Program Approval Form

For approval of new programs and deletions or modifications to an existing program.

Action Requested:

- [ ] Create New (SCHEV approval required except for minors and certificates)
- [ ] Delete Existing
- [X] Modify Existing (check all that apply)
  - [ ] Title (SCHEV approval required except for minors, certificates)
  - [ ] **Concentration** (Choose one): [ ] *Add* [ ] *Delete* [ ] *Modify*
  - [X] Degree Requirements
  - [ ] Admission Standards
  - [ ] Application Requirements
  - [ ] Other Changes: _____

Type (Check one):

- [ ] B.A. [ ] B.S. [ ] Minor
- [ ] Undergraduate Certificate
- [ ] M.A. [ ] M.S. [ ] M.Ed.
- [X] Ph.D. [ ] Graduate Certificate
- [ ] Other: _____

College/School:	College of Science	**Department:**	Geography and Geoinformation Science		
Submitted by:	Timothy Leslie	**Ext:**	3-4336	**Email:**	tleslie@gmu.edu

Effective Term: Fall 2013

Please note: For students to be admitted to a new degree, minor, certificate or concentration, the program must be fully approved, entered into Banner, and published in the University Catalog.

Justification: (attach separate document if necessary)

See Attached

	Existing	New/Modified
Program Title: (Required) Title must identify subject matter. Do not include name of college/school/dept.	Earth Systems and Geoinformation Sciences	
Concentration(s):		
Admissions Standards / Application Requirements: (Required only if different from those listed in the University Catalog)		
Degree Requirements: Consult University Catalog for models, attach separate document if necessary using track changes for modifications		See Attached
Courses offered via distance: (if applicable)		
TOTAL CREDITS REQUIRED:		

Approval Signatures

Department	Date	College/School	Date	Provost's Office *Interdisciplinary Council Use Only*	Date

If this program may impact another unit or is in collaboration with another unit at Mason, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Programs Only

Graduate Council Member	Provost Office	Graduate Council Approval Date

For Registrar Office's Use Only: Received_____Banner_____Catalog_____

revised 5/5/10

Proposed Program Modifications for ESGS PhD
Fall 2013

Overall: As a PhD program, our curriculum has been somewhat diffuse and difficult to understand. We seek to simplify our degree by providing flexibility and greater direction in our core as well as pruning the emphasis areas that have become cumbersome. At the end of this modification, the degree will have more core areas, a similar level of depth, and more choices. In addition, we are reducing the number of pre-defense dissertation credits required in case students need additional coursework. Finally, students have expressed an interest in a number of our research synthesis courses, and we seek to incorporate these into their degree program.

Proposed Modifications:

1) **Modify** core to require **five out of six** core categories, and **two courses in three** of those five choices.
   Rationale: This is a change intended to permit our students to participate in the breadth of our core, without being forced into courses that do not fit in their program of study. We want students to attain a measure of depth and require they take a second course in three of the cores.

2) **Modify** Computational-Quantitative to be the Quantitative Core, requiring **one** of GGS 560, 754, or 791
   Rationale: We have removed the outside-of-department requirements in order to focus on spatially based curriculum that forms the basis of our department.

3) **Modify** Geosciences-Geography to be the Geosciences and Physical Geography Core, requiring **one** of GGS 656, GGS 657, GGS 670, GGS 721, PHYS 575
   Rationale: GGS 704 (Spatial Analysis and Modeling of Population) doesn't really fit in this set of environmentally based courses. For the other courses we have removed the non-GGS cross lists so that we can potentially take ownership of these courses with our own instructors, however at this time we wish to maintain the integration with other departments.

4) **Split** Geoinformation Sciences Core into a Geographic Information Science Core and a Remote Sensing Core
   Rationale: Combining these two was done so that each core group would have six credits in the original PhD proposal. We see these as two separate areas, and wish to properly distinguish them.

5) **Modify** Geographic Information Science Core to require remove GGS 653
   Rationale: GGS 653 is the third course in the sequence (GGS 553, 563, 653). Since we only need two courses in a single core, a third course is extraneous as a core listing.

6) **Modify** Remote Sensing Core to also include GGS 760 and GGS 777
   Rationale: We want out students to be able to also take more advanced remote sensing courses to complete this requirement.

7) **Create** a Geoinformatics Core composed of GGS 650, 664, 675, and GGS 787.
   Rationale: This is a growing aspect of our department with a set of knowledge that we believe merits inclusion for our students in the base of understanding.

8) **Create** a Human Geography Core composed of GGS 505, 525, 533, 540, 605, and 704.
   Rationale: This is longstanding and well-developed aspect of our department with a set of knowledge that we believe merits inclusion for our students in the base of understanding.

9) **Remove** Emphasis Areas from the degree.
   Rationale: These areas are restricting for our students, and force students into tracks that are not necessarily appropriate or line up with their research interests. As graduate students seeking a terminal degree, we trust students (with their advisors) to properly determine their own decisions regarding curricular specialization.

10) **Modify** Dissertation Research requirement to require 12-24 credits.
    Rationale: While we wish to maintain the 12 credits of research necessary after the defense of the proposal, we find that many students would make better use of these credits in additional coursework rather than dissertation proposal time. We seek to provide the flexibility in the degree to allow students to take up to four additional courses, while also explicitly providing an alternate path for students to focus more on their dissertation proposal.

- *This proposed modification matches the dissertation requirement in the ESP PhD.*

11) **Modify** Elective Course Credit Requirement to be 19-32 as necessary to bring total credits to 72.
    Rationale: Since several groupings now have variable credit numbers because of different credit counts in courses, this requirement should be flexible.

12) **Add** Requirement that at least half of the elective credits taken at GMU must be GGS credits.
    Rationale: While we support students taking courses in other disciplines, we believe a degree from our department should be rooted in our courses.

- *This proposed modification is intended in the vein of the ESP PhD's 'Course Work Focus' requirement.*

13) **Modify** seminar requirement to take two instances of GGS 900.
    Rationale: We are reducing this requirement as a measure to encourage students to incorporate synthesis into their study program (see next requirement).

14) **Create** Research Synthesis requirement to take one of GGS 684, 689, 792, or 795
    Rationale: We have a number of colloquium and seminar-based courses in the department, and desire students to be able to take different foci rather than just the standard colloquium course.

Expected Implications / Potential Repercussions

1. Reduced cross-over activity with CSI department.
    a. The CSI department has changed substantially over the past few years, and our interaction with them has reduced.
2. Increased load in GGS 664, 675, and 787. 664 and 787 are already taught regularly. 675 is new.
3. Increased load in GGS 505, 525, 533, 540, 581, and 605.
    a. These courses are irregularly offered because of variable enrollment, and will likely be better subscribed. In addition, we anticipate substituting in relevant courses from omnibus options that are offered every semester.
4. Potential decrease in participation in cross-listed courses if students substantially avoid earth science core.
5. Increased participation in GGS 684, 689, 792, and 795, with somewhat fewer students in GGS 900.
    a. The reduced requirement for 900 will permit us to offer the GGS 900 course annually rather than every semester. Participation in the research synthesis courses will benefit the PhD population.

Current ESGS PhD Core

Core: (18 credits)

Computational-Quantitative Core (6 cred)
CSI 600 (Quantitative Foundations for Computational Sciences)
CSI 700 (Numerical Methods)
CSI 703 (Scientific and Statistical Visualization)
CSI 710 (Scientific Databases)
GGS 754 (Earth Science Data and Advanced Data Analysis)
GGS 791 (Advanced Spatial Statistics)
GGS 560 (Quantitative Methods)

Geosciences-Geography Core (6 credits)
GGS 704 (Spatial Analysis and Modeling of Population)
GGS 721 (Biogeography)
GGS 657 OR GEOL 601 (The Lithosphere)
CSI 655 (Atmospheric Physics I) OR GGS 670 (Intro to Atmosphere and Weather)
GGS 656 OR EVPP 652 (The Hydrosphere) OR GGS 725 (Advanced Hydrosphere)

Geoinformation Sciences Core
Choose one course from the GIS group:
GGS 553 (Geographic Information System)
GGS 563 (Advanced Geographic Information Systems)
GGS 653 (Geographic Information Analysis)
GGS 671 (Algorithms and Modeling in GIS)

One course from the Remote Sensing group:
GGS 579 (Remote Sensing)
GGS 680 (Earth Image Processing)
GGS 756 (Physical Principles of Remote Sensing)

ESGS PhD Core
After Proposed Modifications

Core: (24 credits)
1 course in 5 of the following 6 groups
2 courses in 3 of those 5 choices

Quantitative Core
GGS 560
GGS 754
GGS 791

***New** Geoinformatics Core*
GGS 650 (Introduction to GIS Algorithms and Programming)
GGS 664 (Spatial Data Structures)
GGS 675 (Location Science)
GGS 787 (Scientific Data Mining for Geoinformatics)

Geosciences and Physical Geography Core
GGS 656 (Hydrosphere) – CL: EVPP 652
GGS 657 (Lithosphere) – CL: GEOL 601
GGS 670 (Intro to Atmosphere and Weather)
GGS 721 (Biogeography)
PHYS 575 (Atmospheric Physics I)

***New** Human Geography Core*
GGS 505 (Transportation Geography)
GGS 525 (Economics of Human / Env Interact)
GGS 533 (Issues in Regional Geography)
GGS 540 (Medical Geography)
GGS 605 (Socioeconomic Applications of GIS)
GGS 704

Geographic Information Science Core
GGS 553
GGS 563
GGS 671

Remote Sensing Core
GGS 579
GGS 680
GGS 756
GGS 760 (Advanced Topics in Remote Sensing)
GGS 777 (Remote Sensing of Natural Hazards)

Other ESGS PhD Requirements Current	**Other ESGS PhD Requirements** *After Proposed Modifications*
Emphasis Area (6 credits)	Research Synthesis (2-3 credits) GGS 684 (Selected Topics in Geospatial Intelligence) GGS 689 (Seminar in Geographic Thought and Methodology) GGS 792 (Seminar in Earth Systems Science) GGS 795 (Seminar in Regional Analysis)
Seminar (3 credits)	Seminar (2 credits)
Dissertation & Proposal (24 credits, with at least 12 credits in GGS 999)	Dissertation & Proposal (12-24 credits, with at least 12 credits in GGS 999)
Electives (21 credits)	Electives (19-32 credits)
Total: 72 credits	Total: 72 credits