LSC Use Only Proposal No: LSC Action-Date: Ap-1/31/13	UWUCC Use Only Proposal No: 12-76b. UWUCC Action-Date: App-2/19/13 Senate Action Date: App. 3/26/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Kenneth S. Coles	Email Address kcoles@iup.edu
Proposing Department/Unit Geoscience	Phone 724-357-5626

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

- [ ] New Course
- [x] Course Revision
- [ ] Course Prefix Change
- [ ] Course Number and/or Title Change
- [ ] Course Deletion
- [ ] Catalog Description Change

Current course prefix, number and full title: GEOS 203 Surficial Processes

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

- [ ] Learning Skills
- [x] Knowledge Area
- [ ] Global and Multicultural Awareness
- [ ] Writing Across the Curriculum (W Course)
- [ ] Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)
  - [ ] Global Citizenship
  - [ ] Information Literacy
  - [ ] Oral Communication
  - [ ] Quantitative Reasoning
  - [ ] Scientific Literacy
  - [ ] Technological Literacy

3. Other Designations, as appropriate

- [ ] Honors College Course
- [ ] Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

- [ ] Catalog Description Change
- [ ] Program Revision
- [ ] Program Title Change
- [ ] New Track
- [ ] New Degree Program
- [ ] New Minor Program
- [ ] Liberal Studies Requirement Changes
- [ ] Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	Kenneth S. Coles	11/5/2012
Department Chairperson(s)	[signature]	11/12/12
College Curriculum Committee Chair	Anne Kondo	12/5/12
College Dean	[signature]	12/5/12
Director of Liberal Studies (as needed)	[signature]	2/12/13
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail Sechrist	2/19/13

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Part II. Description of Curricular Change

1. SYLLABUS OF RECORD

I. Catalog Description
GEOS 203 Surficial Processes (3c-3l-4cr)
Prerequisite: Grade of C or better in GEOS 201

Introduces students to the geological processes that shape the Earth's surface, from uplift and erosion of mountains to the transport of sediment and subsequent formation of sedimentary rocks. Focuses on the interaction of underlying tectonic forces with the natural cycles of the Earth's atmosphere and hydrosphere and the subsequent evolution of both landscape and surface deposits.

II. Course Objectives (Note: these objectives have not changed but they have been mapped to specific Expected Undergraduate Student Learning Outcomes.)

By engaging in the activities and exercises of this lab, the students will:

Objective 1:
Combine knowledge of surface processes such as uplift, erosion, subsidence and sedimentation into an understanding of how the Earth's surface is formed and shaped through time.
Expected Student Learning Outcomes 1 and 2
Informed and Empowered Learners
Rationale:
Assignments will focus on the linkages between Earth systems. Students will examine data and predict atmosphere-hydrosphere-lithosphere interactions, for example the both tectonic uplift/subsidence and climatically controlled global sea-level changes on localized sea level measurements. They are also expected to understand how this will change environments of deposition and the resulting sedimentary deposits.

Objective 2:
Demonstrate understanding of the fate of sediments, from their creation by weathering through their transport by fluvial, eolian, glacial, gravitational and tectonic processes.

Expected Student Learning Outcomes 1 and 2
Informed and Empowered Learners
Rationale:
Throughout the course, the surficial processes discussed will focus on how these processes aid in the creation of sediments (mostly through the breakdown of preexisting rock). The role these processes play in the transport and deposition of the material is also stressed as the students discuss specific environments of deposition and the subsequent sedimentary rocks that can form from these deposits.

Objective 3:
Compare and contrast the impact of different environmental factors on the composition and distribution of soils, sediments and sedimentary rocks.

Expected Student Learning Outcomes 1 and 2
Informed and Empowered Learners

Rationale:
Every surface process studied and the resulting sediment and sedimentary deposits leaves a unique fingerprint on the resulting sedimentary rocks. Through assignments looking at modern surficial processes students will apply this to investigating how sedimentary characteristics preserved in rocks can tell us about the geologic history of the material and the location.

Objective 4:
Summarize and discuss the ways in which plate tectonic forces drive surficial processes and how changes on the Earth's surface can in turn affect the course of plate tectonics.

Expected Student Learning Outcomes 1 and 2
Informed and Empowered Learners
Rationale:
Students first focus on how plate tectonics drives surficial processes, the most important being in creating a topography on which the surficial processes can act. Assignments for this will include landform evolution models over landscapes of differing tectonic settings. Additional assignments will challenge the students using data of mountain uplift and mountain erosion rates to address the role that surface processes may play in driving plate tectonics, a much more advanced and complicated understanding that is not intuitive.

Objective 5:
Recognize the impact of cycles in the Earth's orbit, atmosphere, hydrosphere and climate on the nature and outcome of surface processes.
Expected Student Learning Outcomes 1 and 2
Informed and Empowered Learners
Rationale:
The Earth is an intricate connection of many different systems functioning on different timescales. Assignments will require students to understand individual cycles and then the feedback between systems and how this controls surface processes.

III. Course Outline (See table below)

GEOS 203-A01 Surficial Processes Lecture		
Meeting	**Content**	**Theme**
1	Isostasy, introduction to geophysics	Controls on Earth's surface (3 academic hours)
2	Tectonic uplift	
3	Subsidence & basin formation	
4	Introduction to climates	Making sediments (3 academic hours)
5	Weathering - mechanical & chemical	
6	Mechanisms of erosion	
7	Transport & depositional processes - intermontane/alluvial	Terrestrial depositional systems (6 academic hours)
8	Transport & depositional environments - intermontane/alluvial	
9	Rock products - intermontane/alluvial	
10	Transport & depositional processes - fluvial/deltaic	
11	Transport & depositional environments - fluvial/deltaic	

12	Rock products - fluvial/deltaic	
13	**Exam One**	1 academic hour
14	Transport & depositional processes - carbonate banks/reefs	Marine depositional systems (5 academic hours)
15	Rock products - carbonate banks/reefs	
16	Transport & depositional processes - transitional/deep water	
17	Transport & depositional environments - transitional/deep water	
18	Rock products - transitional/deep water	
19	Sedimentary facies	Deposition through time (3 academic hours)
20	Transgression	
21	Regression	
22	Earth as a system	Earth system science (3 academic hours)
23	Lithosphere-Atmosphere coupling	
24	Lithosphere-Hydrosphere coupling	
25	Fluvial processes	Stream systems (3 academic hours)
26	Fluvial landforms	
27	Quantitative fluvial geomorphology	
28	**Exam Two**	1 academic hour
29	Ground-water flow & occurrence	Hydrosphere (5 academic hours)
30	Ground-water controlled landscapes	
31	Introduction to oceanography - global circulation patterns	
32	Introduction to oceanography – ocean chemistry	
33	Sea level change	
34	Ice ages	Global change (3 academic hours)
35	Global cycles	
36	Climate change	
37	Compaction & cementation of clastic sediments	Sedimentary rock evolution (3 academic hours)
38	Chemical sediment formation	
39	Chemical sediment diagenesis	
40	Organic chemical sediments	Energy resources (3 academic hours)
41	Fossil fuels	
42	Renewable energy resources	
FINALS	**Cumulative Lecture Final During Finals Week**	2 academic hours

GEOS 203-A02 Surficial Processes Laboratory

Lab	**Content**	**Theme**
1	Describing sediments & rocks	Basic skills development (6 academic hours)
2	Map skills	
3	Quiz 1, Intermontane/alluvial system analysis	Integrative analyses of multicomponent systems (12 academic hours)
4	Fluvial/deltaic system analysis	
5	Quiz 2, Carbonate bank/reef system analysis	
6	Transitional/deep water system analysis	
7	Quiz 3, Weekend Fieldtrip	Applications of lecture & lab concepts to actual field sites (9 academic hours)
8	Student presentations of depositional system projects	
9	Fluvial systems fieldtrip - Aultman bony pile/Young Twp Park	
10	Ground water	Hydrosphere (6 academic hours)
11	Quiz 4, Oceanography	

12	Climate change & glacial processes/deposits	Earth Systems & Resources (6 academic hours)
13	Chemical sediments, diagenesis & fossil fuels	
14	Lab Final Exam	(3 academic hours)

IV. Evaluation Methods
The final class grade will be determined from the following assessments:

Exam 1	20 %
Exam 2	20 %
Final Exam	35 %
Lab Quizzes (4)	10 % total
Lab Final Exam	8 %
Lab Project	7 %
Total	100 %

Possible points earned are distributed between lecture and lab according to the credit hour allocation for the course (3 credits for the lecture, 1 credit for the lab).

V. Example Grading Scale
The final grade will be assigned based on the semester average using the scale: 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D and below 60%=F.

VI. Attendance Policy
The attendance policy will conform to IUP's undergraduate course attendance policy.

VII. Required Textbook(s), Supplemental Books and Readings.
The required textbook for this course:
Reynolds, S.J., J.K. Johnson, M.M Kelly et al., *Exploring Geology*, Second Edition. McGraw Hill,2010.

This text will be supplemented by assigned electronic reserve readings from specialized textbooks and research articles from the primary geologic literature:
McPhee, John, 1989, *The Control of Nature:* New York, The Noonday Press, 272 p.
Piazza, Tom, 2005, *Why New Orleans Matters:* New York, HarperCollins, 167 p.
"Floating Houses," p. 120-130 from Kolbert, Elizabeth, 2006, *Field Notes from a Catastrophe:* New York, Bloomsbury Publishing, 210 p.
Haug, G. and L.D. Keigwin, How the Isthmus of Panama Put Ice in the Arctic, Oceanus, V.42,N.2, 2004.
Haug, G., R. Tiedemann, R. Zahn and A.C. Ravelo, *2001, Role of Panama uplift on oceanic freshwater balance: Geology, v. 29, p. 207–210.*

VIII. Special Resource Requirements.
There are no special resource requirements for this course.

IX. Bibliography
In addition to the required textbooks and supplemental readings from science journals, the following will be used to develop the course curriculum:

Published Resources

Bennett, M.R., and N.F. Glasser, 1996. *Glacial Geology: Ice Sheets and Landforms*. Wiley, London.

Burbank, D. W., A. E. Blythe, J. Putkonen, B. Pratt-Sitaula, E. Gabet, M. Oskin, A. Barros and T. P. Ojha, Decoupling of erosion and precipitation in the Himalayas, Nature 426, 652-655 (11 December 2003) doi: 10.1038/nature02187.

Dadson, Simon J., Niels Hovius, Hongey Chen, W. Brian Dade, Meng-Long Hsieh, Sean D. Willett, Jyr-Ching Hu, Ming-Jame Horng, Meng-Chiang Chen, Colin P. Stark, Dimitri Lague and Jiun-Chuan Lin, Links between erosion, runoff variability and seismicity in the Taiwan orogen, Nature 426, 648-651 (11 December 2003) doi: 10.1038/nature02150

Esper, J., E.R. Cook and F.H. Schweingruber, Low-frequency signals in long tree-line chronologies for reconstructing past temperature variability, *Science*, 295, 2250-2253, 2002.

Knighton, D., 1998. Fluvial Forms and Processes, Arnold, N.Y., 383 p.

Lamb, S., and P. Davis, Cenozoic climate change as a possible cause for the rise of the Andes, Nature 425, 792-797 (23 October 2003) doi: 10.1038/nature02049.

Mann, M.E., R.S. Bradley, and M.K. Hughes, Northern Hemisphere Temperatures During the Past Millennium: Inferences, Uncertainties, and Limitations, *Geophysical Research Letters*, *26*, 759-762, 1999.

Mann, M.E., P.D. Jones, Global surface temperature over the past two millennia, *Geophysical Research Letters*, 30 (15), 1820, doi: 10.1029/2003GL017814, 2003.

Orndorff, R. L., 2002, Introducing Problem Formulation And Spatial Analysis With An Example In Global Warming And Sea Level Rise: Journal of Geoscience Education, v. 50, p. 357.

Richards, K., 2004. Rivers Form and Process in Alluvial Channels: The Blackburn Press NJ, 361 p.

Trop, J.M., G.H. Krockover & K.D. Ridgway, K.D., 2000, Integration of Field Observations with Laboratory Modeling for Understanding Hydrologic Processes in an Undergraduate Earth-Science Course. Journ. Geoscience Ed. v. 48, p. 520.

Online Resources

Crabaugh, Jeff. 2005. Teaching Geoscience with Visualizations: Sedimentation Models http://serc.carleton.edu/NAGTWorkshops/visualization/collections/sedmod.html

R. Stewart. 2006, Our Ocean Planet: Oceanography in the 21st Century (online textbook): http://oceanworld.tamu.edu/resources/oceanography-book/contents2.htm

USC Stratigraphy Web Site (with animations) http://strata.geol.sc.edu/

2. SUMMARY OF PROPOSED REVISIONS

1. Objectives – the course objectives were revised from the original syllabus of record and aligned with the Expected Undergraduate Student Learning Outcomes (EUSLO) and Common Learning Objectives found in the criteria for a laboratory Natural Science course.

2. Updated text and non-textbook to more current books and also updated the bibliography

3. JUSTIFICATION/RATIONALE FOR THE REVISION

The course is a currently approved Liberal Studies Laboratory Natural Science course and is being revised to meet the new curriculum criteria for this category.

Example Assignment & Grading Rubric

Groundwater Pollution Exercise:

On a bus ride, you notice a groundwater treatment system with an air stripper tower (a method of remediating groundwater contamination) at a gas station adjacent to a lake. This indicates that there was some sort of groundwater contamination problem there, and since the lake is the reservoir for your drinking water supply, it merits further investigation.

In the 1970's, a law called the Freedom of Information Act was adopted. This allows citizens access to public records, including environmental data such as drilling logs, groundwater gauging data and groundwater sampling results. You visit your local Environmental Conservation office to have a look at the data associated with the site. The data is given to you below.

The goal of this exercise is for you to determine if this groundwater pollution problem presents a threat to the drinking water supply. You will do this by performing your own site assessment using the data provided.

You will be provided with the following data:

- site maps
- groundwater gauging data
- groundwater sampling data.

Using this data, you will be able to generate the following items (turn these in):

- groundwater contour map
- isoconcentration map.

After analyzing the data and constructing maps, you will be able to examine the spill and determine its present and future effects on the aquifer and on the lake.

Answer these questions after you have completed the maps (turn in with maps)

- What is the source of the petroleum contamination?
- What evidence did you use to locate it?
- Is the pollution a threat to the lake?
- How can you tell?

Groundwater Contour Map

1. The well gauging data provided is from October 21, 1988. The depth to groundwater was measured in nine monitoring wells. The ground elevation was surveyed at the top of each monitoring well. To find the elevation of the water table, you need to subtract the depth to groundwater from the elevation of the top of the well.

Example:

top of well elevation = 84.30 feet
-depth to groundwater = -7.02 feet
----
elev. of water table = 77.28 feet

2. Determine the water table elevation in each monitoring well.

3. Take one copy of the site map, and write in the groundwater elevations at each well (write in pen). Write in the elevation of the surface in the lake also.

4. Using PENCIL, contour the groundwater elevations using a contour interval of 0.5 feet. Label each contour line.

5. Determine the direction of groundwater flow, and draw an arrow that indicates flow direction.

Groundwater Gauging Data
Date: October 21, 1988 Performed by: Groundwater Technology, Inc.
All measurements in feet

Well	Top or Well Elevation	Depth to Groundwater	Water Table Elevation
MW-1	84.30	7.02	
MW-2	98.69	21.30	
MW-3	100.71	22.57	
MW-4	99.07	21.53	
MW-5	102.07	23.23	
MW-6	88.36	10.98	
MW-7	82.90	5.69	
DEC-10	84.43	7.20	
DEC-11	85.66	8.53	
B-1	98.25	20.82	
B-2	100.48	22.53	
LAKE	80.69	3.50	

Isoconcentration Map

1. The groundwater quality data below indicates the hydrocarbon concentration in each monitoring well measured in parts per billion.

2. Using another site map, write the hydrocarbon concentration at each well. ND means that no hydrocarbons were detected in the well.

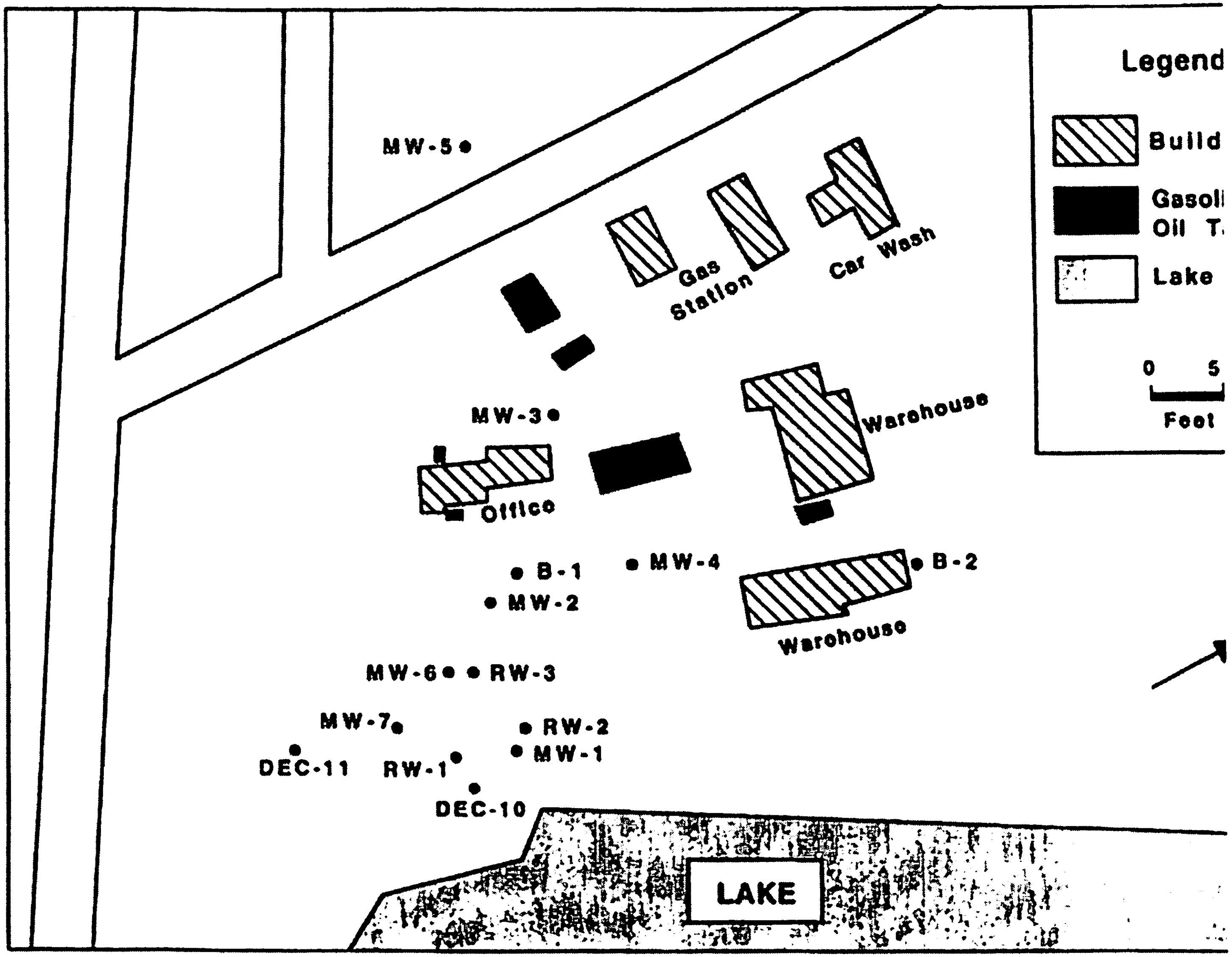
3. Contour the hydrocarbon concentrations using a 5000 ppb contour interval, starting at 1000 ppb, then 6000 ppb, and 11,000 ppb.

4. Shade each interval with colored pencils, and provide a key to the colors. Label the map"Dissolved Hydrocarbon Isoconcentration Map."

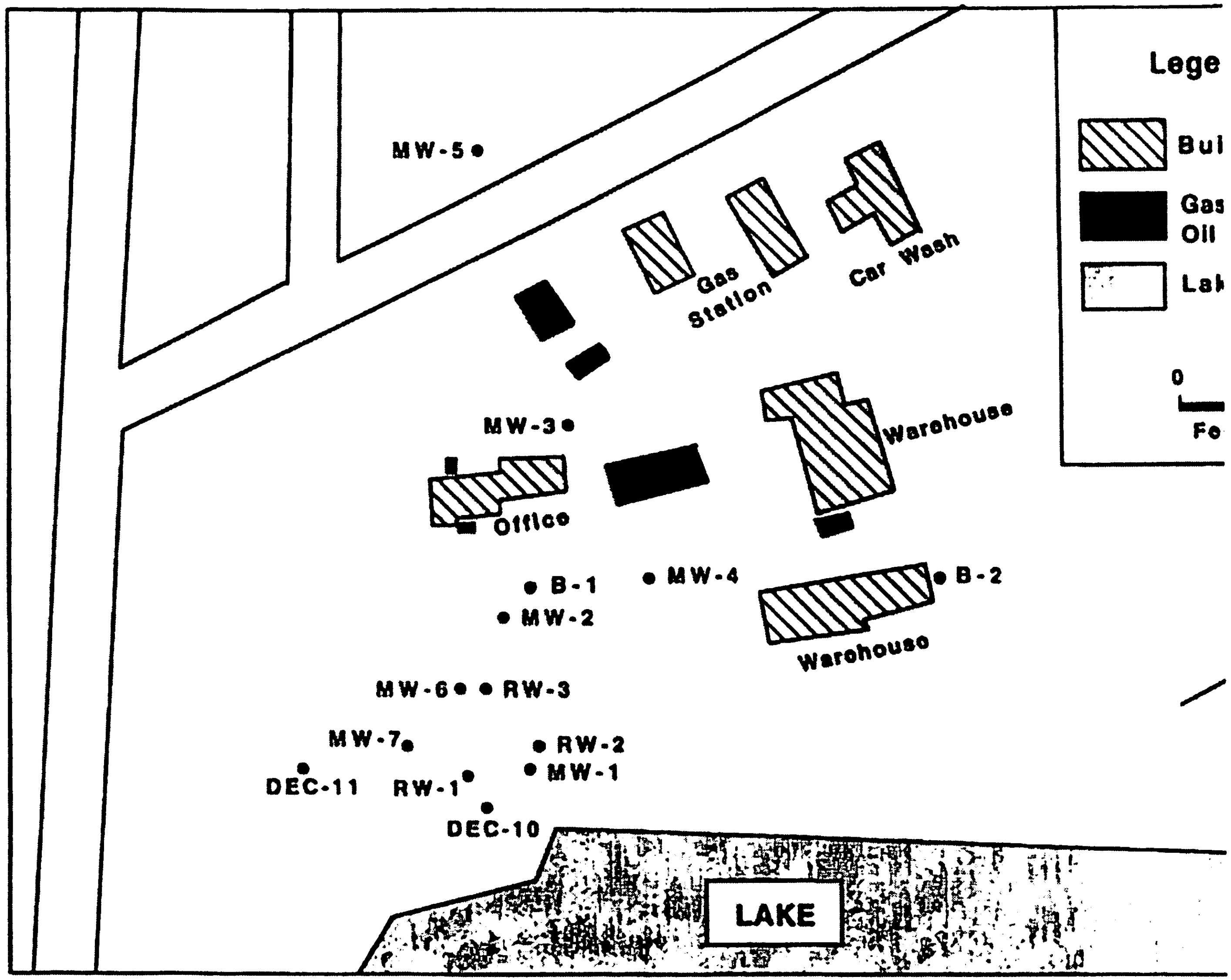
Groundwater Sampling Data
Analyzed by: Hudson Environmental Services, Inc.
Sampling Date: February 20, 1995

Well	Hydrocarbon Concentration in ppb.
MW-1	Not detected
MW-2*	8,618
MW-3	7.8
MW-4**	153.5
MW-6	15,265
MW-7	4,897
MW-8	Not detected
B-1	2,236
B-2	53.5
RW-1	777.7
RW-2	Not detected
RW-3	947
DEC-10*	36
DEC-11	Not detected
LAKE	Not detected

* A fingerprint analysis identified gasoline as the petroleum product in these wells.
** A fingerprint analysis identified fuel oil as the petroleum product in this well.



Groundwater Assessment Site Map



Groundwater Assessment Site Map

Rubric

Map 1: Contour Map of Water Table Surface

10 pts	9 pts	8 – 7 pts	6 – 5 pts	4 – 0 pts
Data is contoured at a 0.5 ft interval; follows the rules of contouring and appears to be plausible in the real world. Groundwater flow direction is indicated by an arrow and is correct.	Same as 10 pts, however not at an interval of 0.5 ft.	Data is contoured (correct interval =8pts, incorrect = 7 pts), and is plausible water table in the real world. Flow direction is indicated but is incorrect.	Data is contoured (correct interval =6pts, incorrect = 5 pts), but is not a plausible water table in the real world. Flow direction is indicated and is incorrect but consistent with contours drawn.	Significant errors in contouring, non-plausible water table surface and flow direction missing.

Map 2: Identifying pollutant plume location

10 pts	9 pts	8 – 7 pts	6 – 5 pts	4 – 0 pts
Data is contoured at a 5000 ppb interval starting with 1000 ppb; follows the rules of contouring and appears to be plausible in the real world. Plume contours are color coded and a legend is provided with the map.	Same as 10 pts, however not at an interval of 5000 ppb, or starting at the wrong concentration.	Data is contoured (correct interval =8pts, incorrect = 7 pts), and is plausible plume contour in the real world. Missing legend.	Data is contoured (correct interval =6pts, incorrect = 5 pts), but is not a plausible plume contour in the real world. Legend is missing/incorrect or illegible.	Significant errors in contouring, non-plausible plume contours and no color coding of plume concentrations.

Synthesis Questions:

5 pts	4 pts	3 pts	2 pts	1 pt
Uses correct terminology during discussion. Indicates the correct source of contamination and clearly states the evidence. Correctly identifies the potential for threat.	Indicates the correct source of contamination, but does not clearly state the evidence or uses incorrect terminology. Correctly identifies the potential for threat.	Indicates the correct source of contamination, but does not clearly state the evidence or uses incorrect terminology. Incorrectly identifies the potential for threat.	Incorrectly identifies the source of contamination and in the process does not use the correct terminology when discussing the evidence. Incorrectly identifies the potential for threat.	Incomplete answers to the questions, obvious lack of effort.

Liberal Studies Course Approval General Information

1. This course will be taught in one section by one instructor.

2. Readings taken from New York Times reporter Elizabeth Kolbert's book Field Notes from a Catastrophe: Man, Nature and Climate Change" will highlight the important contributions that this female journalist has made to conveying modern science to a broad audience (see 3 below)

3. In addition to the textbook "Exploring Geology" a number of non-textbook readings will incorporated into the course from the above-mentioned book, as well as from John McPhee's classic essay "The Control of Nature," an interesting look at the human attempt to conquer nature through engineering. Students also read a pairing of an article written for the general public and one of the original primary journal article it is based on (Haug and Keigwin, 2004; Haug et al., 2001). Other readings are often based off of surface processes making the news (landslides, hurricanes, climate change issues, floods, etc.) and would include the reading of articles from global newspapers as well as primary literature related to that topic. Some examples used in past classes include:

Wines, M., *Landslide Risk at Reservoir Cited in China*, New York Times, 4/18/2012
Gillis, J., *Rising Sea Levels Seen as Threat to Coastal U.S.*, New York Times, 3/13/2012
Domingues, C.M., J.A. Church, et al., 2008, *Improved Estimates of Upper-Ocean Warming and Multi-Decadal Sea-Level Rise*, Nature, 453, 1090 – 1093.
Fuller, T., *Thailand Flooding Cripples Hard-Drive Suppliers*, New York Times, 11/6/2011
Leier, Andrew L., Peter G. DeCelles and Jon D. Pelletier (2005), *Mountains, monsoons, and megafans*, Geology, v. 33, no. 4, pp. 289-292.

All readings are assessed on the course exams.

4. This course will draw on elements of the geosciences pertinent to understanding the interactions between the lithosphere, biosphere, hydrosphere and atmosphere. As such, the course will focus on the processes that bear on the parts of Earth that constitute the human ecosystem. The content will follow logically from that covered in GEOS 201 Foundations in Geology, which is open to GEOS majors and minors, SSED majors and minors, and ANTH, GEOG, and RGPL majors, or by instructor permission. The emphasis on processes and the resulting rock products is designed to provide a working knowledge of the Earth Sciences that will be readily transferable to a variety of academic as well as career paths, including but not limited to: agriculture, economics, anthropology, geography, safety science and history.

OLD SYLLABUS OF RECORD

I. Catalog Description:

3 class hours
3 lab hours
4 credit hours
(3c-3l-4cr)

GEOS 203 Surficial Processes

Prerequisite: Grade of C or better in GEOS 201

Introduces students to the geological processes which shape the Earth's surface, from uplift and erosion of mountains to the transport of sediment and subsequent formation of sedimentary rocks. Focuses on the interaction of underlying tectonic forces with the natural cycles of the Earth's atmosphere and hydrosphere and the subsequent evolution of both landscape and surface deposits.

II. Course Objectives

At the end of this course students will be able to:

1) Combine knowledge of surface processes such as uplift, erosion, subsidence and sedimentation into an understanding of how the Earth's surface is formed and shaped through time.
2) Demonstrate understanding of the fate of sediments, from their creation by weathering through their transport by fluvial, eolian, glacial, gravitational and tectonic processes.
3) Compare and contrast the impact of different environmental factors on the composition and distribution of soils, sediments and sedimentary rocks.
4) Summarize and discuss the ways in which plate tectonic forces drive surficial processes, and how changes on the Earth's surface can in turn affect the course of plate tectonics.
5) Recognize the impact of cycles in the Earth's orbit, atmosphere, hydrosphere and climate on the nature and outcome of surface processes.

Student outcomes assessment matrix:

Conceptual Framework (Danielson Domain)	Content Standard (NSTA Science Teacher Preparation)	Course Objective	Assessment (*denotes assessment for reporting)
1	1a	1	Exam 1, Final Exam, Lab Quiz 1
1	1a	2	***Lab Quiz 2**, Lab Quiz 3, Lab Quiz 4, Lab Final, Exam 1
1	1a	3	***Lab Project**, Lab Quiz 4, Lab Final, Exam 1, Exam 2
1	1a, 1b	4	Exam 2
1	1b	5	Final Exam

III. Course Outline

See table below.

GEOS 203-A01 Surficial Processes Lecture		
Meeting	**Content**	**Theme**
1	Isostasy, introduction to geophysics	Controls on Earth's surface
2	Tectonic uplift	

3	Subsidence & basin formation	(3 academic hours)
4	Introduction to climates	Making sediments (3 academic hours)
5	Weathering - mechanical & chemical	
6	Mechanisms of erosion	
7	Transport & depositional processes - intermontane/alluvial	Terrestrial depositional systems (6 academic hours)
8	Transport & depositional environments - intermontane/alluvial	
9	Rock products - intermontane/alluvial	
10	Transport & depositional processes - fluvial/deltaic	
11	Transport & depositional environments - fluvial/deltaic	
12	Rock products - fluvial/deltaic	
13	**Exam One (1 hr)**	
14	Transport & depositional processes - carbonate banks/reefs	Marine depositional systems (5 academic hours)
15	Rock products - carbonate banks/reefs	
16	Transport & depositional processes - transitional/deep water	
17	Transport & depositional environments - transitional/deep water	
18	Rock products - transitional/deep water	
19	Sedimentary facies	Deposition through time (3 academic hours)
20	Transgression	
21	Regression	
22	Earth as a system	Earth system science (3 academic hours)
23	Lithosphere-Atmosphere coupling	
24	Lithosphere-Hydrosphere coupling	
25	Fluvial processes	Stream systems (3 academic hours)
26	Fluvial landforms	
27	Quantitative fluvial geomorphology	
28	**Exam Two (1 hr)**	
29	Ground-water flow & occurrence	Hydrosphere (5 academic hours)
30	Ground-water controlled landscapes	
31	Introduction to oceanography - global circulation patterns	
32	Introduction to oceanography – ocean chemistry	
33	Sea level change	
34	Ice ages	Global change (3 academic hours)
35	Global cycles	
36	Climate change	
37	Compaction & cementation of clastic sediments	Sedimentary rock evolution (3 academic hours)
38	Chemical sediment formation	
39	Chemical sediment diagenesis	
40	Organic chemical sediments	Energy resources (3 academic hours)
41	Fossil fuels	
42	Renewable energy resources	
FINALS	**Cumulative Lecture Final During Finals Week**	

GEOS 203-A02 Surficial Processes Laboratory		
Lab	**Content**	**Theme**
1	Describing sediments & rocks	Basic skills development (6 academic hours)
2	Map skills	
3	Quiz 1, Intermontane/alluvial system analysis	Integrative analyses of multicomponent systems (12 academic hours)
4	Fluvial/deltaic system analysis	
5	Quiz 2, Carbonate bank/reef system analysis	
6	Transitional/deep water system analysis	
7	Quiz 3, Weekend Fieldtrip	Applications of lecture & lab concepts to actual field sites (9 academic hours)
8	Student presentations of depositional system projects	
9	Fluvial systems fieldtrip - Aultman bony pile/Young Twp Park	
10	Ground water	Hydrosphere (6 academic hours)
11	Quiz 4, Oceanography	

12	Climate change & glacial processes/deposits	Earth Systems & Resources (6 academic hours)
13	Chemical sediments, diagenesis & fossil fuels	
14	Final Exam During Final Lab Period	(3 academic hours)

IV. Evaluation Methods
The final class grade will be determined from the following assessments:

Exam 1	125 points
Exam 2	125 points
Final Exam	200 points
Lab Quizzes (4)	60 points total
Lab Final Exam	50 points
Lab Project	40 points
Total	600 points

Possible points earned are distributed between lecture and lab according to the credit hour allocation for the course (3 credits for the lecture, 1 credit for the lab). Total class points will be calculated by adding together the scores of the three lecture exams, four lab quizzes, lab project and lab final and dividing by 600 to obtain the class average for the semester.

V. Example Grading Scale
The final grade will be assigned based on the semester average using the scale: 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D and below 60%=F.

VI. Attendance Policy
The attendance policy will conform to IUP's undergraduate course attendance policy.

VII. Required Textbook(s), Supplemental Books and Readings.
The required textbook for this course:
Marshak, Steven. *Earth: Portrait of a Planet.* New York: W.H. Norton and Co., 2005.

This text will be supplemented by assigned electronic reserve readings from specialized textbooks and research articles from the primary geologic literature.

VIII. Special Resource Requirements.
There are no special resource requirements for this course.

IX. Bibliography.
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Online Resources

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R. Stewart. 2006, Our Ocean Planet: Oceanography in the 21st Century (online textbook): http://oceanworld.tamu.edu/resources/oceanography-book/contents2.htm
USC Stratigraphy Web Site (with animations) http://strata.geol.sc.edu/