REQUEST FOR APPROVAL TO USE W-DESIGNATION

LSC # W1-259
Action______

COVER SHEET: Request for Approval to Use W-Designation

TYPE I. PROFESSOR COMMITMENT
(x) Professor Jonathan C. Lewis Phone 724-357-5624
(x) Writing Workshop? (If not at IUP, where? when?) Yes. May 2006, IUP
(x) Proposal for one W-course (see instructions below)
(x) Agree to forward syllabi for subsequently offered W-courses?

TYPE II. DEPARTMENT COURSE
( ) Department Contact Person ______ Phone ______
( ) Course Number/Title ______
( ) Statement concerning departmental responsibility
( ) Proposal for this W-course (see instructions below)

TYPE III. SPECIFIC COURSE AND SPECIFIC PROFESSOR(S)
( ) Professor(s) ______ Phone ______
( ) Course Number/Title ______
( ) Proposal for this W-course (see instructions below)

SIGNATURES:

Professor(s) [signature]

Department Chairperson [signature]

College Dean [signature]

Director of Liberal Studies [signature] 8-31-06

COMPONENTS OF A PROPOSAL FOR A WRITING-INTENSIVE COURSE:

I. "Writing Summary"--one or two pages explaining how writing is used in the course. First, explain any distinctive characteristics of the content or students which would help the Liberal Studies Committee understand your summary. Second, list and explain the types of writing activities; be especially careful to explain (1) what each writing activity is intended to accomplish as well as the (2) amount of writing, (3) frequency and number of assignments, and (4) whether there are opportunities for revision. If the activity is to be graded, indicate (5) evaluation standards and (6) percentage contribution to the student's final grade.

II. Copy of the course syllabus.

III. Two or three samples of assignment sheets, instructions, or criteria concerning writing that are given to students. Limit: 4 pages. (Single copies of longer items, if essential to the proposal, may be submitted to be passed among LSC members and returned to you.)

Please number all pages. Provide one copy to Liberal Studies Committee.

Before you submit: Have you double-checked your proposal against "The Liberal Studies Committee's Most Frequently Asked Questions"? Yes.

Summary Chart for Writing Assignments*

A. *Writing Assignments*					
Assignment Title	**# of Assignments**	**# of total pages**	**Graded (Yes/No)**	**Opportunity for Revision (Yes/No)**	**Written Assignment represents what % of final course grade**
Annotated outline	1	1	Yes	No	3
Minute papers	6	~3	Yes	No	8
Literature summaries	5	5	Yes	No	11
Draft proposal	1	8-12	Yes	Yes	14
Final proposal	1	8-12	Yes	No	14
Totals	**14**	**25-33**	**NA**	**NA**	**50†**

B. Examinations (Complete only if you intend to use essay exams/short answers as part of the required number of pages of writing.)			
Exams	**Approx.% of exam that is essay or short answer**	**Anticipated # of pages for essay or short answer, or approx. word count**	**Exam constitutes what % of final course grade**
1.	50	~2	11
2.	50	~2	11
3.	40	~2	14
Totals		**~6**	**36†**

***Total writing assignments should contain at least 5000 words (approximately 15-20 typed pages) in two or more separate assignments; written assignments should be a major part of the final grade—at least 50% or more.**

† The totals in these two tables sums to 86%, the remaining 14% of the course grade is related to lab activities (see attached syllabus).

Writing Summary

GEOS 362 *Plate Tectonics* is an upper division course in the Geoscience Department that is required for Geology Track Geoscience majors. This class is also a viable elective for Earth & Space Science Education majors. The prerequisites for the class include PHYS 111-112 and a minimum of 20 credit hours of geoscience coursework, thus it is typically taken by juniors and seniors. Enrollment is capped at 24 and the class is taught every other Spring.

Plate Tectonics includes a variety of writing assignments that are designed to mimic a types of writing typically done by geoscientists conducting research. These assignments are also designed to foster focused inquiry and in so doing facilitate learning. For these reasons, and because of the fundamental importance of the Plate Tectonic paradigm to virtually all subdisciplines in the geosciences, the class is well suited as a writing intensive class. The types of writing assignments included in this class are as follows:

1. Writing to stimulate thinking about key concepts. Near the completion of a minimum of six lectures the students write short, in-class "minute papers" that they are unaware are coming. These assignments require that the students explain in a few complete sentences a key concept covered in that day's lecture. Opportunities for revision are not provided.

These assignments serve several purposes. First, because they are graded on a 1-5 point scale, they provide feedback to the students on how well they are able to demonstrate in writing their grasp of fundamental concepts. Second, because I anonymously review graded examples of a few of the 4-point and 5-point responses in the following lecture, students have the opportunity to see, in detail, what constitutes a complete answer. Third, by showing more than one well-crafted response the students become aware of the fact that there are numerous ways to craft complete responses. Fourth, by judicious selection of which responses to review in class, positive feedback is provided and distributed as widely as is possible among the students.

2. Writing to enhance reading skills. As part of the development of a National Science Foundation (NSF)-style proposal, the students choose five scientific articles from peer-reviewed journals and craft one-page typed summaries of each. These summaries require that the students grapple with concepts and technical language that are new to them. Prior to this effort one entire lecture is dedicated to a group reading of a single technical paper of the sort that the students will encounter in their proposal writing. In addition, the summary-writing effort is done in a 3-hour lab session dedicated to this purpose. This enables the instructor to provide one-on-one assistance as needed. Opportunities for revision are not provided.

The literature summaries are akin to those that many scientists generate in the course of research (e.g., as notes within EndNote™ libraries), and they serve three functions in the context of the course. First they allow the students to write to themselves in a voice that is formal yet more comfortable than that required in most scientific writing. Second, because the students choose their own research topic (a tectonic boundary) from a provided list, this work allow them to focus their scientific inquiry in directions that are of interest to them. Third, by describing in a comfortable voice the key points provided by these articles, the students deepen their understanding of important concepts that they will later rework in a voice that is appropriate for an external audience of scientists. As such, the summaries serve as important "stepping stones" both in terms of understanding content and improving writing skills.

3. Writing to foster a deeper understanding of the scientific method. In creating an NSF-style proposal the students complete three writing phases that are designed to emphasize the scientific method. (Although strictly speaking item 2 above is part of this process, the purpose it serves is slightly different in the context of this writing intensive course.) An opportunity for revision of the draft proposal is provided.

The first phase is the development of an annotated outline of their proposal. This effort requires that the student adhere to NSF format and content guidelines, and forces them to consider their hypotheses and how they will test them. During this phase, the students are encouraged to consider the functional arrangement of their text by focusing on draft topic sentences. The next phase is the generation of a first draft for evaluation by the instructor. The first drafts are returned in a timely manner (e.g., within ~1 week) with extensive feedback designed to help the students in preparing a final proposal. The feedback emphasizes adherence to the NSF guidelines, appropriate framing of the overall context, clear statements of hypotheses and methodologies. The students are provided with the rubric for the evaluation of this draft when it is returned, not as part of the assignment. The final phase is the writing of the final version of the proposal. Although the rubric for the final version is likewise not provided in advance, the students are made aware that the evaluation of their final proposal places emphasis on how instructor feedback on the draft version is addressed.

4. Writing for evaluation. Although all of the above types of writing are submitted for evaluation, the essay questions on exams are the only writings that fit best in this category. On each exam at least one essay question is a variation of one of the "minute papers" used earlier in the semester (see item 1 above). Other essay questions may be based on conceptually-rich figures that have been the focus of attention during lectures, or on lecture and lab material without reference to specific illustrations. The essay questions typically require approximately 5-10 sentences to answer and each exam typically includes 4-8 such questions.

Plate Tectonics Lecture (GEOS 362)

Where: Walsh 104 (M & W), Walsh 106 (F) **When:** MW 9:15-10:15, F 2:15-5:15

Who: Dr. Jon Lewis **Email:** jclewis@iup.edu **Phone:** 724-357-5624

Office: 113 Walsh Hall **Hrs:** MW 3:30-5:00, R 10:00-12:00

Prerequisites

Physics 111-112 and a minimum of 20 credits of geoscience.

Required textbook

Readings listed below are chapter sections in the textbook *Tectonics*, 1st edition, by Eldridge M. Moores & Robert J. Twiss (W.H. Freeman & Company, New York), unless noted otherwise

Catalog Description

Introduction to formal theory of plate tectonics. Topics include magnetic anomalies, first motion studies, thermal structures of the plates, kinematics, crustal generation, sea floor spreading, collision, and subduction deformation.

Objectives

This course is designed to familiarize students with the underlying paradigm of the geosciences using the basic skills from lower division geoscience courses and by introducing them to the tools of geophysics. The course is structured to emphasize the interdisciplinary nature of geoscience including connections to the tools of allied fields such as continuum mechanics and spherical geometry.

Outcomes

At the completion of this class students will:

(1) be able to demonstrate understanding of the differences between geometry, kinematics and dynamics in the context of Plate Tectonics,

(2) be able to craft concise written summaries of scientific publications, and from these develop a scientific proposal to conduct research on a tectonic setting of their choice,

(3) be able to describe the fundamental characteristics of divergent, convergent and transcurrent plate boundaries,

(4) be able to plot lines, planes, Euler poles and earthquake focal mechanisms on stereographic projections, and

(5) display improved writing skills.

Monday & Wednesday Meetings

mtg	day	lecture topic	reading	theme
1	W18J	Introduction	1	Intro. and geophysical tools
2	M23J	Geophysical techniques	2	
3	W25J	Geophysical techniques II	2	
4	M30J	Principal tectonic features on Earth	3	Geometry, kinematics & dynamics
5	W1F	Relative plate motion & triple junctions	4.1-4.3	
6	M6F	Finite & absolute plate motion, the mantle & forces	4.4-4.7	
7	W8F	Continental rifts, young oceans, passive margins	5.1-5.4	Divergent margins
8	M13F	Oceanic crust, models of continental rifting	5.5-5.6	
9	W15F	Models of seafloor spreading, miogeoclines	5.7-5.8	
10	M20F	**EXAM #1 [40 pts]**		

11	W22F	Oceanic transforms, models	6.1-6.3	Transform & convergent margins
12	M27F	Continental transforms	6.4-6.5	
13	W1M	Continental transform motion in CA	Unruh PDF	
14	M6M	Convergent margin geography & physiography	7.1-7.3	
15	W8M	Convergent margin geophysics, structures & models	7,4-7.5	
	M13M	Spring Break, no class		
	W15M	Spring Break, no class		
16	M20M	Convergent margin geophysics, structures & models Triple junctions I	7.4-7.7 8.1-8.2	Velocity space
17	W22M	Triple junctions II	8.1-8.2	
18	M27M	Selected triple junctions	8.3-8.7	
19	**W29M**	**EXAM #2 [40 pts]**		
20	M3A	Arc-continent & arc-arc collisions	9.1-9.2	Geologic record of plate tectonics
21	W5A	Continent-continent collisions, models	9.3-9.4	
22	M10A	Foredeeps & foreland basins, fold & thrust belts	10.1-10.3	
23	W12A	Orogenic core zones	10.4-10.5	
24	M17A	Metamorphism & small-scale structures	10.6-10.7	
25	W19A	Models of orogens, Wilson Cycle, terranes	10.8-10.11	
26	M24A	Direct measurement of plate motions	11.1-11.3	Neotectonics and active tectonics
27	W26A	Tectonic geomorphology	11.4-11.5	
28	M1M	Active tectonics of the western U.S.		
	W10M	**FINAL EXAM 12:30-2:30 [50 pts]**		

Friday Meetings (2:15 – 5:15 pm)

date	**activities**	**Preparation**
Jan 20	Discovering plate boundaries	
Jan 27	Earthquakes	
Feb 3	Copies of 5 references due at start of lab [10 pts] Earthquakes II & divergent motion	Bring 5 references
Feb 10	Literature Summaries due at start of lab [25 pts] Plate kinematics	Summaries due
Feb 17	Plate kinematics II	

Feb 24	Proposal annotated outline due at start of lab [12 pts] 3-plate problems, spherical geometry	Annotated outline due
Mar 3	Spherical geometry II	
Mar 10	Draft proposal due at start of lab [50 pts] Spherical geometry III and faults	Draft proposal due
Mar 17	Spring Break - No Lab	
Mar 24	Draft proposals returned with comments Earthquake focal mechanisms	
Mar 31	Earthquake focal mechanisms II	
Apr 7	Final proposals due at start of lab [50 pts] Instantaneous linear velocity	Final proposal due
Apr 14	Active tectonics	
Apr 21	Student presentations	
Apr 28	Student presentations	

Evaluation Methods

Final grades will be based on a total of 360 possible points distributed by percentage as follows:
36% exams (half of which will be essay questions)
7% lab contribution
7% lab presentation
8% unannounced, in-class writing assignments ("minute papers")
42% scientific proposal (including literature summaries, annotated outline, draft proposal, and final proposal)

Course Grading

Grades will be assigned using ranges no narrower than 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D and below 60%=F.

Attendance Policy

Attendance is required and you will find that it is necessary in order to excel in the class. In the event of an absence, it is your responsibility to find out what you missed and to make up any missed work. If you miss an assignment or exam for a legitimate reason you must contact the professor <u>within</u> 24 hours to schedule a makeup, otherwise you forfeit your opportunity for a makeup. All requests for makeup work must be accompanied by appropriate documentation and will only be possible (1) in cases where the work was missed for legitimate reasons such as a <u>verifiable</u> family emergency, a <u>verifiable</u> illness, or a <u>verifiable</u> university-sponsored event, and (2) if you have appropriate documentation regarding the legitimate reason.

Sample Writing Assignments

1. Minute papers
   - Explain in a few complete sentences the geometry and kinematics of mid-ocean ridges and fracture zones. Include a description of how the actual kinematics might be described as surprising.
   - Briefly explain what unroofing sequences are and why they are helpful in understanding plate tectonics.
   - Episodic Tremor and Slip (ETS) at Cascadia is marked by apparent discontinuities in distance versus time plots (i.e., GPS time series). In detail ETS occurs over several days, thus the plots are essentially continuous and reflect a short-lived change in direction and speed. Briefly explain in a few complete sentences the nature of GPS time-series plots in the case of an earthquake.
2. Exam essay questions
   - Using your understanding of how underplating occurs at a subduction zone, explain how the position of the décollement zone changes in order for subduction erosion to occur.
   - Breccias are sedimentary or volcano-clastic deposits that record very little transport from their source areas. Explain why we sometimes find breccias in the parts of exhumed ophiolites that we interpret as fossil transform fault zones. Pay particular attention to the factors that favor the deposition of breccias in such settings.
   - Explain the differences between a GPS time-series plot that records an episodic tremor and slip "event" versus an earthquake.
   - Explain why passive (Atlantic-style) margins are characterized by profound unconformities with continental sediments (including evaporites in some cases) and/or shallow-water marine sediments on top of older crystalline basement rocks.
3. NSF-style proposal

GEOS 362 *Plate Tectonics*
NSF-style Proposal Assignment
(examples & NSF guidance documents to be provided later)

A significant proportion of the writing in this course will be related to an NSF-style proposal to study one of the plate boundaries listed below using one or more of the research tools also listed below. The process of preparing this proposal will be akin to that used by many researchers and it will require focused effort throughout the semester. The deliverables that will be evaluated in this effort include (1) five 1-page summaries of key articles relevant to your proposal, (2) an annotated outline of your proposal, (3) a first draft proposal, and (4) a final proposal. The timeline for this effort will be strictly enforced by means of penalties for late submissions. Note that these deliverables are due at the start of Friday labs, so if you arrive late without a legitimate excuse, points will be deducted. Penalties will amount to 5% of the total value of the assignment for the first minute late, and an additional 10% for each 24-hour period thereafter. This approach is used for two reasons: (1) so that lab sessions will not be co-opted for working on late deliverables, and (2) to ensure that the proposal-writing effort stays focused. Attached you will find an example of an article summary. Additional examples and guidelines (e.g., from NSF) will be provided well in advance of the deadlines indicated below.

<u>Deadline #1</u> Wed 25 Jan [5 pts] Topic

Decide on a topic from the list below based on discussions with me and/or some literature searches. Through interlibrary loan our library is able to provide you with just about ANY publication you find in GeoRef that you think will be helpful. You must get started early on deciding on your paper topic so that you can have the necessary publications delivered to you in a timely manner.

<u>Deadline #2</u> Fri 3 Feb [10 pts] Five references

Bring a minimum of five published papers with you to work on. During lab you will work on writing one-page summaries of the key points of each of the papers. Each appropriate paper earns you 2 pts for a total maximum of 10 pts. Points will be deducted for selecting papers that are not appropriate for your project so please consult with me as you assemble your references.

<u>Deadline #3</u> Fri 10 Feb [25 pts] Five article summaries

For each of your selected references you will turn in a one page summary of the article using a format akin to that of the attached example. You only need to do this for five of your references, although I expect you will probably have more papers by the time the semester is over.

<u>Deadline #4</u> Fri 24 Feb [12 pts] Annotated outline

In order to help you organize your proposal you will develop a simple annotated outline. The outline should be essentially a skeleton of the final proposal with each paragraph or section serving a particular function, such as stating the problem to be solved or explaining the broader impact of your proposed work beyond the scientific goals. It can be helpful to think of the annotations as topic sentences.

<u>Deadline #5</u> Fri 10 Mar [50 pts] Draft proposal

You should prepare this draft of your proposal with care, perhaps as if you were submitting it to a peer or supervisor for comments prior to final submission. A well-crafted first draft will generally require considerably less editing before final submission than a poorly crafted draft.

<u>Deadline #6</u> Fri 7 Apr [50 pts] Final proposal

Your final proposal will be evaluated to a large extent on how well you have addressed the review comments provided on your first draft.

Plate boundaries
Woodlark Basin divergent boundary (east of Papua New Guinea)
Cascadia subduction zone
Sumatra subduction zone
Nazca-South America subduction zone
Middle America subduction zone

Mantle hot spot fixity (Hawaii and others)
East Pacific Rise (divergent boundary)
Galapagos (hot spot and divergent boundary)
Denali fault zone (transcurrent boundary)
San Andreas fault (transcurrent boundary)
Mariana subduction zone
Nankai subduction zone
Iceland (hot spot and divergent boundary)
eastern Caribbean subduction zone
Taiwan (arc-continent collision)
Red Sea divergent boundary

Primary tools
isotopic dating
bathymetry
sedimentation rates
paleothermometry
paleobarometry
tectonic geomorphology
topography
inverse modeling
forward modeling
analog modeling
earthquake locations
earthquake focal mechanisms
seismic reflection
seismic refraction
geodesy (GPS)
LIDAR
InSAR
petrologic modeling
sediment provenance
meteorology
paleoseismology (trenching & dating)

Example Article Summary

Citation: Corti, G., E. Carminati, F. Mazzarini and M. O. Garcia (2005) Active strike-slip faulting in El Salvadorre, Central America, Geology, v. 33, no. 12, p. 989-992.

Prepared by: J. C. Lewis 01/02/2006

This paper provides constraints on the kinematics, current activity and segmentation of the El Salvador fault system, a proposed fault system thought to accommodate eastward transcurrent motion of the El Salvador forearc crust. These constraints are important, in part, because this fault system is very seismically active and thus represents a major geologic hazard to the region. Prior to the work of these authors, the existence of this crustal boundary was based on plate kinematic (e.g., DeMets, 2001, GRL) and seismologic (e.g., Carr & Strober, 1977, GSAB; White & Harlow, 1993, BSSA; Dewey et al., 2004, GSA Sp. Paper 375) arguments.

The new constraints provided by this paper consist of fault kinematic data for a total of 35 lineated faults, air photo interpretation of drainage patterns and fault-scarp height measurements. The fault data were inverse modeled for stress geometry using Carey's (1979, Rev. Geol. Dynam. et de Geograph. Phys., in French) method. Most of the air photo interpretation relies on simple tectonic geomorphologic observations and mapping of surficial geologic units. In total, these constraints are quite convincing when viewed within the tectonic context provided by earlier workers and summarized nicely in this paper. They conclude that their observations support earlier estimates that the El Salvador forearc is moving ~11mm/yr by strike-slip motion localized on the El Salvador fault zone (DeMets, 2001, GRL). They do not see evidence for compressional strain associated with Cocos-Caribbean relative motion and this also supports the notion of forearc sliver transport.