Course
General Education Area 4 - Natural Science
Assoc in Applied Sci - Area 4

Assoc in Science - Area 4
Assoc in Arts - Area 4

Request Course Transfer

Proposed For:

Central Michigan University
Eastern Michigan University
Ferris State University
Grand Valley State University
Jackson Community College
Michigan State University
Oakland University
University of Michigan
Wayne State University
Western Michigan University

Student Learning Outcomes

1. Recognize and identify introductory principles and concepts related to geology including: topographic maps, minerals, rocks, soil erosion and formation, plate tectonics, earthquakes, volcanoes, mountain building, geologic time and dating, running water, lakes, groundwater, oceans and glaciations, as well as the environmental concerns associated with each.
   Assessment 1
   Assessment Tool: Departmental Exams
   Assessment Date: Winter 2013
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: Random sample of 50% of the students from each section with a minimum of one full section.
   How the assessment will be scored: Multiple choice questions will be scored using the key. Essay and short answer questions will be scored using a departmentally-developed rubric.
   Standard of success to be used for this assessment: Students will score an overall average of 72.5% or better on each assessment question.
   Who will score and analyze the data: Appropriate geology faculty will analyze the data.

2. Apply appropriate principles, tools and concepts to solve problems, as well as construct and interpret maps, charts, diagrams and graphs related to geological concepts.
   Assessment 1
   Assessment Tool: Laboratory Exercises
   Assessment Date: Winter 2013
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: Random sample of 50% of students from each section with a minimum of one full section.
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Students will score an overall average of 72.5% or better.
   Who will score and analyze the data: Appropriate geology faculty.
   Assessment 2
   Assessment Tool: Departmental Exams
   Assessment Date: Winter 2013
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: Random sample of 50% of students from each

section with a minimum of one full section.
How the assessment will be scored: Multiple choice questions will be scored using the key. Essay and short answer questions will be scored using a departmentally-developed rubric.
Standard of success to be used for this assessment: Students will score an overall average of 72.5% or better on each assessment question.
Who will score and analyze the data: Appropriate geology faculty will analyze the data.

Course Objectives

1. Explain the nature of scientific inquiry and the scientific method.
   Matched Outcomes
2. Describe the theory or hypothesis (nebular hypothesis) for the origin of the solar system and Earth.
   Matched Outcomes
3. Summarize the components of the Earth system and describe its interrelated spheres.
   Matched Outcomes
4. Differentiate the concepts of catastrophism and uniformitarianism.
   Matched Outcomes
5. Identify and locate features using topographic maps.
   Matched Outcomes
6. Describe basic subatomic particles, atomic mass, atomic number, and ions and their relationship to minerals and Earth materials.
   Matched Outcomes
7. Identify the structure of the silicon-oxygen tetrahedron and explain the characteristics of the common silicate minerals.
   Matched Outcomes
8. Describe the chemical classification of minerals (such as silicates, carbonates, etc.).
   Matched Outcomes
9. Identify the physical and chemical properties of minerals.
   Matched Outcomes
10. Explain the difference between magma and lava, intrusive rocks and extrusive rocks, plutonic rocks and volcanic rocks.
    Matched Outcomes
11. Describe how the rate of cooling influences the size of crystals in igneous rocks.
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12. Identify the different igneous rock textures (aphanitic, phaneritic, porphyritic, pegmatitic, vesicular, glass, and pyroclastic) and explain their origins.
    Matched Outcomes
13. Relate an understanding of Bowen's Reaction Series to melting and crystallization.
    Matched Outcomes
14. Compare and contrast the various compositional groups of magma (felsic, intermediate, mafic and ultramafic) and how they relate to igneous rocks.
    Matched Outcomes
15. Explain the relationship between igneous rocks and plate tectonic setting.
    Matched Outcomes
16. Describe the various origins of sedimentary rocks.
    Matched Outcomes
17. Classify the various environments in which sediment is deposited.
    Matched Outcomes
18. Identify the various sedimentary textures and compositions (detrital, chemical, biochemical).
    Matched Outcomes
19. Explain the importance of sedimentary rocks in the study of Earth history (geologic dating, fossils and ancient environments).
    Matched Outcomes
20. Compare and contrast the basic groups and principle characteristics of sedimentary rocks.
    Matched Outcomes

21. List the agents (or causes) of metamorphism and their effects.
    Matched Outcomes
22. Describe and identify various metamorphic textures, including foliation and layering.
    Matched Outcomes
23. Explain the relationship between metamorphism and plate tectonics.
    Matched Outcomes
24. Describe the progressive stages that metamorphic rocks undergo with increasing grade of metamorphism, including low and high-grade metamorphism.
    Matched Outcomes
25. Recognize and define the physical and chemical properties of common rocks and minerals.
    Matched Outcomes
26. Explain the rock cycle and the interrelationship of various types of rocks.
    Matched Outcomes
27. Summarize the difference between weathering and erosion.
    Matched Outcomes
28. Distinguish the differences between chemical and physical weathering.
    Matched Outcomes
29. Identify the different types of physical or mechanical weathering.
    Matched Outcomes
30. Explain the concept of the soil profile and identify the factors influencing soil formation.
    Matched Outcomes
31. Create a soil profile and identify the texture of the soil.
    Matched Outcomes
32. List the factors that influence the type and rate of rock weathering.
    Matched Outcomes
33. Describe the causes and identify the various types of slow and rapid mass wasting processes, including creep, solifluction, rock fall, and slumps.
    Matched Outcomes
34. Identify key geological events that characterize each era and period in geologic time.
    Matched Outcomes
35. Explain Alfred Wegener’s continental drift hypothesis and how his work contributed to plate tectonic theory.
    Matched Outcomes
36. List and describe the evidence that supports plate tectonic theory, including ocean drilling and paleomagnetism along the mid-ocean ridges.
    Matched Outcomes
37. Draw the boundaries of the major plates of the Earth on a global map.
    Matched Outcomes
38. Explain the mechanisms and recent theories that drive plate motion.
    Matched Outcomes
39. Explain the tectonic processes and identify features associated with divergent plate boundaries, including oceanic ridge spreading centers and rift valleys, with major worldwide examples.
    Matched Outcomes
40. Explain the tectonic processes and identify features associated with convergent plate boundaries, including subduction zones, deep-ocean trenches, volcanic island arcs, continental volcanic arcs, continental collision, orogenesis, and emplacement of plutons, with major worldwide examples.
    Matched Outcomes
41. Explain the tectonic processes and identify features associated with transform plate boundaries, with major worldwide examples.
    Matched Outcomes
42. Describe what mantle plumes and hot spots are and how they differ from plate boundaries, as well as identify major worldwide examples of where they exist, such as Hawaii and Yellowstone National Park.
    Matched Outcomes
43. Explain the causes of earthquakes as related to the elastic rebound theory.

Matched Outcomes

44. Differentiate and identify the basic types of earthquake waves.
    Matched Outcomes
45. Explain the difference between the focus and epicenter of an earthquake.
    Matched Outcomes
46. Relate the world-wide distribution pattern of earthquake activity to plate tectonics by mapping recent earthquake events on a global map.
    Matched Outcomes
47. Compare and contrast the various scales used to measure earthquakes, including Richter, Moment Magnitude and the Mercalli Scales.
    Matched Outcomes
48. Locate the epicenter of an earthquake using seismogram records and the triangulation method.
    Matched Outcomes
49. Describe how destruction is caused by earthquake activity, including tsunamis and liquefaction, as well as contributing factors such as soil properties and building construction.
    Matched Outcomes
50. Explain how faults are monitored and future earthquakes are predicted.
    Matched Outcomes
51. Describe the New Madrid Fault and explain how an earthquake along that fault would affect the center of the North American plate, including Michigan.
    Matched Outcomes
52. Identify the composition, layers and discontinuities of the Earth's crust and explain how seismic waves are used to determine these.
    Matched Outcomes
53. Identify the origins of each layer as related to meteorites and the formation of the Earth.
    Matched Outcomes
54. Explain how the Earth's magnetic field is generated.
    Matched Outcomes
55. Demonstrate an understanding of the factors that determine the nature of an igneous eruption.
    Matched Outcomes
56. Recognize and identify the various materials that may be emitted during a volcanic eruption.
    Matched Outcomes
57. Compare and contrast the three basic types of volcanoes (shield, composite, and cinder cone) as to size, shape, eruptive style, and plate tectonic setting and classify well known world volcanoes according to their basic type.
    Matched Outcomes
58. Identify the various types of intrusive igneous bodies (dike, sill, laccolith, stock, batholith), including their approximate sizes and geometrical relationship to surrounding rocks (concordant, discordant).
    Matched Outcomes
59. Describe the relationship between the geographic distribution of volcanic activity and the plate tectonic model by plotting the major volcanoes of the world on a global map.
    Matched Outcomes
60. Identify and describe the five common types of mountains and how they are formed.
    Matched Outcomes
61. Draw the various types of folds (anticlines, synclines, monoclines, basins, domes) and describe the type of stress that produced them.
    Matched Outcomes
62. Identify the different types of faults (normal, reverse, thrust, strike-slip), and demonstrate an understanding of the type of stress that produces them.
    Matched Outcomes
63. Identify and solve problems related to strike and dip.
    Matched Outcomes

64. Demonstrate an understanding of the concept of isostasy and isostatic adjustment.
    Matched Outcomes
65. Identify the processes related to the hydrologic cycle.
    Matched Outcomes
66. Explain the processes of erosion, transportation and deposition of sediment by streams, and identify the features that form as a result of these processes.
    Matched Outcomes
67. Differentiate the types of transported stream load (bed load, suspended load, dissolved load), and relate the concepts of stream capacity, and stream competence.
    Matched Outcomes
68. Define the concepts of base level, discharge and gradient, as related to stream processes.
    Matched Outcomes
69. List the causes and types of floods and methods of flood control.
    Matched Outcomes
70. Demonstrate the concepts of porosity and permeability.
    Matched Outcomes
71. Explain the concept of the water table and the various factors which affect it.
    Matched Outcomes
72. Describe the environmental problems related to groundwater.
    Matched Outcomes
73. Explain the origin and list the major features of karst topography (sinkholes, caves, disappearing streams, etc.).
    Matched Outcomes
74. Differentiate the various theories describing the onset of ice ages, including plate tectonics and Milankovitch cycles.
    Matched Outcomes
75. Compare and contrast the formation, location, movement and landforms developed by alpine and continental glaciers.
    Matched Outcomes
76. Locate and explain the glacial processes that created Michigan landforms including: kames, kettles, moraines, drumlins, eskers, outwash plains and Great Lakes.
    Matched Outcomes
77. Identify the location and characteristics of the seafloor, including the continental margins (continental shelf, continental slope, continental rise).
    Matched Outcomes
78. Describe the characteristics and behavior of ocean waves (crest, trough, wavelength, wave height, wave period, wave refraction) and the factors which produce waves.
    Matched Outcomes
79. Explain the characteristics and causes of tides.
    Matched Outcomes
80. Identify and explain shoreline features and processes acting along the shoreline (erosion, deposition, beach drift and longshore currents).
    Matched Outcomes

New Resources for Course

Course Textbooks/Resources

Textbooks

Monroe, James, Wicander and Reed. *The Changing Earth with Geology of the Michigan Great Lakes*, 5 ed. Cengage Learning, 2009, ISBN: 9780495654650.

Hamblin, W. Kenneth. *Exercises in Physical Geology*, 12 ed. Prentice Hall, 2009, ISBN: 9780131447707.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Computer workstations/lab
TV/VCR
Data projector/computer

Reviewer	Action	Date
Faculty Preparer:		
Suzanne Albach	*Faculty Preparer*	*Mar 14, 2012*
Department Chair/Area Director:		
Kathleen Butcher	*Recommend Approval*	*Mar 27, 2012*
Dean:		
Martha Showalter	*Recommend Approval*	*Mar 28, 2012*
Vice President for Instruction:		
Stuart Blacklaw	*Approve*	*Apr 11, 2012*