LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No. 08-73	UWUCC Action-Date:	Senate Action Date:
		~~07-43s~~	App-9/30/08	App-2/24/09

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
Jonathan Lewis	**jclewis@iup.edu**
Proposing Department/Unit	Phone
Geoscience	**724-357-5624**

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

1. Course Proposals (check all that apply)

_____New Course _____Course Prefix Change _____Course Deletion

__X__Course Revision __X__Course Number and/or Title Change __X__Catalog Description Change

GEOS 325 Structural Geology	**GEOS 302 Structural Geology**
***Current** Course prefix, number and full title*	***Proposed** course prefix, number and full title, if changing*

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.

_____ This course is also proposed as an Honors College Course.

_____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

_____Catalog Description Change _____Program Revision

_____New Degree Program _____Program Title Change _____Other

_____New Minor Program _____New Track

***Current** program name*	***Proposed** program name, if changing*

4. Approvals		**Date**
Department Curriculum Committee Chair(s)		2/4/08
Department Chair(s)		2/4/08
College Curriculum Committee Chair		2-11-08
College Dean		2-11-08
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	Gail Sechrist	9/30/08

* where applicable

Received SEP 25 2008 Liberal Studies

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PART II: Description of Curricular Change

1. New Syllabus of Record

I. Catalog Description

GEOS 302 Structural Geology 3c-3l-4cr

Prerequisite: Grade of C or better in GEOS 201 and GEOS 202

Study of the geometry, kinematics and dynamics of the primary structures of the Earth's crust. Focuses on the geometric relations between geologic contacts and surface topography, the description of primary structures such as foliations, lineations, folds and fractures, the constraints on crustal motions, and the relation between stress and strain. Students are introduced to the tools of rock mechanics and spherical geometry. The laboratory includes extensive work with geologic maps and profiles, the Brunton compass, and orthographic and stereographic projections. Includes field trips which may occur on weekends.

II. Course Objectives

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

- measure the strike and dip of planar geologic features, and the trend, plunge and rake of linear geologic features using a Brunton™ compass.
- demonstrate an understanding of the geometry of the intersection between subsurface strata and topographic surfaces.
- recognize geometric versus kinematic versus dynamic characteristics of geologic structures.
- explain the main characteristics of stress in the context of geologic structures, and use the Mohr circle for stress.
- differentiate finite and infinitesimal strain in the context of geologic structures.
- interpret and construct geologic maps and structure sections.
- plot and rotate planar and linear features using stereographic projections.
- use Global Positioning Systems in the evaluation of geologic structures on local and regional scales

III. Course Outline

GEOS 302-A01 Structural Geology Lecture		
Meeting	**Content**	**Theme**
1	Introduction	Descriptive Analysis & Geometry (12 academic hours)
2	Primary structures & contacts	
3	Stereographic projections	
4	Depth & thickness analyses, folding lines	
5	Faults & fractures	
6	Fault slip vs. separation	
7	Fault recognition	
8	Faults on maps	
9	Joints vs. faults	
10	Folds	
11	Fold classification	
12	Fold superposition	
13	**Lecture Exam One (1 academic hour)**	
14	Measures of strain	Kinematic Analysis (14 academic hours)
15	The strain ellipsoid	
16	States of strain	
17	Finite vs. infinitesimal strain	
18	Pure shear vs. simple shear	
19	Equations of strain	
20	Classical fold mechanisms	
21	Buckling	
22	Homogeneous strain	
23	Fabrics and folding	
24	Transposition	
25	Deformation mechanisms	
26	Crystal defects	
27	Crystal defects II	
28	**Exam Two (1 academic hour)**	
29	Forces, tractions, stress on a plane	Dynamic Analysis (14 academic hours)
30	Stress at a point, states of stress	
31	Equations of stress, Mohr circle for stress	
32	Deviatoric and non-deviatoric stress	
33	Rock failure	
34	Rock failure II	
35	Pore pressure	
36	Stress and strain synthesis	
37	Andersonian behaviors	
38	Brittle and ductile shear zones	
39	Progressive deformation	
40	Material properties	
41	Material properties II	
42	Global tectonics	
FINAL	**Cumulative Lecture Final**	

GEOS 302-A02 Structural Geology Laboratory (3 academic hours each)		
Lab	**Content**	**Theme**
1	Sidewalk fractures; use of Brunton Compass and GPS	Descriptive Analysis & Geometry
2	Plotting lines & planes on stereographic projections	
3	Horizontal & vertical contacts	
4	Folding lines, non-vertical dipping contacts	
5	Rotations of lines & planes on stereographic projections	
6	Down-plunge projections of folds	Geometry & Kinematics
7	Subsurface mapping – isopachs, isochores, structure contours	
8	Map and fault problems	
9	Weekend fieldtrip using Brunton Compass and GPS	
10	Cross-sections	
11	Analysis of 3D data – structural domains	
12	Stress & brittle failure	Dynamic Analysis
13	Strain	
14	Final Exam	

IV. Evaluation Methods

Each component of the course will contribute to the final grade as follows:

Lecture quizzes	10%
Lecture exam 1	18%
Lecture exam 2	18%
Lecture final exam	18%
Laboratory exercises	11%
Laboratory final exam	25%

V. Example Grade Scale:

Final grades will be assigned based on the following scale: 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D, and <60%=F.

VI. Attendance Policy

Will comply with IUP policies.

VII. Required Textbook(s), Supplemental Books and Readings

The required textbook for this course is:

van der Pluijm, Ben A., and Marshak, Stephen. *Earth Structure – An Introduction to Structural Geology and Tectonics 2nd edition.* New York: W.W. Norton & Company, 2005.

VIII. Special Resource Requirements

Students will be required to have the following resources:

Hand-lens, geologic field notebook, protractor and ruler.

IX. Bibliography

Clark, I. F. and James, J. R. (2004) Using Concept Maps to Plan an Introductory Structural Geology Course, Journal of Geoscience Education, v. 52, no. 3, p. 224-230.

de Caprariis, P. P. (2004) Developing Successful Learning Strategies in Structural Geology, Journal of Geoscience Education, v. 50, no. 2, p. 145-149.

Gonzales, D. A. (2004) A Simple and Effective Tool for Teaching the Concept of Strike and Dip and the Measurement of Structural Data in the Field, Journal of Geoscience Education, v. 52, no. 3, p. 274-276.

Peacock, D. C. P. (2003) A Simple Experiment to Demonstrate Overpressured Fluids and Soft Sediment Deformation, Journal of Geoscience Education, v. 51, no. 4, p. 410-414.

Pollard, David D. and Fletcher, Raymond C. (2005) Fundamentals of Structural Geology, Cambridge University Press, 512 p.

Online Resources:

Teaching Structural Geology in the 21st Century "On the Cutting Edge" workshop resources sponsored by: the National Science Foundation, The National Association of Geoscience Teachers, Digital Library for Earth Science Education, and the Science Education Resource Center of Carleton College:
http://www.nagt.org/nagt/index.html
http://dlese.org/dds/index.jsp
http://serc.carleton.edu/NAGTWorkshops/structure/index.html

2. Summary of the Proposed Revisions

The proposed revisions include:

a) changing the course number from GEOS 325 to GEOS 302,

b) changing the credit distribution from 2c-3l-3cr to 3c-3l-4cr, and

c) changing the prerequisite from GEOS 131/132 or instructor permission to Grade of C or better in GEOS 201 and GEOS 202. Note that in the current course catalog, prerequisite of GEOS 133 is listed. This course no longer exists, thus this prerequisite is being removed from the catalog description.

3. Justification/Rationale for the Revision

The content within the discipline of Structural Geology has expanded recently in response to the development of new scientific tools. Of particular significance in this regard is the development of satellite surveying capabilities (e.g., Global Positioning System, GPS) that allow scientists to observe contemporary movements of Earth's surface. This, in conjunction with the development of new geochemical dating methods, has led to the expansion of Structural Geology to include what have become known as Neotectonics and Active Tectonics. These sub-disciplines address dynamic aspects of Earth's architecture that have implications for the human condition (e.g., earthquakes, landslides). Moreover, modern Structural Geology teaching typically includes more content on earthquake processes (from seismology) than it used to.

The revised version of GEOS 325 (to become GEOS 302) will be comparable to Structural Geology courses taught elsewhere, as indicated by the following list of courses that are likewise offered at 4 credits:

University of Massachusetts at Amherst, GEO 431 – Structural Geology
University of Michigan, GS 351 – Structural Geology
University of Vermont, GEOL 260 – Structural Geology
North Dakota State University, GEOL 457 – Structural Geology
Northern Illinois University, GEOL 333 – Dynamics and Structure of the Earth
Edinboro University of Pennsylvania, GEOS 531 – Structural Geology

4. Old Syllabus of Record

There is no available syllabus of record. The following is an old syllabus of instruction.

GS 325 Structural – Field Geology I

A. Purpose of Course:

To acquaint the student with the basic aspects of deformation structures such as folds, faults, joints, foliation and lineation, the principles involved in their origin, and study of examples in the field.

B. Basic Text(s) Used:

STRUCTURAL GEOLOGY, by M.P. Billings
ANALYSIS OF GEOLOGIC STRUCTURES, by J.M. Dennison
MANUAL OF FIELD GEOLOGY, by R.R. Compton

C. Procedure to be Employed Conducting the Course:

The course consists primarily of lecture sessions supplemented by slides, maps and outside readings. Laboratory work will involve practical application of material covered, using geologic maps and cross sections, orthographic and stereographic projections, field studies and drafting techniques.

Grade is based on the quality of written examinations and the completed assignments.

D. Scope of Course and Schedule of Course Sessions (Topics Expected to be Covered):

LECTURE

Introduction and Scope of Structural Geology
Mechanical Principles (Behavior of Rock Materials).
Primary Structures
Contacts – Conformable and unconformable
Folds – Types, systems, field study and representation
Fractures - Stress and strain Ellipsoids – Joints

EXAM I – MID TERM

Faults - terminology, classifications, recognition, effects
Thrust Faults, Normal Faults, Strike Slip Faults
Foliation
Lineation

FINAL EXAM

LABORATORY

Use of Brunton Compass and Pacing – Exercises dealing with bearings.
Strike and dip; true and apparent dip.
Primary structures.
Geologic maps and Rules of V's
Structure sections; orthographic projections
Oriented structures and stereographic projections (including joint analysis).
Field trips to Nittany Anticlinorium region – Project involving field work with sedimentary rocks, geologic maps, strike and dip, folds, joints and faults; culminates with geologic map – structure section project on the region covered by field trips (1:62,500 scale).

5. Liberal Studies checklist: Not applicable.

Part III. Letters of Support or Acknowledgment

No other departments or programs are affected by these revisions.