**Contact Information**

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| **Instructor:** | Dr. Wenge Ni-Meister |
| **Email**: | Wenge.Ni-Meister@hunter.cuny.edu – email is the best way to contact me |
| **Office hours:** | Wednesday: 4:30 pm-5:30 pm or by appointment |

**Prerequisites:** GTECH 321/712 or equivalent

**Course Materials:**

*Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition,* John R. Jensen, Pearson Prentice Hall, ISBN-13: 978-0134058160 and ISBN-10: 013405816X (optional).

**Course Description:**

The course aims to introduce students to advanced topics in remote sensing applications and digital image processing and analysis. Students will learn to use Google Earth Engine (GEE) – a cloud-based platform for large-scale geospatial analysis. Students are exposed to use machine learning and artificial intelligence for image classification and land use cover change analysis. They will also work with lidar data to extract topography and vegetation structure information using LASTool and FUSION software. Throughout the course, students will conduct a research project of environmental science applications using remote sensing data and document their research work.

**Learning Outcomes:**

Upon completing this course, students will be able to:

- Access remote sensing images using Google Earth Engine or from other online resources.
- Extract information from remote sensing data using artificial intelligence and machine-learning based classification and land-cover/land-use change detection.
- Extract topography and vegetation structure information from lidar data using LASTools and FUSION
- Conduct research of environmental science applications of remote sensing.
- Communicate their research results through oral presentation and writing research paper

**Grading:**

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| Lab exercises | 40% |
| Final project/Final Exam | 40% |
| Student Paper presentation | 20% |

**Lab exercises** will be given each week. Hand-on lab assignments are due when the new lab is given. Unless otherwise instructed, you will submit assignments in electronic forms through BlackBoard. I take late lab work, but with 5% penalty with each day's delay.

**Student paper presentation** – Students are expected to read and present research papers published in a remote sensing refereed journal reading in class. The research papers should be closely related to the content of this course (I share the papers) and the student's interest or his/her final project topic.

Presentations should clearly present research objectives, methods, results, conclusions, and implications for his/her own research. The presenter should critically review the work presented in the paper and best

address questions from classmates. Grades reflect on both the presentations and the questions asked throughout the semester.

**Final Project/Final Exam** – Instead of in-class written final exam, each student is expected to complete a class project and will present his/her project and submit a research paper at the end of the semester. The project must use remote sensing data and digital image processing techniques to develop your final product for an environmental application. Work that contributes to your thesis research or current employment is encouraged.

A proposal (150-word maximum) must be turned in by the required date. The proposal should describe the goal of the project, proposed research method and at least five preliminary references. Well-chosen student projects may be suitable for subsequent publication in either conference proceedings or the peer-reviewed journals. Please keep this goal in mind as you develop and carry out your projects, and particularly for graduate students who are thinking of thesis topics.

The final paper must be 12-point double-spaced with 1 inch margins all around. Captions, references, footnotes, appendices, tables, etc. may be single-spaced. It should be no less than 15 pages including figures, tables. The final report should include an abstract of no more than 150 words that is succinct and informative without reference to the text. This should be followed by the Introduction (including a thorough literature review, with Background and Objectives), Methods, Results, and Discussion/Conclusions. Keep in mind that these are semester projects.

Graduate students are expected to do much more comprehensive final projects than undergraduate students. Different grading system will be used for undergraduate and graduate students.

## Grading Policy

Grading will following Hunter College policy as outlined in the online undergraduate catalog that can be found **at http://catalog.hunter.cuny.edu/**.

I do not give incompletes (IN) except under the most extraordinary, and documented, circumstances. You must contact me within 48 hours of the final exam and request IN as a grade. At that time you will schedule a date to meet with me at the college and complete a Contract to Resolve Incomplete Grades. Otherwise, I will average the grades I have for you and record you the grade you have earned.

Only undergraduate students are eligible for credit/no credit (C/NC) as a final course grade. Please see the college's policy on C/NC at **http://catalog.hunter.cuny.edu/content.php?catoid=37&navoid=10489**. You must meet submit your CR/NC form no later than 15 minutes before the final presentation period.

## Resources
- All class material will be posted on Bb.

## Essential Policy Information:
- Attendance/lateness policy: It is extremely important to attend the regular lectures and labs and take detail notes. Students who attend classes regularly are much more successful than those who are not.
- Email Policy
  - Please use GTECH322/713 in the subject line when you email me. I do not answer email with insufficient subject lines.
  - Email me from your @myhunter account.
  - Please sign your full name as it appears in CUNYfirst to any message. I do not answer unsigned email messages.

- Student's email will be responded within 24 hours. Please note there will be a delay for messages sent over the weekend or during non-business hours.

## Hunter College Statement on Academic Integrity

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures. Plagiarism, dishonesty, or cheating in any portion of the work required for this course will be punished to the full extent allowed according to Hunter College regulations.

## ADA Policy

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: (212) 772- 4857 or (212) 650-3230.

## Hunter College Policy on Sexual Misconduct

In compliance with the CUNY Policy on Sexual Misconduct, Hunter College affirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationship. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

a.      Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, on contacting the College's Public Safety Office (212-772-4444)

b.      All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) of Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link: http://www.cuny.edu/about/administration/offices/la/Policy-on-Sexual-Misconduct-12-1-14-with-links.pdf

## Syllabus Change Policy

- Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.
- Any changes will be updated through Bb.

## Tentative Daily Schedule and Readings

| Week | Date | Lecture Topics |
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| Week 1 | Feb. 2 | Course Overview |
| Week 2 | Feb. 9 | GEE Concepts |
| Week 3 | Feb. 16 | GEE Methods |
| Week 4 | Feb. 23 | Time Series Analysis |
| Week 5 | Mar. 2 | Advanced Classification |
| Week 6 | Mar. 9 | Land Use and Land Cover Change |
| Week 7 | Mar. 16 | Machine Learning in GEE |
| Week 8 | Mar .23 | Asset Management |
| Week 9 | Mar. 30 | Python API |
| Week 10 | Apr. 6 | Lidar Sensors and Applications |
| Week 11 | Apr. 13 | Airborne Lidar |
|  | Apr. 20 | **Spring Recess College Closed** |
| Week 12 | Apr. 27 | Airborne Lidar |
| Week 13 | May 4 | Space Lidar – GEDI & ICESat-2 |
| Week 14 | May 11 | Final Review |
| Week 15 | May 18 | Final Project Presentations |