FLORIDA ATLANTIC UNIVERSITY™

Graduate Programs—NEW COURSE PROPOSAL

UGPC APPROVAL _____
UFS APPROVAL _____
SCNS SUBMITTAL _____
CONFIRMED _____
BANNER POSTED _____
CATALOG _____

DEPARTMENT: GEOSCIENCES | **COLLEGE:** CHARLES E. SCHMIDT COLLEGE OF SCIENCE

RECOMMENDED COURSE IDENTIFICATION:

PREFIX GIS **COURSE NUMBER** 6032 **LAB CODE (L or C)** C

(TO OBTAIN A COURSE NUMBER, CONTACT RPOLANSK@FAU.EDU)

COMPLETE COURSE TITLE: LiDAR REMOTE SENSING AND APPLICATIONS

EFFECTIVE DATE
(first term course will be offered)
Fall 2012

CREDITS: 3

TEXTBOOK INFORMATION:
Shan, J., and C. Toth. 2008. *Topographic Laser Ranging and Scanning, Principles and Processing.* Boca Raton, FL. Taylor & Francis Group. ISBN 9781420051421

GRADING *(SELECT ONLY ONE GRADING OPTION)*: **REGULAR** _YES_____ **SATISFACTORY/UNSATISFACTORY** _____

COURSE DESCRIPTION, NO MORE THAN 3 LINES:
This course will introduce LiDAR principles, sensors and platforms, data processing and analysis, and applications. Students will master basic skills of LiDAR needed to leverage the commercial LiDAR sources and information products in a broad range of applications.

PREREQUISITES *:	**COREQUISITES*:**	**REGISTRATION CONTROLS (MAJOR, COLLEGE, LEVEL)*:**
GIS 5051 PRINCIPLE OF GIS	NONE	GRADUATES IN DEPARTMENT OF GEOSCIENCES

* *PREREQUISITES, COREQUISITES AND REGISTRATION CONTROLS WILL BE ENFORCED FOR ALL COURSE SECTIONS.*

MINIMUM QUALIFICATIONS NEEDED TO TEACH THIS COURSE: INSTRUCTOR SHOULD HAVE SOLID BACKGROUND IN REMOTE SENSING.
Instructor should have a Ph.d. & solid background in Remote Sensing ~~Prof.~~ Dr. Charles Roberts

Faculty contact, email and complete phone number:	Departments and/or colleges that might be affected by the new course must be consulted and listed here. Please attach comments from each.
Dr. Caiyun Zhang Email: czhang3@fau.edu Phone: 561-297-2648	Department of Geosciences in College of Science

Approved by:	***Date:***
Department Chair: Russell Dy	9/28/11
College Curriculum Chair:	3/06/12
College Dean:	3/06/12
UGPC Chair:	
Graduate College Dean:	

ATTACHMENT CHECKLIST

- **Syllabus** (see guidelines for requirements: *http://www.fau.edu/graduate/facultyandstaff/programscommittee/index.php)*
- **Written consent** from all departments affected by new course

Email this form and syllabus to *diamond@fau.edu* **one week before** the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

New Course Proposal

Course name: LiDAR Remote Sensing and Applications
Course number: GIS 6032
Term: Expecting to open in Fall 2012
Prerequisites: GIS 5051 Principle of GIS
Co-requisites: no
Instructor: Dr. Caiyun Zhang (Department of Geosciences)
Office number: PS 333
Telephone: 561-297-2648
Email: czhang3@fau.edu
Office hours: Tuesday, 10:00 AM- 12:00 PM
Classroom: PS 352
Required Textbook:
Shan, J., and C. Toth. 2008. *Topographic Laser Ranging and Scanning, Principles and Processing.* Boca Raton, FL. Taylor & Francis Group. ISBN 9781420051421
Bibliography:

1) Popescu, S. C. 2012. *LiDAR: Remote Sensing of Terrestrial Environments.* 1st edition, CRC Press. ISBN 978-1420047639.
2) Maune, D. F. 2007. *Digital Elevation Model Technologies and Applications: The DEM Users Manual.* 2nd edition. Bethesda, MD. American Society for Photogrammetry and Remote Sensing. ISBN 1-57083-082-7.
3) Campbell, J.B. 2007. *Introduction to Remote Sensing.* 4th edition. The Guilford Press. ISBN 978-1606230749.
4) Congalton, R., and K. Green. 2009. *Assessing the Accuracy of Remotely Sensed Data.* 2nd edition. CRC Press. ISBN 978-1-4200-5512-2.
5) Jensen, J.R. 2007. *Remote Sensing of the Environment: An Earth Resource Perspective.* 2nd edition. Prentice Hall. ISBN 978-0131889507.
6) Wolf, P., and B. Dewitt. 2000. *Elements of Photogrammetry.* 3rd edition. Boston. McGraw-Hill. ISBN 0-07-292454-3.

Course Description:

This course will introduce principles of LiDAR, LiDAR sensors and platforms, LiDAR data view, processing, and analysis, and LiDAR applications. Students will master basic skills of LiDAR needed to leverage the commercial LiDAR sources and information products in a broad range of applications, including topographic mapping, vegetation characterization, and 3-D modeling of urban infrastructure.

LiDAR (Light Detection And Ranging) is a relatively new technology in remote sensing. The main advantage of LiDAR over other remote sensing technologies is that it provides a direct method for 3-D data collection. It has been widely used for 3-D topographic mapping, vegetation analysis, and 3-D urban infrastructure since the emergence of scanning LiDAR in 1990s. Local, state, and federal government agencies often collect LiDAR data and derived products for flood

mapping, transportation planning and design, resource and environment management, and emergency response. A lot of commercial companies have been established in the past decade to support these applications. A systematic understanding of LiDAR principles, LiDAR data processing and analysis, and applications is part of the essential body of knowledge in the geospatial information sciences (GIS).

Course Objectives:

The course will also introduce fundamental concepts of accuracy assessment and appropriate use of LiDAR derived data products. It helps students master basic skills needed to leverage these data sources and information products in the context of application domains, such as topographic mapping, floodplain mapping, forestry, urban and regional planning, transportation systems design, and emergency response.

Students who excel in this course are able to:

1) Summarize the basic operational characteristics of mapping LiDAR instruments and platforms.
2) Describe the basic principles of calibrating, georeferencing, and processing of LiDAR data.
3) Describe quantitative and qualitative methods and industry standards for quality assurance and accuracy assessment of LiDAR-derived data products.
4) Critically assess the strengths and weaknesses of various LiDAR platforms and instruments for a broad range of application scenarios.
5) Apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate LiDAR data processing and analysis methods.

Course Organization:

This course is designed as a series of on class lectures followed by hands-on laboratory exercises. The lecture section will last 1-1.5 hours, and laboratory exercises will take the remaining of the allotted time.

Grading Policy:

The final grade in the course will come from the class attendance, laboratory exercises, midterm exam, and the research project. The total average grade for the laboratory exercises constitutes 50% of the final course grade. The class attendance, midterm exam and final project will count 10%, 20%, and 30%, respectively, towards the final course grade.

Course Component	% of Final Grade
Attendance	10%
Midterm Exam	20%
Lab Exercises	50%
Final Project	30%

Points	Final Grade
94 - 100	A
90 - 93	A-
87 - 89	B+
84 - 86	B
80 - 83	B-
77 - 79	C+
74 - 76	C
70 - 73	C-
67 - 69	D+
64 - 66	D
60 - 63	D-
59 or lower	F

Tentative Lectures, Labs, and Assessment: see Table 1.

Table 1 Scheduled lectures, labs, and assessment

Week	Scheduled Lectures, Labs, and Assessment
1	Overview of the courses, Syllabus Introduction to LiDAR Remote Sensing *Lab 0*
2	LiDAR Sensor Design *Lab 1*
3	LiDAR Remote Sensing Platforms *Lab 2*
4	Georeferencing and Calibration of LiDAR Data *Lab 3*
5	Pre-Processing of LiDAR Data *Lab 4*
6	LiDAR Data Filtering *Lab 5*
7	Management of LiDAR Data Lab 6
8	*Midterm*
9	LiDAR Application: Topographic Mapping *Lab 7*
10	LiDAR Application: Vegetation Analysis *Lab 8*
11	LiDAR Application: Urban Feature Extraction *Lab 9*
12	LiDAR Application: Mobile Mapping Lab 10
13	Doing final project, no lecture
14	Final Project Presentation

Students with Disabilities:

In compliance with the Americans with Disabilities Act (ADA), students who require reasonable accommodations due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) – in Boca Raton, SU 133 (561-297-3880); in Davie, LA 240 (954-236-1222); in Jupiter, SR 110 (561-799-8010); or at the Treasure Coast, CO 117 (772-873-3441)- and follow all OSD procedures.

Honor Code:

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001.