Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and attachments

1. This request is submitted by the Department of Ecosystem Science and Management

2. Course prefix, number and complete title of course: FRSC 661, Advanced Remote Sensing

3. Change requested
   a. Prerequisite(s): From: 444 or GEOG 651 or 661. To: FRSC 608, RENR 444, GEOG 651, GEOG 661
   b. Withdrawal (reason):
   c. Cross-list with: Cross-listed courses require the signature of both department heads.
   d. Change in course title and description. Enter complete current course title and current course description in item 4; enter proposed course title and proposed course description in item 5.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 6. Attach a course syllabus.

4. Complete current course title and current course description:

5. Complete proposed course title and proposed course description (not to exceed 50 words):

6. a. As currently in course inventory:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>CIP and Fund Code</th>
<th>Admin. Unit</th>
<th>FICE Code</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRSC</td>
<td>661</td>
<td>ADVANCED REMOTE SENSING</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>00</td>
<td>05</td>
<td>08</td>
<td>41</td>
</tr>
</tbody>
</table>

b. Change to:

<table>
<thead>
<tr>
<th>Prefix</th>
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<tr>
<td>ESSM</td>
<td>656</td>
<td>ADVANCED REMOTE SENSING</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>00</td>
<td>05</td>
<td>08</td>
<td>41</td>
</tr>
</tbody>
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Approval recommended by:

Head of Department
Date

Chair, College Review Committee
Date

Dean of College
Date

Submitted to Coordinating Board by:

Associate Director, Curricular Services
Date

Effective Date

Questions regarding this form should be directed to Sandra Williams at 845.8201.
Curricular Services – 11/07
I request that the prerequisites be changed from Approval of instructor, or FRSC 308 or RENR 444 or GEOG 651 or 661 for FRSC 661 to FRSC 608, RENR 444, GEOG 651, GEOG 661 for ESSM 656 based on a typing error. The first prerequisite should be FRSC 608, not FRSC 308.

Sorin Popescu
 Course title: Advanced Remote Sensing

Course number: ESSM 656

Course date: Fall Semester 2008

Location: Lectures and labs: Centeq B 214

Meeting day(s): Tuesday and Thursday

Meeting time(s): Lectures: Tuesday and Thursday 12:45 to 1:35
Lab: Thursday 1:45 to 3:45 (SSL)

Course description

The goal of this course is twofold: to introduce students with a basic knowledge of remote sensing to advanced topics in digital remote sensing applications and to instill enthusiasm in this subject area to encourage future specialists. The course emphasizes a hands-on learning environment, with in depth insights into theoretical and conceptual underpinnings in both aerial and satellite remote sensing. Primary focus will be placed on advanced active (lidar) and passive sensors characteristics, digital image analysis, and processing for a broad range of sensors and applications. Ultimately, the course will empower students to delve more deeply into advanced issues in remote sensing and to customize and develop image processing tools for their particular area of interest.

Prerequisites: Approval of instructor or one of the following: FRSC 608 (ESSM 655), RENR 444, GEOG 651, GEOG 661.

Learning outcomes

Upon completion of the course, students are expected to:

1. Compare remote sensing systems characteristics and select appropriate imagery for environmental applications
2. Perform pixel-based and object-oriented image classification; compare results of various classification techniques and select the most accurate classifier
3. Select appropriate segmentation parameters when using object-oriented classification
4. Understand principles of active sensors data, such as lidar data, including discrete return and full waveform data
5. Process lidar and optical remote sensing data and understand data fusion
6. Write basic working programs for processing digital images (using IDL)
7. Report in writing and orally present the remote sensing approach to problem solving
Instructor information

Name: Sorin Popescu
Email: s-popescu@tamu.edu
Office location: Centeq B221D
Phone: 862-2614
WebCT/Vista: http://elearning.tamu.edu (follow link to VISTA LOGINS @ TAMU)

Office hours: Open door policy, though I recommend emailing or calling for appointments. Please put “656” in the subject of email messages regarding this class to receive prompt attention. Please avoid “drop-ins” just before class on Tuesday and Thursday.

Teaching assist. Muge Mutlu, PhD student mugemutlu@tamu.edu
Office hours: Friday, 1:00-2:00pm

Textbooks


Lecture materials and references posted on WebCT/Vista

Grading

10 point brake-out system

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90.0 – 100</td>
</tr>
<tr>
<td>B</td>
<td>80.0 - 89.9</td>
</tr>
<tr>
<td>C</td>
<td>70.0 – 79.9</td>
</tr>
<tr>
<td>D</td>
<td>60.0 – 69.9</td>
</tr>
<tr>
<td>F</td>
<td>00.0 – 59.9</td>
</tr>
</tbody>
</table>

Lab assignments and homework: 25 % (due at the beginning of the following lab period)

Project: 20 %

Paper presentation: 10 % (includes answers to questions)

Midterm exam: 20 % October 11, Thursday, during lecture/lab time

Final exam: 25 % December 12, Wednesday, 8-10 a.m.

Lab assignments: All lab work is due at the beginning of the following lab period. All laboratory and homework assignments are to be completed in a neat, logical, and clear fashion.

Late assignments: A 10% reduction in grade, up to a maximum of 50%, will be assessed for each weekday an assignment is handed in late. Assignments will not be accepted if more than 5 weekdays late, unless documented excuse is presented as per Texas A&M University rules.
**Important dates**

Midterm exam: October 11, Thursday, during lecture/lab time

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>% of project grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project proposal and presentations</td>
<td>October 18(^{th})</td>
<td>5%</td>
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<tr>
<td>Project progress report</td>
<td>November 1(^{st})</td>
<td>10%</td>
</tr>
<tr>
<td>Project paper due</td>
<td>November 29</td>
<td>75%</td>
</tr>
<tr>
<td>Project presentations</td>
<td>November 29</td>
<td>10%</td>
</tr>
<tr>
<td>Final exam</td>
<td>December 12, Wednesday, 8-10 a.m.</td>
<td>65%</td>
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Student paper presentation dates: September 27, October 4, October 25, November 15

**Tentative course and laboratory outline**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Definition of terms; Visualization of remote sensing data; Electromagnetic spectrum and radiation laws as they relate to remote sensing.</td>
</tr>
<tr>
<td>2</td>
<td>Active and Passive sensors, sensor platforms (airborne &amp; satellite). Review of the remote sensing process. Understanding the capabilities of today’s sensors for various types of applications.</td>
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<tr>
<td>3</td>
<td>Image processing considerations and processing techniques.</td>
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<tr>
<td>5</td>
<td>High resolution imaging satellites and applications. High-resolution digital airborne imagery. Image analysis and processing issues.</td>
</tr>
<tr>
<td>6</td>
<td>Image segmentation methods for object-based analysis and classification (ENVI Feature Extraction and Definiens Professional).</td>
</tr>
<tr>
<td>8</td>
<td>Lidar-derived elevation: bare Earth DEMs and applications in urban areas, topographic mapping, forestry.</td>
</tr>
<tr>
<td>9</td>
<td>Lidar image geometry. 3D feature extraction.</td>
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<tr>
<td>10</td>
<td>Planning a lidar acquisition; deciding upon data collection characteristics. Fusion with multispectral data.</td>
</tr>
<tr>
<td>11</td>
<td>Large resolution remote sensing sensors (MODIS) and applications.</td>
</tr>
<tr>
<td>12</td>
<td>Hyperspectral remote sensing. Current sensors and applications in natural resources.</td>
</tr>
<tr>
<td>13</td>
<td>Hyperspectral information extraction. Advanced processing techniques.</td>
</tr>
<tr>
<td>14</td>
<td>The digital revolution in remote sensing: What’s next? Final exam review</td>
</tr>
</tbody>
</table>

**Laboratory, Homework, and Exam policy**

The University policy on Scholastic Dishonesty will be enforced in this course. While you are encouraged to help each other understand concepts and techniques, all work submitted should be your own. Exceptions to this policy will be explicitly noted by the instructor and should not be assumed by students.
All laboratory and homework assignments are to be completed in a neat, logical, and clear fashion. A 10% reduction in grade, up to a maximum of 50%, will be assessed for each weekday an assignment is handed in late. Assignments will not be accepted if more than 5 weekdays late, unless documented excuse is presented (family or medical emergencies).

**Laboratory reports**

Unless otherwise indicated, all laboratory exercises must contain a brief report following the format guidelines given below. The report should be divided into **Introduction, Methods, Results and Discussion, and Conclusions** sections, and should tie together and synthesize the lecture, readings, and practical exercises. In the Methods section do not include a list of ENVI commands that you have used. Give instead the big picture of your approach and the remote sensing/image processing methods that you have used. You may include an appendix of ENVI commands used, for future references. Figures and tables inserted in the text are encouraged. When appropriate, include snapshots of your imagery in the report, mainly in the Results section, but no larger than half a page. Each laboratory exercise will be due the following laboratory period, at the beginning of class, unless otherwise indicated. Instructor may give extra credit to students that engage in developing the assignment beyond the required tasks, e.g., extra programming developments, extended literature search and citations on the topic, etc.

**Projects**

Each student is required to design and implement a class project. The project must use digital image source data and the student must develop a specific output product useful in his own field of interest for applying remote sensing. The project is designed to (1) build upon and synthesize techniques or concepts demonstrated in class, and (2) let you explore your own data sets and research objectives using your developing remote sensing "toolkit." Work that contributes to your thesis research or current employment is encouraged. Students may write their own image processing software, using IDL, as an integral part of the project; however, a specific (useful) output product must be one result of the project. Group projects tackling larger research or management issues are encouraged. All projects require instructor approval.

A proposal (150-word maximum) and outline describing the project and **proposed methods** must be turned in by the date indicate in the **Important dates** section. However, students are encouraged to turn in proposals as soon as is feasible. The proposal/outline should contain at least **five** preliminary references. The final report must be no more than twenty pages in length including figures and references, and the final report and summary/outline must follow the format guidelines for papers and laboratory reports. Failure to follow these guidelines will result in the paper not being accepted. The final report must 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. Laboratory time will be provided for work on your project during the semester, but will be insufficient by itself. A 2-5 page project progress report is required at the start of class as indicated in the **Important dates** section. Well-chosen student projects may be suitable for **subsequent publication** in either conference proceedings or the peer-reviewed literature. Please keep this goal in mind as you develop and carry out your projects, and particularly as you prepare your final reports.
Format Guidelines for Papers and Laboratory Reports
Papers and lab reports must be double-spaced (using a 12-point proportionally-spaced font) with 1 inch margins all around. Captions, references, footnotes, appendices, tables, etc. may be single-spaced. Figures and tables are encouraged when they serve to illustrate or clarify a point. They should be inserted in the text. Each page following the first full page of text should have a page number in the upper right corner or bottom center. A title page may be supplied; however, reports in special binders of any kind will generally not be accepted. In text citations and references should follow the guidelines for manuscripts submitted for publication to the American Society of Photogrammetry and Remote Sensing (http://www.asprs.org/publications.html), for Photogrammetric Engineering and Remote Sensing (PE&RS). Lab reports should be printed on one side of 8.5 by 11 inch white paper. Final projects must be printed using the same criteria. Students are required to keep photocopies and/or electronic copies of all work submitted.

Student paper presentations
Each student will present at least one scientific paper published in a remote sensing refereed journal throughout the course (approx. 30 min, including questions). Students should consult the presentation dates in the “Important dates” section and decide by the second week of classes when they intend to present. Each student is expected to find three research papers published in remote sensing journals that fit the topic of interest for his/her research and ideally match lectures topics covered during the week of the presentation. At least one week before the scheduled presentation date, the student should consult with the instructor and choose one of the three papers for presentation. Students will make the chosen paper available as pdf to the instructor, to be posted on WebCT a week in advance of the presentation date. Each student is required to prepare at least one question for the presenter. Questions should indicate depth of thought and familiarity with the topic covered in the paper. Presentations should clearly present research objectives, methods, results, conclusions, and implications for his/her own research. It is expected that the presenter will critically evaluate the work presented in the paper. Grades reflect on both the presentations and the questions asked. Recommended journals: Photogrammetric Engineering & Remote Sensing, Remote Sensing of Environment, Canadian Journal of Remote Sensing, etc.

Aggie Code of Honor
Aggies do not lie, cheat, or steal, nor do they tolerate those who do.
The Aggie Code of Honor functions as a symbol to all Aggies, promoting understanding and loyalty to truth and confidence in each other. http://www.tamu.edu/aggiehonor

Americans with Disabilities Act
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

For any other questions or concerns, please refer to http://student-rules.tamu.edu