

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

COURSE OUTLINE

COURSE TITLE: Regional Geology

CODE NO. : NRT 221 **SEMESTER:** 3
5 (opt)

PROGRAM: Parks & Outdoor Recreation Technician
Integrated Resource Mgt. Technology (optional)

AUTHOR: Harvey Robbins

DATE: June 2003 **PREVIOUS OUTLINE DATED:** June
2002

APPROVED:

	_____	_____
	DEAN	DATE

TOTAL CREDITS: 3

PREREQUISITE(S): None

LENGTH OF COURSE: 15 Weeks **TOTAL CREDIT HOURS:** 45

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Technology & Natural Resources
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I. COURSE DESCRIPTION:

Students will gain an understanding of the processes that have led to the incredible variety of formations in the rocks and soils of our region. These will be related to land use and travel patterns both contemporary and historical. Included will be rock formation, minerals, surficial geology, soils and fossil formation and identification.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Explain the Geological Development of the Earth since the Beginning of its formation.

Potential Elements of the Performance:

- Describe the makeup of the earth
- Explain the theory of plate tectonics, (continental drift)
- Explain why magnetic reversals are observed
- Explain the structure of subduction zones and their associated phenomena
- Describe mid-oceanic ridges
- Describe the geological time scale and how it applies to Ontario
- Explain the development of the present-day continents.
- Explain the major dating processes used to determine the age of rocks

This learning outcome will constitute 10% of the course's grade.

2. Explain the Development of Ontario's Precambrian Shield Country.

Potential Elements of the Performance:

- Explain the role of Plate Tectonics in forming the Precambrian in Ontario
 - the Archean Continent and Superior Province
 - the Southern Province-a Zone of Transition and Change
 - the Grenville Orogeny and the Grenville Province
 - Pre-Cambrian Sedimentation, glaciation and Metamorphosis

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- Describe the present-day Precambrian provinces and zones in relation to the building processes described previously
- Identify a variety of rock types found in the Algoma District and relate them to the previously described geological processes
- Identify a variety of important and common minerals of Ontario

This learning outcome will constitute 35% of the course's grade.

3. Describe the Sedimentary building events of the Paleozoic era, which have led to Sedimentary rock formation south and north of the Precambrian Shield.

Potential Elements of the Performance:

- Describe the main types of sedimentary rock found in Ontario in relation to rock type, origin, characteristics and age
- Explain the formation of Precambrian sandstones
- Explain the formation of the Middle Ordovician Limestones of the North Channel Islands and central S. Ontario
- Explain the formation of the Upper Ordovician Deposits of Manitoulin Is. and central S. Ontario
- Explain the formation of the Silurian deposits of Manitoulin Is. and the Niagara Escarpment
- Explain the formation of Devonian rocks of SW Ontario
- Identify the major sedimentary rock types
- Identify major fossil groups found in the sedimentary rocks of Ontario
- Explain why the remains of dinosaurs and other more recent large animals have seldom been found in Ontario
- Relate each of the above to Ontario's geological time scale

This learning outcome will constitute 20% of the course's grade.

4. Explain the major glacial events in Ontario's recent history and describe the resulting impacts on Surficial Geology and Landforms produced.

Potential Elements of the Performance:

- On maps of Ontario, describe the sequences of glacial advances and associated glacial lakes
- Explain Isostatic rebound and how this phenomenon has left its mark in Algoma District

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- Identify and explain the formation of glacial landforms such as eskers, drumlins, kames, potholes, outwash plains and moraines
- Explain climate change in the recent epoch and its impact on animal and plant populations

This learning outcome will constitute 15% of the course's grade.

5. Describe Climate as it affects tourism in Ontario.

Potential Elements of the Performance

- Describe the paths taken by cyclones (lows) in winter and summer
- Generally set out on an Ontario map areas with the greatest snowfall and explain why the Great Lakes are the major reason for this
- Identify and access local weather information
- Using familiar signs make reasonable predictions about the weather to be expected in the ensuing 24 hours
- Describe weather conditions in winter and summer that may develop into potentially dangerous conditions for recreational activities including remote touring

This learning outcome will constitute 10% of the course's grade.

6. Explain the significance of the geography in the region in and around Ontario to the tourism industry.

Potential Elements of the Performance:

- Describe early travel patterns by explorers in the Great Lakes region and how these influenced the locating of towns and cities
- Describe the role of railways and canals in opening up the hinterland
- Describe how resource extraction activities have contributed to the opening up of the northland
- Describe existing land travel patterns in the Great Lakes region and how these influence the tourism market in the region
- Describe the limitations of air travel in accessing the Northern Ontario region

This learning outcome will constitute 5% of the course's grade.

III. TOPICS:

1. Geological Development of the Earth – 2 weeks (Sep. 8, 22) (Field camp Sep. 15)
 - Layers composing the earth
 - Plate tectonics
 - Magnetic reversals
 - Subduction zones and associated structures
 - mid-oceanic ridges
 - geological time scale in Ontario
 - development of present -day continents
 - methods used to date rocks and organic matter

2. Development of the Precambrian Shield-3 weeks
 - the Archean Continent (Sept. 29, Oct. 6, 13,20 –includes Manitoulin and north field trips)
 - superior Province
 - southern province
 - Grenville province
 - the building stages that occurred to form the Precambrian shield
 - sedimentation, glaciation and metamorphism during Precambrian times
 - identification of important rocks and minerals

3. Sedimentary rock formation and types during the Paleozoic Era in Ontario. –2 ½ weeks (Oct. 27, Nov. 3, 10)
 - main types of sedimentary rocks and their characteristics in Ont.
 - Middle Ordovician limestones of the North Channel
 - Upper Ordovician limestones of Manitoulin and S. Ont.
 - Silurian deposits of Manitoulin and the escarpment
 - More recent rocks in SW Ont. and the far north
 - Identification of sedimentary rock and associated fossils

4. Glacial history and resulting surficial geology
 - Sequences of glacial advances
 - Glacial lakes and isostatic rebound
 - Landforms left by lakes (glacio-lacustrine)
 - Landforms associated with glacial movement (glacial)
 - Landforms left by galcial meltwater (glacio-fluvial)

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5. Climate and tourism in Ontario – 2 weeks (Dec. 1, 8)
 - Patterns of movement of cyclones (lows)
 - Impact of the Great Lakes
 - Local weather information
 - Weather signs
 - Dangerous weather conditions in winter and summer
6. Ontario geography and tourism -½ week (Dec.15)
 - Historical travel patterns
 - The role of railways and canals
 - Resource extraction activities
 - Present land travel patterns
 - Limitations to air travel in the north

IV REQUIRED RESOURCES/TEXTS/MATERIALS:

Environment Canada. 1998. Wind, Weather & Waves, A guide to marine weather in the Great Lakes region. Ottawa, Minister of Supply & Services. 144 pp.

Ministry of Northern Development and Mines, Ontario 1994. ROCK Ontario, Ontario Ministry of Northern Development and Mines, ROCK ON Series 1, 89 pp.

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Code No.**Some Other Resources Available on Reserve in the Library:**

American Geological Institute. 1984. Dictionary of Geological Terms. Toronto, Anchor Books, Doubleday 571 pp.

Annelis, R.N. 1973. Proterozoic Flood Basalts of Eastern Lake Superior: The Keweenaw Volcanic Rocks of the Mamainse Point Area, Ontario. Geol. Survey Can., Pap. 72-10. 51 pp, map, figure.

Chernicoff, S., H.A. Fox and R. Venkarakrishnan. 1997. Essentials of Geology. New York, Worth Publ. 411 pp. Appendices.

Cole, F.W. 1980. Introduction to Meteorology. Toronto, John Wiley & Sons. 505 pp.

Geddes, R.S., F.J. Kristjansson and J.T. Taylor. 1987. XII th Inqua Congress Field Excursion c-12. Quarternary Features and Scenery along the North Shore of Lake Superior. 62 pp.

Hewitt, D.F., and E.B. Freeman. 1978. Rocks and Minerals of Ontario, Revised Edition. Ontario Department of Mines and Northern Affairs, GC 13, 145 pp.

Government of Canada and United States Environmental Protection Agency 1995. The Great Lakes, An Environmental Atlas and Resource Book, 3rd Edition. Toronto, Government of Canada and Chicago, U.S. Environmental Protection Agency. 46 pp. (available in reference section).

Karrow, P.F. 1991. Quarternary Geology, St. Joseph Island. Ont. Geol. Surv., Open File Rep. 5809. 81 pp. maps.

Levin, H.L. 1990. Contemporary Physical Geology. Toronto, Saunders. 623 pp.

Lutgens, F.K. and E.J. Tarbuck. 2000. Essentials of Geology. Upper Saddle River (NJ), Prentice Hall. 449 pp.

Merritts, D., A. De Wet and K. Menking. 1998. Environmental Geology. New York, W.H. Freeman. 452 pp.

Meteorological Branch, Department of Transport, Canada. 1968. Weather Ways, Ottawa, Queen's Printer. 145 pp.

Mottana, A. et al. 1977. Simon & Schuster's Guide to Rocks and Minerals. New York, Fireside Books, Simon & Schuster 607 pp.

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National Geographic Society. 1976. *Our Continent, a Natural History of North America*. Washington, National Geographic Society. 398 pp.

Press, F. and R. Siever. 2000. *Understanding Earth*. NY. W.H. Freeman. 573 pp.

Pye, E.G. 1997. *Roadside Geology of Ontario: North Shore of Lake Superior*. Ontario GEOservices Centre, ROCK ON Series 2, 164 pp.

Robertson, J.A. and K.D. Card. 1972. *Geology and Scenery, North Shore of Lake Huron Region*. Ont. Geol. Survey, Geol. Guide Book 4. 224 p.

Russell, L.S. 1965. *The Mastodon*. Royal Ontario Museum, Toronto. 16 pp.

Shrock, R.R. and W.H. Twenhofel 1953. *Principles of Invertebrate Paleontology*. New York, McGraw-Hill. 816 pp

Strickland, D. 1998. *Brent Crater Trail, History of the Crater*. Whitney (ON), Friends of Algonquin Park. 14 pp.

Symes, R.F. et. al. 1988. *Rocks & Minerals*. Toronto, Stoddard Publ. 64 pp.

Theberge, J.B. 1989. *Legacy, The Natural History of Ontario*. Toronto, McClelland & Stewart Inc. 397 pp. (available in reference section)

Thompson, I. 1997. *National Audubon Society Field Guide to North American fossils*. New York, Alfred A. Knopf. 846 pp.

Tovell, W.W. 1979. *The Niagara River*. Toronto, Royal Ontario Museum. 25 pp.

Tovell, W. M. 1992. *Guide to the Geology of the Niagara Escarpment, with Field Trips*. Niagara Falls (ON), Niagara Parks Commission. 159 pp., Field Trips a-1 to J-8 and Appendices.

Thurston, P.C. et al. (Editors) 1991. *Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 1*. 711 pp.

Thurston, P.C. et al. (Editors) 1992. *Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 2*. 1525 pp.

Verma, H. M. 1979. *Geology and Fossils, Craigeith Area, Ontario*. Ont. Geol. Survey Guidebook 7, 61 pp.

Waddington, J. 1979. *An Introduction to Ontario Fossils*. Toronto, Roy. Ont. Mus. 28 pp.

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EVALUATION PROCESS/GRADING SYSTEM:**The final grade will be determined on the basis of the following:**

Term test 1- Units 1-2:	20%
Term test 2 - Units 3-4:	20%
Term test 3 – Units 5-6	15%
Rock Identification Test:	10%
Mineral Identification Test:	10%
Presentation on Geological Feature:	5%
Field Trip Reports	10%
Attendance & Participation	<u>10%</u>
Total	100%

There will be 4 field trips to view geological formations in Algoma District and to Manitoulin Is. Attendance on field trips is mandatory. All marks for reports on these trips will be forfeited for non-attendance.

Field trips are scheduled as follows:

Oct. 14-15 – all day both days –Manitoulin Is. –overnight –bring camping gear

Oct. 20 – 11:30 AM-4:30 PM – North tour

Nov. 3 – 2:30 PM- 5:00 PM –local city tour

Nov. 17 – 11:30 AM – 4:30 PM –east tour

All reports will be discounted 10% per day late. Presentations are to be done on prescribed day or will also be discounted.

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 - 100%	4.00
A	80 - 89%	3.75
B	70 - 79%	3.00
C	60 - 69%	2.00
F (Repeat)	59% or below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field placement or non-graded subject areas.	
U	Unsatisfactory achievement in field placement or non-graded subject areas.	
X	A temporary grade. This is used in limited situations with extenuating	

