GIS 4037: Digital Image Processing [sect #6234]

[4 Credit Hours]

Spring 2019

Instructor: Mehedy Hassan
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Course Website: Log in to CANVAS at http://lss.at.ufl.edu
Software access: https://apps.ufl.edu/Citrix/UFAppsWeb/
Course Communications: Please email the instructor with questions, either via email or the email function in canvas

Required Text: ‘Digital Image Processing’, by John R. Jensen, Fourth Edition, Text [can be book purchase, rental or ebook] from Pearson. Available access to sign up for this text can be found by logging into the course on Canvas, and under the ‘Modules’ link you will see the ‘eText: Digital Image Processing’ link. This is a required Text and you must purchase this as soon as you can. Once purchased you can access this text via Canvas if you selected ebook or you can use a hardcopy of the book if you prefer. From Amazon: etextbook = $119, Hardcover can rent ($60), or buy used for ~$120, new is $175

Course Description: Introduces the theory and application of digital imagery data in geographical research with a hands-on, lab-based approach.

Purpose of Course: This course provides an introduction to the use of remotely sensed data in environmental research. Remote sensing is the science of acquiring data using techniques that do not require actual contact with the object or area being observed. The different sensors used to collect this information, and the interpretation techniques vary quite widely, and are being developed at an astounding rate. In this course, we will focus on the interpretation and applications of data from spaceborne imaging systems (eg: Landsat MSS, Landsat TM, Quickbird, MODIS, AVHRR and SPOT). The number of disciplines that utilize remotely sensed data continues to increase. Geologists, geographers, climatologists, and ecologists have all adapted remote sensing techniques to their respective research. We will briefly discuss many different uses of remotely sensed data, but focus on natural resources management and ecological applications. Each module has required readings and videos in Canvas. Lecture sessions will generally be used for brief lecture overview, preparation for lab session topics and class activities related to the fundamental topics and theory which you have already completed the readings assignment on. information.
Course Goals and/or Objectives: In this course you will learn about the fundamentals of Remote Sensing theory and technologies through the use of **problem solving** and **spatial thinking** skills. The approach used in this course is problem-based learning applied to spatially explicit problems. These concepts are essential to the use of RS. You will develop your own analytical skills by addressing real-world problems within the spatial framework of RS. The **Goal of this course** is for you, the student,

- to understand the fundamentals of remote sensing theory and technologies through the use of problem solving and spatial thinking skills.
- To improve your geographic problem solving abilities through the application of remote sensing (RS) technology and knowledge and via the application of spatial thinking skills.
- To learn geographic concepts and skills and to determine their relevance to you.
- To sharpen your critical thinking skills about geographic information, specifically in the form of RS products – their reliability, accuracy and precision.
- To acquire competence in basic knowledge and skills regarding RS.
Lab Policy: Labs are frequently quite complex and much of each exercise will need to be completed. 10-12 lab exercises are planned, and these will take you from basic introductory tasks through intermediate and some more advanced remote sensing techniques. It is not our goal to teach to the software. While we plan to show you tips and pointers about the ERDAS Imagine software the main goal is to learn the RS concepts. We can tell you from experience if you learn the concepts then moving from one software to another is easy. You are given 1 week to complete each lab and all labs must be submitted online in Canvas within given period. Late labs will not be accepted. Each late lab will incur 10% point deduction for each week late. Labs are a key component of the learning in this course and keeping current with them is essential for success in this class. If you have a legitimate reason for missing a lab the absence MUST be documented, e.g., you are in a car wreck, then I need to see the accident report, a death in the family, I need to see the obituary and service times. Labs are critical to this class and it is easy to fall behind. Labs are an integral part of the learning procedure in this course and are timed to coincide with the appropriate lectures and reading materials. As such they comprise a significant proportion of your grade and should be taken very seriously.

Please note – the Labs are time consuming. You will need to spend a lot of time on your computer to complete these weekly assignments. I do not want this to be a shock to anyone and so here is your heads up – learning RS takes a lot of time and patience – but is an amazing tool once you have it, so hang in there!!

Course Project Policy: In order to show the amount of information you have learned in the labs and lecture a final course project will be undertaken throughout the course and presented to the class in the last few weeks of the semester. This will be the culmination of what you have learned and will be an independent piece of work. As for Labs, no late project write-ups are accepted. In addition to presenting on your project you will also be responsible for peer reviewing other students' projects via their presentations and papers. Different components building to this final project will be due throughout the class and are indicated clearly in Module 10-12 and on the course calendar. The Course Project, the peer evaluations and the presentation of your project, is worth a total of 500 points.

Reading Assignment Policy: Each Module has a series of assigned readings from the textbook, a series of videos to be watched and a word file to be completed, either solo or in a group of your choosing. Once this word document has been finished by you or your group you are then ready to take the Reading Assignment Quiz. The Quiz must be taken by each student individually, and will be completed in Canvas. It will consist of 10 questions drawn at random from the reading assignment document and will be unique for each student. It is a timed quiz, you have only 15 minutes to complete
it - the time is so tight as all you should be doing is cutting and pasting the information from your word file. You must not plagiarize the textbook but rather write your answers in your own words. Each quiz is worth 100 points in the course. More information is given in each Module’s Reading Assignment Document.

Course Technology: There are a number of different software packages used in this course: ERDAS Imagine, ArcGIS, Google Earth etc. as well as specific requirements of file access and data storage on the UF server (R). The lab period will be the time for you to work on these, learn the software and concepts and ask any questions you may have related to the labs. Use this time well!

UF Policies:

University Policy on Academic Misconduct: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at http://www.dso.ufl.edu/students.php.

Netiquette: Communication Courtesy: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats.

When communicating online, you should always:

- Treat instructor with respect, even in email or in any other online communication
- Always use your professors’ proper title: Dr. or Prof., or if you in doubt use Mr. or Ms.
- Unless specifically invited, don’t refer to them by first name.
- Use clear and concise language
- Remember that all college level communication should have correct spelling and grammar
- Avoid slang terms such as “wassup?” and texting abbreviations such as “u” instead of “you”
- Use standard fonts such as Times New Roman and use a size 12 or 14 pt. font
- Avoid using the caps lock feature AS IT CAN BE INTERPRETED AS YELLING
- Limit and possibly avoid the use of emoticons like :) or 九大
• Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or offensive
• Be careful with personal information (both yours and other’s)

When you send an email to your instructor or classmates, you should:
• Use a descriptive subject line
• Be brief
• Avoid attachments unless you are sure your recipients can open them
• Avoid HTML in favor of plain text
• Sign your message with your name and return e-mail address
• Think before you send the e-mail to more than one person. Does everyone really need to see your message?
• Be sure you REALLY want everyone to receive your response when you click, “reply all”
• Be sure that the message author intended for the information to be passed along before you click the “forward” button

When posting on the Discussion Board in your class, you should:
• Make posts that are on topic and within the scope of the course material
• Take your posts seriously and review and edit your posts before sending
• Be as brief as possible while still making a thorough comment
• Always give proper credit when referencing or quoting another source
• Be sure to read all messages in a thread before replying
• Don’t repeat someone else’s post without adding something of your own to it
• Avoid short, generic replies such as, “I agree.” You should include why you agree or add to the previous point
• Always be respectful of others’ opinions even when they differ from your own
• When you disagree with someone, you should express your differing opinion in a respectful, non-critical way
• Do not make personal or insulting remarks
• Be open-minded

Getting Help:

For issues with technical difficulties for E-learning in CANVAS, please contact the UF Help Desk at:
• Learning-support@ufl.edu
• (352) 392-HELP - select option 2
• https://lss.at.ufl.edu/help.shtml

Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail your instructor immediately.
Other resources are available at [http://www.distance.ufl.edu/getting-help](http://www.distance.ufl.edu/getting-help) for:

- Counseling and Wellness resources
- Disability resources
- Resources for handling student concerns and complaints
- Library Help Desk support

Should you have any complaints with your experience in this course please visit [http://www.distance.ufl.edu/student-complaints](http://www.distance.ufl.edu/student-complaints) to submit a complaint.

**Grading Policies:**

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<tr>
<th>Assignment Type</th>
<th>Points</th>
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<tr>
<td>Readings Assignments and Quiz</td>
<td>100 each</td>
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<tr>
<td>Lab Exercises – vary by lab</td>
<td>100-200 each</td>
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<tr>
<td>Course Project</td>
<td>500 total</td>
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**GRADING SCHEME:**

[A= 90 and above] [B+=85-89.9] [B=80-84.9] [C+=75-79.9] [C = 70-74.9] [D+ = 65-65.9] [D = 60-64.9] [E = <60]

All grades will be available for you to see in Canvas and will be updated weekly. It is your responsibility to know how well you are doing in the class.

**Course Schedule**

For full details of Each Module please see the course website in Canvas. An overview of items is given below.
# Course Schedule

[Class activities added during lectures – not given here]

<table>
<thead>
<tr>
<th>Week 1</th>
<th>INTRO to the class</th>
<th>Introduction</th>
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<tbody>
<tr>
<td>Week 2</td>
<td>Module 1: Introduction to RS</td>
<td>Module 1 Reading Assignment Module 1 Reading Assignment Quiz Lab-1. Introduction to basic Remote Sensing Data processing function in ERDAS IMAGINE</td>
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<td>Week 3</td>
<td>Module 2: RS Data Collection</td>
<td>Module 2 Reading Assignment Module 2 Reading Assignment Quiz Lab-2. Assessing global image information</td>
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<td>Week 5</td>
<td>Module 4: Image Correction</td>
<td>Module 4 Reading Assignment Module 4 Reading Assignment Quiz Lab-4. Multispectral Image Enhancement Techniques-(II)</td>
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<tr>
<td>Week</td>
<td>Module</td>
<td>Assignments</td>
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| Week 6 | Module 5: Image        | Module 5 Reading Assignment  
|        | Enhancement             | Module 5 Reading Assignment Quiz  
|        |                         | Course Project - Final Research Questions  
|        |                         | Lab-5. Image Mosaicking, Rectification and Geometric Correction Techniques |
| Week 7 | Module 6: Image        | Module 6 Reading Assignment  
|        | Classification          | Module 6 Reading Assignment Quiz  
|        |                         | Lab-6. Image Classification (Unsupervised) and Mapping techniques in ERDAS and ArcGIS |
| Week 8 | Module 6: Continued    | Course Project - Proof of Data in Hand  
|        |                         | Lab-7. Training Sample Collection Techniques |
| Week 9 | Module 7: Classifiers,  | Module 7 Reading Assignment  
|        | Accuracy Assessments,   | Module 7 Reading Assignment Quiz  
|        | Change detection &     | Lab-8. Supervised Classification and Accuracy Assessment  
|        | Advanced Methods        |                                        |
| Week 10| Module 7: Continued    | Lab-9. Advanced Methods in Remote Sensing (I)  
|        |                         | Course Project - Submit Project Proposal |
| Week 11| Module 8: Hyperspectral | Module 8 Reading Assignment  
|        | Analysis                | Module 8 Reading Assignment Quiz  
|        |                         | Class Project - Research and Share Activity  
|        |                         | Lab-10. Advanced Methods in Remote Sensing (II) |
| Week 12       | Module 9: Time Series Analysis | Module 9 Reading Assignment  
                             |                              | Quiz                         
                             |                              | Course Project - Full Analysis of Imagery  
                             |                              | Lab-11. Advanced Analysis of post classification remote sensing data  |
|--------------|-------------------------------|-------------------------------|
| Week 13      | Module 10: Google Earth       | Work on your Course Projects! |
| Week 14      | Module 11: Class Project finale! | Future Directions in RS      
                             |                              | Course Project - Record and Submit Presentation  |
| Week 15      | Module 11: Continued          | Course Project - Submit Final Project  |
| Exam Week    |                               | Course Project – Peer Evaluations  
                             |                              | Course Project – Final Project submission if you made any adjustments due to your peer evaluations and comments  |