Course Approval Form

For approval of new courses and deletions or modifications to an existing course.

registrar.gmu.edu/facultystaff/curriculum

Action Requested:

- [ ] Create new course
- [ ] Delete existing course
- [X] Modify existing course (check all that apply)
  - [X] Title
  - [ ] Credits
  - [ ] Repeat Status
  - [ ] Grade Type
  - [ ] Prereq/coreq
  - [ ] Schedule Type
  - [ ] Restrictions
  - [ ] Other:

Course Level:

- [ ] Undergraduate
- [X] Graduate

College/School: Science
Department: GGS
Submitted by: Chaowei Yang
Ext: 3-4742
Email: cyang3@gmu.edu

Subject Code: GGS
Number: 772
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term:

- [X] Fall
- [ ] Spring
- [ ] Summer

Year 2014

Title:
Current: Distributed GIS
Banner (30 characters max including spaces): Cloud GIS
New: Cloud GIS

Credits: (check one)

- [x] Fixed 3
- [ ] Variable to

Repeat Status: (check one)

- [x] Not Repeatable (NR)
- [ ] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)

Maximum credits allowed:

Grade Mode: (check one)

- [x] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type Code(s): (check all that apply)

- [x] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s):
GGS 650 Introduction to Programming and GIS Algorithms

Corequisite(s):

Instructional Mode:

- [x] 100% face-to-face
- [ ] Hybrid: ≤ 50% electronically delivered
- [ ] 100% electronically delivered

Special Instructions: (list restrictions for major, college, or degree;hard-coding; etc.)

Are there equivalent course(s)?

- [ ] Yes
- [x] No

If yes, please list

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)

Indicate number of contact hours: Hours of Lecture or Seminar per week: ____ Hours of Lab or Studio: ____

When Offered: (check all that apply) [ ] Fall [ ] Summer [ ] Spring

Approval Signatures

Department Approval Date

College/School Approval Date

If this course includes subject matter currently dealt with by any other units, 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 Courses Only

Graduate Council Member

Provost Office

Graduate Council Approval Date

For Registrar Office's Use Only: Banner_____Catalog_____

revised 2/2/10

Course Change Proposal to be Submitted to the Curriculum Committee of the College of Science

1. COURSE NUMBER AND TITLE:

GGS 772 – Distributed GIS **to** GGS 772 – Cloud GIS

2. COURSE DESCRIPTION:

This course is to introduce the latest advancement in cloud computing and GIS in the direction of distributed and cloud arena to better prepare our graduate students for the job market.

3. CHANGE JUSTIFICATION:

The Distributed GIS course was developed in 2003 and has been evolving in the past decade. This name change is to reflect the course content update and also to provide a book as text for the course.

Required Text: Yang C., Huang Q., Li Z., Xu C., Liu K., 2013, *Spatial Cloud Computing: A Practical Approach,* CRC Press/Taylor & Francis, 304p. ISBN: 978-1466593169.

Approvals:

- 9/25/14: Approved by the departmental curriculum committee
- 10/14/14: Approved at GGS department meeting

Appendix Course Syllabus

This course is to introduce comprehensively the knowledge of cloud computing and GIS to our graduate students through practical examples in 14 lectures chapters from five aspects including a) what are the essential cloud computing concepts and why GIScience need cloud computing? b) how to migrate simple GIS applications to cloud computing? c) how to cloud-enable complex GIS applications? d) how to test if a cloud service is ready to support GIS applications? and e) what are the research issues and needs for further investigation?

- Lectures 1 and 2 introduce the GIScience requirements for cloud computing, summarizes the architecture, characteristics and concepts of cloud computing, and discusses the enabling technologies of cloud computing.
- Lectures 3, 4, and 5 introduce the general procedures and considerations when migrating GIS applications onto cloud services. Lecture 3 introduces how to use cloud services through deploying a simple GIS application onto two popular cloud services: Amazon EC2 and Microsoft Azure. Lecture 4 introduces the common procedures for deploying general GIS applications onto cloud platforms with needs of server-side scripting, database configuration, and high performance computing. Lecture 5 discusses how to choose cloud services for GIS applications based on the general cloud computing measurement criteria and cloud computing cost models.
- Lectures 6, 7, 8 introduce how to deploy different GIS applications onto cloud services. Lecture 6 introduces how users interact with cloud services using ArcGIS in the cloud as an example. The other two lectures demonstrate how to cloud-enable three different complex GIS applications: 1) cloud-enabling databases, spatial index, and spatial web portal technologies to support GEOSS Clearinghouse, 2) cloud-enabling standalone model simulations for Climate@Home, and 3) leveraging elastic cloud resources to support disruptive event (e.g., dust storm) forecasting.
- Lecture 9, 10, 11 and 12 examine the readiness of cloud computing to support GIS applications using open source cloud software solutions and commercial cloud services. Lecture 9 introduces and compares three commercial cloud services: Amazon EC2, Microsoft Azure, and Nebula. In Lecture 10, readiness of these three cloud services are tested with the three GIS applications described in Part 3. Lecture 11 introduces four major cloud computing open-source solutions including CloudStack, Eucalyptus, Nimbus and OpenNebula; their performance and readiness are tested and compared. Lecture 12 presents the background, architecture design, approach and coordination of GeoCloud, which is a cross-agency initiative to define common operating system and software suites for GIS applications.
- Finally Lectures 13 and 14 review the future research and developments for cloud computing and GIS. Lecture 13 introduces data, computation, concurrency, and spatiotemporal intensities of GISciences and how cloud service can be leveraged to solve the challenges. Lecture 14 introduces the research directions from the aspects of technology, vision and social dimensions.