Department: CEES

Prepared by: David Franzi

Dept. Approval:
FAS/CCP Approval:

Course Number and Title:
GEL 341 Geomorphic Processes

Course Catalog Description:
The study of landforms, landscapes and their relationship to surface and internal Earth processes, underlying geological structures and the history of geological changes.

Prerequisites: GEL 101

Number of Credits: 4 credit hours

Number of Contact Hours: 6 contact hours

Objectives:

Geomorphic Processes views landforms and landscapes as the result of a balance between driving forces, such as climate, gravity and internal heat flow, and the resisting framework created by the lithology and structure of near-surface Earth materials. This approach emphasizes the relationship between process and form; underscores the linkages between geomorphology and other geologic disciplines such as tectonics, structural geology, geophysics, petrology, sedimentology, stratigraphy, cosmology and atmospheric science; and acknowledges that landscapes are palimpsests that often retain relict features that are not in equilibrium with existing conditions.

By the end of the semester student' should be able to;

- Explain the principles and main components that are common to most natural systems and…
- Apply the systems concept to any biological, chemical or physical system;
- Identify basic landforms on topographic maps, aerial images or in the field and interpret how they formed;
- Identify linkages between different geological processes and systems;
- Collect and analyze geomorphological data from topographic and geologic maps, geological cross sections of the Earth's crust and field exposures of geological materials;
- Relate natural geological processes to natural hazards (for example earthquakes, volcanoes, floods and hurricanes), and contemporary social issues such as energy and mineral resources, ground and surface water resources, pollution and global climate change;
- Make informed decisions about issues dealing with our physical environment and act to make the world a better place for everyone.

Specific Program Outcomes Supported:

Geomorphic Processes is a fundamental surface-processes course that is required in most geology programs across the country. Its subject matter helps geology majors understand how Earth systems work and how to interpret Earth history from surface deposits, landforms and landscapes. Geomorphology is also an integral part of ecosystem research. The course introduces environmental science majors to surficial processes that create the physical infrastructure or habitat templates for ecosystems.

Geomorphic Processes supports the following learning outcomes;

- Provide a fundamental understanding of Earth systems and the complexity of system responses to environmental changes (lecture, in-class discussions, out-of-class reading, laboratory exercises and projects)
- Learn current methods of geomorphological analysis (lecture, out-of-class readings and laboratory exercises and projects)
- Improve critical thinking and communication skills in the natural sciences (lecture, in-class discussions, out-of-class reading, laboratory exercises and projects, laboratory reports)
- Read with comprehension (out-of-class readings, background readings for laboratory exercises and projects)
- Improve quantitative skills (homework exercises, field and laboratory exercises and laboratory projects)
- Use technology effectively (laboratory exercises (esp. GIS) and projects)

Major Programs Supported

Required: 193 Geology BA (Environmental Geology)

Elective: 756 Geology BS; 714 Geology BA; 369 Geology BA (Earth Science); 363 Environmental Science BA; 366 Environmental Science BS; 365 Environmental Science BA (Planning & Management); 293 Ecology BS

Minor Programs Supported

Elective: 4994 Environmental Science Minor; 1914 Geology Minor; 4992 Hydrogeology Minor

General Education Outcomes Supported:

Although GEL 341 Geomorphology is not part of the SUNY Plattsburgh General Education Program, the course satisfies most of the General Education Program Objectives listed in the College catalog.

College-wide Outcomes Supported:

The subject of geomorphology and the analytical skills learned in the geomorphology course contribute directly and meaningfully to the student's ability to;

- master the core knowledge, skills and perspectives of the geology program (these are geology program goals that are supported all aspects of the geomorphology course),
- think analytically and critically and reason logically (these are geology program goals that are supported all aspects of the geomorphology course),
- hold a professional position or pursue graduate study in geology (these are geology program goals that are supported all aspects of the geomorphology course),
- continue to grow professionally and personally (these are geology program goals that are supported all aspects of the geomorphology course),

- communicate effectively in written and oral expression (accomplished primarily through homework assignments and laboratory reports),
- Access, evaluate and use information technology effectively and efficiently (accomplished primarily through homework assignments and laboratory reports),
- Recognize continuity and change in the human experience, e.g. the interdependence and interrelationships of human society and its physical environment, esp. surface processes, natural resources, and human activities (accomplished primarily through lecture),
- Acquire the capacity for self-reflection as a requirement for working independently and cooperatively (accomplished primarily through laboratory exercises and projects),
- Work effectively in group settings and assume leadership roles (accomplished primarily through laboratory exercises and projects),
- Become responsible contributing members of their professional, local, regional and global communities (these are geology program goals that are supported all aspects of the geomorphology course)

Lecture Content:

- Approaches to Geomorphology, Geomorphic Systems
- Cascading Process Systems
- Rates and Dates in Geomorphology
- Weathering, Erosion and Mass Wasting
- Tectonic Geomorphology and Geological Structures
- Mass Wasting and Hillslope Hydrology
- Drainage Basin Morphology and Hydrogeology
- Fluvial Processes
- Fluvial Landforms and Landscapes
- Glacial Processes
- Glacial Landforms and Landscapes
- Quaternary Climate Changes and Ice Ages
- Periglacial Processes and Landforms
- Coastal Processes and Landforms

Laboratory Content:

- Topographic Maps and Aerial Photographs: Projections, Scales, Coordinate Systems
- Introduction to Geographic Information Systems (GIS)
- Geological Controls on Landscapes (Map, Aerial Photograph and GIS Analysis)
    - Landscapes in Horizontal and Folded Sedimentary Strata
    - Fault-Controlled Landscapes and Volcanic Terranes
- Hillslope Hydrology, Mass Wasting and Slope Stability Modeling (computer modeling; 2 weeks)
- Watershed Delineation and Basin Analysis (Map, Aerial Photograph and GIS Analysis)
- Fluvial Hydrology–Analysis of Stream Discharge and Basin Character (Map, Aerial Photograph and GIS Analysis)
- Analysis of Drainage Networks (Map, Aerial Photograph and GIS Analysis)
- Geomorphic Classification of River Channels –or– Surficial Mapping (2-week field and mapping exercise)
- Glaciated Landscapes (Map, Aerial Photograph and GIS Analysis)
- Possible Field Trips:
    - Glacial Deposits, Landforms, and Late Quaternary Geological History of the Champlain Lowland
    - Fluvial Processes and Riverscapes in the Adirondack Mountains and Champlain Lowlands
    - Shoreline Processes and Shoreline Geomorphic Systems in Lake Champlain
    - Landslides in the Adirondack Mountains and Champlain Lowlands

Text / Selected Bibliography:

Text

- Easterbrook, D.J., 1999, *Surface Processes and Landforms–Second Edition:* Prentice-Hall, Upper Saddle River, New Jersey, 546p.

Other Readings

- Allen, P.A., 1997, *Earth Surface Processes:* Blackwell Science, Inc., Malden, MA, 404p.
- Benn, D.I., and Evans, D.J.A., 1998, *Glaciers and Glaciation:* Oxford University Press, Inc., New York, 734p.
- Bloom, A.L., 1998, *Geomorphology: A Systematic Analysis of Late Cenozoic Landforms–Third Edition:* Prentice–Hall, Upper Saddle River, NJ, 482p.
- Burbank, D.W., and Anderson, R.S., 2001, *Tectonic Geomorphology:* Blackwell Science, Inc., Malden, MA, 274p.
- Graedel, T.E., and Crutzen, P.J., 1993, Atmospheric Change–An Earth System Perspective: W.H. Freeman and Company, New York, 446p.
- Dorava, J.M., Montgomery, D.R., Palcsak, B.B., and Fitzpatrick, F.A., (eds.), 2001, *Geomorphic Processes and Riverine Habitat:* Water Science and Application 4, American Geophysical Union, Washington, D.C., 253p.
- Keller, E.A., and Pinter, N., 2002, *Active Tectonics: Earthquakes, Uplift and Landscapes–Second Edition:* Prentice-Hall, Upper Saddle River, New Jersey, 362p.
- Martinni, I.P., Brookfield, M.E., Sadura, S., 2001, *Principles of Glacial Geomorphology and Geology:* Prentice–Hall, Upper Saddle River, NJ, 381p.
- Menzies, J. (ed.), 1995, Modern Glacial Environments–Processes, Dynamics and Sediments: Glacial environments: Volume 1, Butterworth–Heinemann, LTD, Boston, MA, 621p.
- Newsome, M., 1994, *Hydrology and the River Environment:* Clarendon Press, Oxford, UK, 221p.
- Ritter, D.F., Kochel, R.C., and Miller, J.R., 2002, *Process Geomorphology–Second Edition:* McGraw–Hill Companies, New York, 560p.
- Rosgen, D., 1996, *Applied River Morphology:* Wildland Hydrology, Pasoga Springs, CO, 8-43p.
- Ruddiman, W.F., 2001, *Earth's Climate–Past and Future:* W.H. Freeman and Company, New York, 465p.
- Soliman, M.M., LaMoreaux, P.E., Memon, B.A., Assaad, B.A., and Lamoreaux, J.W., 1998, *Environmental Hydrogeology:* CRC Press LLC, Boca Raton, FL, 386p.
- Turekian, K.L., 1996, *Global Environmental Change–past, Present and Future:* Prentice-Hall, Upper Saddle River, New Jersey, 200p.
- Williams, A.A.J., Dunkerley, D.L., DeDeckker, P., Kershaw, A.P., and Stokes, T., 1993, *Quaternary Environments:* Edward Arnold, New York, 329p.