Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).
See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Department of Geology and Geophysics	College/School	College of Natural Science and Mathematics (CNSM)
Prepared by	Anupma Prakash	Phone	Extn 1897
Email Contact	prakash@gi.alaska.edu	Faculty Contact	Anupma Prakash

1. ACTION DESIRED (CHECK ONE): Trial Course [ ]   New Course [X]

2. COURSE IDENTIFICATION: Dept: GEOS   Course #: 222   No. of Credits: 3

Justify upper/lower division status & number of credits:
This course will introduce fundamentals of geospatial sciences (remote sensing, geographic information systems (GIS) and global positioning systems (GPS)) at the basic level. It is targeted for students wanting to pursue advanced courses in this area. Material (lectures and labs) are therefore targeted at a 200 level. The class meets twice a week with 1hr 15 mins of lecture time followed by a 45 minute lab that includes hands-on training. Lectures and the corresponding lab sessions are related to each other and are integral to the course. This contact time allocation satisfies the UAF established requirements for 3 credits.

3. PROPOSED COURSE TITLE: Fundamentals of Geospatial Sciences

4. To be CROSS LISTED? YES/NO YES   If yes, Dept: GEOG   Course #: 222
(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. To be STACKED? YES/NO No   If yes, Dept.:   Course #:

6. FREQUENCY OF OFFERING: Every Fall
Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved) Fall 2012

8. COURSE FORMAT:
NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check all that apply)	1	2	3	4	5	X 6 weeks to full semester

OTHER FORMAT (specify)	

Mode of delivery (specify lecture, field trips, labs, etc)	75 mins of lecture followed by 45 mins of lab meeting twice a week for the whole semester

9. CONTACT HOURS PER WEEK:	2.5	LECTURE hours/weeks	1.5	LAB hours /week		PRACTICUM hours /week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty/cd/credits.html for more information on number of credits.

OTHER HOURS (specify type)	Students will spend additional time in completing homework assignments. This non-contact time will vary by students.

10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

GEOS 222: Fundamentals of Geospatial Sciences
3 Credits
Offered Fall

This course is an introduction to the principles and applications of geospatial science (remote sensing, GIS and GPS). Fundamental concepts include electromagnetic radiations, map projections, basic computer science, data formats, map-reading and map-making, etc. Practical exercises include field data collection using GPS, photo-interpretation, using image processing and GIS software packages. Prerequisites: GEOG 111 or GEOS 101 or permission of instructor. (2.5+1.5)

11. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core?	YES		NO	X

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6		W = Writing Intensive, Format 7		Natural Science, Format 8	

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	YES		NO	X

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	

How many times may the course be repeated for credit?		TIMES

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?		CREDITS

13. GRADING SYSTEM: Specify only one.

LETTER:	X	PASS/FAIL:	

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	GEOG 111 or GEOS 101 or permission of instructor.

These will be *required* before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS	None

16. PROPOSED COURSE FEES	None

Has a memo been submitted through your dean to the Provost & VCAS for fee approval? Yes/No	

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? Yes/No	No

If yes, give semester, year, course #, etc.:	

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

Teaching this course will require a classroom that is suited for offering a lecture directly followed by a lab. The lab component will require that there are computer systems installed with freeware and some commercial software packages (ESRI's ArcGIS) for data processing. The WRRB 004 lab managed by the GINA facility is ideally suited for this and we have coordinated with GINA to ensure that this lab would be available. The computer systems in the GINA lab are already installed with ArcGIS licenses for other course offerings, and so there are no additional costs to run this class.

Offering this course will have some impacts on faculty and staff who are involved with teaching it who will have to make some changes to their current workload distribution. Course instructors and their respective unit heads (dept chairs, deans, and director) are cognizant of this, encourage and support this course offering, and are onboard to accommodate the workload adjustments required to offer this class. These workload adjustments have been possible because of new faculty hires and associated curricula changes in both related departments.

Geos /Geog 222 is now also added as a pre-requisite to some of the existing 300 and 400 level course in the Department of Geology and Geophysics and in the Geography Department, specifically GEOS 422; GEOS 458/658; GEOG 309; and GEOG 339. Paperwork for these minor changes is also being submitted in parallel by both departments.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No	X	Yes		
				We have not contacted the library collection development officer specifically for this course. Elements in this course are basics of remote sensing, GIS, GPS, mapping, and visualization. These are topics that the instructors have been covering at advanced levels in their other courses at UAF. Both the Rasmuson library and the Keith Mather Library are more than adequately stocked with reading

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

Both the Department of Geology and Geophysics and the UA Geography Program will affected by this proposed action.

This course has been developed after extensive consultation, collaboration and focused meetings between the faculty and leadership in both departments (viz. Cary de Wit; Patricia Heiser; Dave Verbyla; Keith Cunningham; Don Atwood; Anupma Prakash; Bernard Coakley; Sarah Fowell). The purpose of these meetings was to ensure that the geospatial science course offering across the UA system were more coherent and integrated. Also, students graduating from UA with an undergraduate degree including an emphasis option in Geospatial Sciences have a consistent set of knowledge and core skills.

The group concluded that the current course offerings in geospatial sciences lacked a course on fundamental principles and skills. This course syllabus and schedule is a result of the intense brain-storming sessions. The course syllabus and outline was also presented to the wider remote sensing faculty and their input was incorporated in subsequent versions.

The deans of both the involved departments have strongly encouraged and supported the plan and efforts to bring coherence in course offerings, leveraging resources, and promoting an undergraduate emphasis option that is based on technology and is in line with the workforce needs of the State and

the nation.

Positive Impacts:

- We will be able to offer effective undergraduate degrees with emphasis options in geospatial sciences.
- The course on Fundamental in Geospatial Sciences will provide the much needed basics on physical principles of geospatial sciences and will better prepare the students to take the advanced courses in this area.
- Having GEOS / GEOG 222 as pre-requisite, will raise the standards of the existing GEOS 422; GEOS 458/658; GEOG 309; and GEOG 339 classes by freeing up time to cover some advanced material and/or more hands-on training in these classes.
- Students coming out of the UA system (following the undergrad degree with emphasis option in geospatial sciences) will have a solid understanding of basic principles and consistent set of core skills in geospatial science regardless of whether they are enrolled in the emphasis within the Department of Geology and Geophysics or the UA Geography Program.

Negative Impacts:
- None known and none anticipated.

Most departments at UAF are struggling with limited budgets, limited faculty to teach courses, and inability to offer some programs they wish to offer. The only way to overcome these challenges is by cooperating across departments (and across campuses), leveraging resources, and finding creative solutions.

This course proposal is a result of such a cooperation and collaboration between the faculty and leadership of the Department of Geology and Geophysics and the UA Geography Program. With the increasing demand from the industry in the area of geospatial science (that involves remote sensing, GIS, GPS) students in both departments are increasingly gravitating toward taking more classes in these thematic areas. Students in both departments need some common core skills, followed by some specialized application courses that are specific for the respective departments.
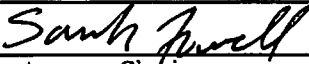
Therefore, after several planning meetings and extensive efforts to leverage resources, the undergraduate degree offerings in both departments were revised to include an option to take a geospatial sciences emphasis track. A common requirement for students taking this track is completion of this cross-listed course GEOS/GEOG 222 on Fundamentals of Geospatial Sciences.

As a result of these revisions and addition of this required class for geospatial science emphasis option, we are certain that the quality of the program offering will be much improved.

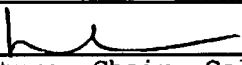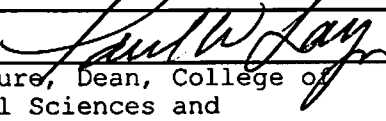of this cross-listed course GEOS/GEOG 222 on Fundamentals of Geospatial Sciences.

As a result of these revisions and addition of this required class for geospatial science emphasis option, we are certain that the quality of the program offering will be much improved.

APPROVALS:

	Date	9/26/11
Signature, Chair, Department of Geology and Geophysics:		

	Date	10/5/11
Signature, Chair, College of Natural Sciences and Mathematics	CNSM	
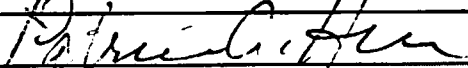
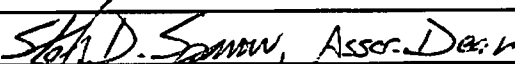|	Date	Oct 7, 2011
Signature, Dean, College of Natural Sciences and Mathematics	CNSM	

	Date	
Signature of Provost (if applicable)		

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	
Signature, Chair, UAF Faculty Senate Curriculum Review Committee		

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

	Date	9-23-11
Signature, Chair, UA Geography Program/Chair, Geog Dept:		

	Date	Sep 23 C
Signature, Chair, School of Natural Resources and Agricultural Sciences:		

	Date	23 Sep 2011
Signature, Dean, School of Natural Resources and Agricultural Sciences		

Syllabus for GEOS/GEOG 222 – Fundamentals of Geospatial Sciences

1. Course information:

Title:	Fundamentals of Geospatial Sciences
Number:	GEOS 222; GEOG 222
Credits:	3
Prerequisites:	GEOG 111 or GEOS 101 or permission of instructor
Location:	Lectures in WRRB Computer Lab; Room 004
	Labs in WRRB Computer Lab; Room 004
Term:	Every Fall
Meeting time:	Lectures: Monday and Wednesday, 2.00 pm to 3.15 pm
	Lab: Monday and Wednesday, 3.15 pm to 4.00 pm

2. Instructor Information (Proposed):

Fall (Odd Years – Geography-lead instructor)	
Dave Verbyla Office: O'Neill 366 Telephone: 907-4745553 Email: dlverbyla@alaska.edu Office hrs: ad hoc / by appointment	Donald Atwood Office: GI-206, UAF Telephone: 907-4747380 Email: dkatwood@alaska.edu Office hrs: ad hoc / by appointment

Fall (Even Years – Geology-lead instructor)	
Anupma Prakash Office: WRRB-108E, UAF Telephone: 907-4741897 Email: prakash@gi.alaska.edu Office hrs: ad hoc / by appointment	Donald Atwood Office: GI-206, UAF Telephone: 907-4747380 Email: dkatwood@alaska.edu Office hrs: ad hoc / by appointment

3. Course readings/materials:

Course text book: In this class we will follow the following text book (required):

Title   : Physical Principles of Remote Sensing
Author   : W. G. Rees
Edition   : 2 edition (September 24, 2001)
Publisher   : Cambridge University Press;
ISBN-10: 0521669480
ISBN-13: 978-052166948

Besides this required text book, you will have access to all class power point lecture materials, lab instructions, and data sets required for your lab assignments. These will be posted on the class website. You are also encourage to refer to other books, journals and magazines available at the UAF library (see list below).

Recommended introductory books in geospatial sciences:

- *Geographic Information Systems and Science, Second Edition,* by Paul Longley, Michael Goodchild, David Maguire, and David Rhind, John Wiley & Sons and ESRI Press, 2005, 534 pages. ISBN: 047087001X.

- *GIS Fundamentals, 3rd Edition,* by Paul Bolstad, Atlas Books, ISBN: 978-0-9717647-2-9.

- *Getting to Know ArcGIS Desktop,* by Tim Ormsby, Eileen Napoleon, Robert Burke, Carolyn Groessl and Laura Bowde, ESRI Press, 2010, 604 pages. ISBN: 9781589482609.

- *Getting Started with Geographic Information Systems*, 5th edition, Keith C. Clarke, Pearson Prentice Hall, 2010, 384 pages. ISBN-10: 0131494988 | ISBN-13: 978-0131494985.

Recommended journals and magazines:

- International Journal of GIS
- International Journal of Remote Sensing
- Geoinformatics
- Geospatial Solutions
- GIS Development
- GPS World

You are encouraged to make extensive use of UAF's investment in electronic journals. Familiarize yourself on the use of *Web of Science* and the *Goldmine* database of the Rasmuson library. There is a wealth of relevant literature there.

4. Course description:

This course provides students with an introduction to the principles and applications of geospatial science (remote sensing, GIS and GPS). Fundamental concepts include electromagnetic radiations, coordinate systems and projections, basic computer science, reasoning and analytical skills, data formats, map reading and map making, and other topics. Practical exercises including field data collection using GPS, photo-interpretation, and using digital image processing and GIS software packages will reinforce theoretical discussions.

5. Course Goals and Student Learning Outcomes

Goal: The goal of this core course, required for the students seeking a degree with emphasis in remote sensing and GIS, is to introduce the students to the fundamental theoretical background and some practical applications of geospatial sciences. The course will prepare the students to take more advanced and specialized courses in remote sensing, GIS, GPS, and digital techniques in data analyses.

Student Learning Outcomes: By the end of the course, students will be able to

- *Understand* the fundamental principles in remote sensing imaging and geospatial data integration and analysis.
- *Search and download* relevant geospatial data required for a certain project/purpose.
- *Visually interpret* in a qualitative way a variety of images (optical, infrared, SAR) taken from airborne and satellite platforms.
- *Collect and import* GPS data using handheld recreational mode GPS units.
- *Project* digital data in different projection systems.
- *Compose* a simple cartographically sound map which integrates GPS data, with other geospatial data (vector data; raster maps and images).
- *Appreciate* how geospatial data can be applied in the real-world for hazard assessment, resource allocation, emergency management, change detection, and policy decision-making.

6. Instructional methods:

- 75 minute lecture followed by 45 minute lab, meeting twice a week.
- Lectures will be interactive and will involve use of power point presentations and group discussions. Material will be posted on the web if possible.
- Laboratory component will include hands-on experience with available image processing software packages.
- Reading assignments from materials provided and recommended readings on selected topics will be an integral part of the course.

7. Course calendar:

See detail class schedule (attached)

8. Course policies:

Attendance in lectures and labs is essential. For some reason, if you can not be present for a lecture or lab, please let us know in advance and make arrangements for make up of the time. Missing one lecture and lab without prior permission from the instructor will result in a loss of 3 points (3% from your final grades).

Due dates for homework assignments and lab assignments are fixed and will be printed on the homework and lab assignment sheets. Late work will be assessed a 10% reduction in score for each day late. After 7 days, late work will be given a score of zero.

Make-up tests or deferral of late penalties will be permitted only with documented proof of illness or for compassionate reasons.

We do expect all students to abide by the UAF Student Code of Conduct (see: http://www.uaf.edu/catalog/current/academics/regs3.html)

9. Grading Policy:

Your grades will be based on several factors as detailed below:

- 15%: Lecture and lab participation (see course policy above)
- 20%: Lab assignments. Most labs require that you complete the lab work in class and show the results to the instructors/TA or submit the answer sheet that accompanies the lab instructions. Make sure that you answer all questions and submit the responses by the indicated deadline (see course policy above).
- 15%: Mid-term. Your mid-term will comprise of short questions/ multiple choice answers that you will complete in class as a 'closed-book' exam.
- 30%: Two homework assignments due in late October and late November. Homework assignment will vary from year to year. Students need to answer the questions independently. Grading will be based on the completeness, comprehensiveness, and demonstrated understanding of the fundamental concepts and applications of geospatial sciences. Late work will be penalized as stated in the course policy.
- 20%: Final exam. Will be a combination of multiple choice answers and an essay type answer on the topics covered throughout the semester.

Grading index followed in this class is given below (Numerical GPA equivalence of Grades as per University Regulation R10.04.09 are indicated in parenthesis)

```
96-100     = A+   (4.0)
92-95      = A     (4.0)
88-91      = A-    (3.7)
84-87      = B+    (3.3)
79-83       = B    (3.0)
75-78      = B-    (2.7)
70-74      = C+    (2.3)
67-69      = C     (2.0)
63-66      = C-    (1.7)
59-62      = D+    (1.3)
55-58      = D     (1.0)
51-54      = D-    (0.7)
50>/=      = Fail
```

10. Learning Support Services:

Besides access to the UAF library that has a wealth of relevant reference material, for this class you will also have access to a computer lab (West Ridge Research Building: WRRB 004) that has relevant software tools, such as Microsoft Excel, ESRI ArcGIS and Google Earth installed on the computers. UAFs OIT also maintains site license for these software packages that you will have access to if you are using a personal computer system that is on the UAF network.

11. Disabilities Services:

Should you have any special needs, please come and talk to us and we will work with you to accommodate your needs as best as possible. We will work with the UAF Office of Disability Services (208 WHITAKER BLDG, 474-5655) to provide reasonable accommodation to students with disabilities.

GEOS 222 / GEOG 222 Fundamentals of Geospatial Sciences		
Class Schedule		
Week 1	Lecture 1	Introduction to Geospatial Sc (RS and GIS)
	Lab 1	Google; NASA WW; Alaska Mapped
	Lecture 2	Map Interpretation
	Lab 2	Reading Maps
Week 2	Lecture 3	Map Projections
	Lab 3	Reprojecting maps (using a global shapefile)
	Lecture 4	Handheld GPS and Controls
	Lab 4	Geocaching and Measurement of controls
Week 3	Lecture 5	Waves and EM Spectrum
	Lab 5	Excel Lab with calculations
	Lecture 6	Active and Passive Sensors
	Lab 6	Visual study of images from active/passive sensors
Week 4	Lecture 7	Platforms (Satellites/Airborne)
	Lab 7	Globes/ Balloons
	Lecture 8	Perspectives and Scales (Nadir vs Oblique)
	Lab 8	Examples of perspectives and scales
Week 5	Lecture 9	Aerial Photography and Photogrammetry
	Lab 9	Stereoscopy lab
	Lecture 10	Modern Ortho imaging
	Lab 10	Lab with PhotoScan
Week 6	Lecture 11	Revision/Discussion
	Lab 11	Mid term exam
	Lecture 12	GIS concepts (raster, vector, database)
	Lab 12	FNSB GIS
Week 7	Lecture 13	GIS Analysis
	Lab 13	GIS Analysis (eg. making an FCC and NDVI)
	Lecture 14	DEM
	Lab 14	ArcGIS to compute SRM, Slope, Aspect, HillShade
Week 8	Lecture 15	Lidar
	Lab 15	Global Mapper: Visualize point-clouds for Fairbanks
	Lecture 16	SAR
	Lab 16	MapReady
Week 9	Lecture 17	Field data collection
	Lab 17	Map GPS points on a map
	Lecture 18	Cartography
	Lab 18	Add WMS base to earlier map
Week 10	Lecture 19	Spectral Signatures
	Lab 19	Use hypercube to play with RGB
	Lecture 20	Landcover Mapping
	Lab 20	Use hypercube to classify Fairbanks (clustering)
Week 11	Lecture 21	Change Detection
	Lab 21	Use Arc GIS for change detection (Amazon)
	Lecture 22	Applications of Change detection

	Lab 22	Several examples (coastal; urban; thermal; wetland)
Week 12	Lecture 23	Thanksgiving
	Lab 23	Thanksgiving
	Lecture 24	Thanksgiving
	Lab 24	Thanksgiving
Week 13	Lecture 25	Cadastral Applications
	Lab 25	Cadastral Lab with Arc GIS
	Lecture 26	Public Safety; Emergency Management
	Lab 26	Vehicle routing lab
Week 14	Lecture 27	Flooding / Landslides
	Lab 27	Inundation Analysis (H&H modeling)
	Lecture 28	Final Exams
	Lab 28	Final Exams