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| **1. Course title/number, number of credit hours** | | |
| Introduction to Laser Mapping Technology (CCE4516C) | | 3 credit hours |
| **2. Course prerequisites, corequisites, and where the course fits in the program of study** | | |
| None | | |
| **3. Course logistics** | | |
| *Semester*: Spring 2017  Classroom: FL 401 for In-person class; recorded videos will be available for DisL students  Class time: T 7:10-10:00 P.M | | |
| **4. Instructor contact information** | | |
| Dr. Sudhagar Nagarajan  Civil, Environmental and Geomatics Engineering  College of Engineering and Computer Science  Florida Atlantic University  777 Glades Road, Building 36, Room 222  Boca Raton, FL, 33431  Phone: (561) 297 3104  E-mail: [snagarajan@fau.edu](mailto:snagarajan@fau.edu)  Office hours: MT 8:30 AM – 10:30 AM | | |
| **5. Course description** | | |
| Terrestrial laser mapping technology, current state of the technology, data collection methodologies and requirements, data processing, calibration, errors, database management, filtering techniques, product generation and applications. Lab included. | | |
| **6. Course objectives/student learning outcomes/program outcomes** | | | |
| *Course objectives* | The students will have strong understanding on 1) working principles of terrestrial laser scanning systems, 2) applying laser scanning to various engineering and science problems. | | |
| *Student learning outcomes*  *& relationship to ABET a-k outcomes* | 1. Understand the principles of laser scanning (a, b, k)  2. Understand the characteristics of laser scanners ( a, b)  3. Understand the sources of errors in laser scanning (a, b, k)  4.Understand the concepts of georeferencing/registration of laser scanning data (a, b)  5. Ability to use a laser scanning software to model and measure (a, b, e, g, k) | | |
| *Relationship to program outcomes* | **Outcome 1**: An understanding of professional and ethical responsibility (High)  **Outcome 2**: A working knowledge of fundamentals, engineering tools, and experimental methodologies (High)  **Outcome 3**: An understanding of the social, economic, and political contexts in which engineers must function (Medium)  **Outcome 4**: An ability to plan and execute an engineering design to meet an identified need (High)  **Outcome 5**: An ability to function on multi-disciplinary teams (High)  **Outcome 6**: An ability to communicate effectively (High)  **Outcome 7**: Graduates will have proficiency in the following areas of civil engineering: (i) structural engineering, (ii) transportation engineering, (iii) geotechnical engineering, (iv) water resources, and (v) environmental engineering (Low)  **Outcome 8**: Graduates will have an adequate appreciation for the role of civil engineering in infrastructure planning and sustainability including safety, risk assessment, and hazard mitigation (High)  **Outcome 9**: Graduates will be successful in finding professional employment and/or pursuing further academic studies (High) | | |
| **7. Course evaluation method** | | | |
| Lab exercises: 15%  Assignments: 25%  Project: 35%  Exam: 25% | | | |
| **8. Policy on makeup tests, late work, and incompletes** | | | |
| Makeup tests are given only if there is solid evidence of a medical or otherwise serious emergency that prevented the student of participating in the exam. Makeup exam should be administered and proctored by department personnel unless there are other pre-approved arrangements.  Incomplete grades are against the policy of the department. Unless there is solid evidence of medical or otherwise serious emergency situation incomplete grades will not be given. | | | |
| **9. Special course requirements** | | | |
| All assigned homeworks must be submitted on or before the posted time. Late submissions will not be accepted unless approved by the instructor in advance  To succeed in this course all exams must be taken. The reasons for missing an exam must be documented, i.e. doctor’s note etc. An unsatisfactory excuse will result in an F entered for that exam. Make-up exams will be administered for ONLY valid reasons.  All exams will be taken on the honor system and must be done by the student ONLY with NO ASSISTANCE FROM ANYONE. A student MAY NOT provide assistance to another student.  You are encouraged to work in groups to complete the homework assignments and/or to study together. However, the completed homework assignments must be your own work. | | | |
| **10. Classroom etiquette policy** | | | |
| University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions. | | | |
| **11. Disability policy statement** | | | |
| In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 131 (954-236-1222); or in Jupiter, SR 110 (561-799-8585) —and follow all SAS procedures. | | | |
| **12. Honor code policy** | | | |
| 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 unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at [*http://www.fau.edu/regulations/chapter4/4.001\_Code\_of\_Academic\_Integrity.pdf*](http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf) | | | |
| **13. Required texts/reading** | | | |
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| **14. Supplementary/recommended readings** | | | |
| 1. Theory and practice on Terrestrial Laser Scanning, Training material based on practical applications, http://jllerma.webs.upv.es/pdfs/Leonardo\_Tutorial\_Final\_vers5\_ENGLISH.pdf 2. Airborne and Terrestrial Laser Scanning, ISBN 9781439827987, Editor(s):George Vosselman, Hans-Gerd Maas, Published: March 5, 2010 by CRC Press 3. Terrestrial laser scanning: Error sources, self-calibration and direct georeferencing, 2009, Yuriy Reshetyuk , ISBN-13: 978-3639175509, VDM Verlag (July 9, 2009) 4. Topographic Laser Ranging and Scanning: Principles and Processing. Jie Shan and Charles K. Toth (Eds.) CRC Press: Boca Raton, FL. 2009 5. Bahadır Ergün (2011). Terrestrial Laser Scanning Data Integration in Surveying Engineering, Laser Scanning, Theory and Applications, Prof. Chau-Chang Wang (Ed.), ISBN: 978-953-307-205-0, InTech, DOI: 10.5772/14728. Available from: http://www.intechopen.com/books/laser-scanning-theory-and-applications/terrestrial-laser-scanning-data-integration-in-surveying-engineering | | | |
| **15. Course topical outline, including dates for exams/quizzes, papers, completion of reading** | | | |
| Week 1: Principles of laser scanning technology  Week 2: Terrestrial laser scanning sensors, Scanning techniques  Week 3: Lab 1: Data collection with laser scanners  Week 4: Georeferencing of terrestrial laser scanning data  Week 5: Lab 2: Laser Scanning data registration  Week 6: Errors and calibration  Week 7: Lab 3: Modeling and measuring with TLS data  Week 8: Planning and field procedures  Week 9: Spring break  Week 10: Mid-term  Week 11: Co-registration of multiple scans, Positioning with GPS and INS  Week 12: Data formats, modelling and surveying with TLS data  Week 13: Project proposal presentation  Week 14: Introduction to Mobile Mapping System  Week 15: Seminar on advanced topics | | | |