Course Change Request

New Course Proposal

Date Submitted: 08/30/20 10:48 pm

Viewing: GGS 426 : Physical Fundamentals of Remote Sensing

Last edit: 08/30/20 11:17 pm

Changes proposed by: nburtch

Are you completing this form on someone else's behalf?

No

In Workflow

1. **GGS Chair**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. Assoc Provost-Undergraduate
5. Registrar-Courses
6. Banner

Approval Path

1. 11/25/19 4:15 pm Nathan Burtch (nburtch): Approved for GGS Chair
2. 12/06/19 12:19 pm Gregory Craft (gcraft): Rollback to Initiator
3. 09/10/20 2:00 pm Nathan Burtch (nburtch): Approved for GGS Chair

Effective Term: Spring 2021

Subject Code: GGS - Geography & Geoinformation Science **Course Number:** 426

Bundled Courses:

Is this course replacing another course? No

Equivalent Courses:

Catalog Title: Physical Fundamentals of Remote Sensing

Banner Title: Phys Fndmntls Remote Sensing

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture

Hours of Lecture or Seminar per week: 3

Repeatable: May be only taken once for credit, limited to 3 attempts (N3)

Max Allowable Credits: 9

Default Grade Mode: Undergraduate Regular

Recommended Prerequisite(s):

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):
GGS 379

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description:

An introduction to fundamental physical principles of remote sensing as applied to Earth science. Focus on the physical and mathematical principles underlying satellite remote sensing techniques. Topics include radiometric information, satellite orbits, atmospheric corrections, data records, and in situ measurements. Current and planned satellite instruments, particularly those operated by NASA, NOAA, and USGS, are utilized.

Justification:

This course has been offered at the 700-level. The proposal is to adjust the content to allow for a 426 / 626 crosslist. The course is designed to add additional depth in the department's remote sensing offerings. This undergraduate course will be added to our advanced techniques course offerings in both the GEOG BS and GIS minor

Does this course cover material which crosses into another department? No

Learning Outcomes:

Attach Syllabus

RS_phys_fund_proposal.pdf

Additional Attachments

Staffing:

This course has been designed by Dr. John Qu, who will be the primary instructor of this course. Additional GGS faculty with remote sensing experience can also teach the course as needed.

Relationship to Existing Programs:

GGS 426 will be offered as an Advanced Techniques course in the BS GEOG degree, and as an elective in the GIS minor

Relationship to Existing Courses:

This course expands the depth of remote sensing course offerings in GGS. After students develop a background in remote sensing in either GGS 379 or GGS 416, GGS 426 is a course that will develop further remote sensing principles.

Additional Comments:

Reviewer Comments

Gregory Craft (gcraft) (12/06/19 12:19 pm): Rollback: Per email

Key: 16651

Physical Fundamentals of Remote Sensing

GGS 426 / GGS 626

Catalog Description

An introduction to fundamental physical principles of remote sensing as applied to Earth science. Focus on the physical and mathematical principles underlying satellite remote sensing techniques. Topics include radiometric information, satellite orbits, atmospheric corrections, data records, and in situ measurements. Current and planned satellite instruments, particularly those operated by NASA, NOAA, and USGS, are utilized.

Course Description

This course is designed to give students with limited Earth science satellite remote sensing background a thorough introduction to gather the basic concepts and physical fundamentals of remote sensing. The main emphasis of this course is on the basic physical and mathematical principles underlying the satellite remote sensing techniques, including radiometric and geometric information, satellite orbit and geo-location simulation, designing, atmosphere corrections, raw data record (RDR), sensor data record (SDR), environment data record (EDR), climate data record (CDR) and in situ measurements in support of remote sensing. In addition, this class will provide a focus on the NASA, NOAA and USGS current and future satellite instruments. This course aims to provide students all-inclusive overview of the state of the art in physical fundamentals of remote sensing for monitoring global, regional, and local atmosphere, both of the ocean and land surface.

Prerequisites

GGS 426 requires GGS 379 as a prerequisite. GGS 626 has a recommended prerequisite of GGS 579.

Undergraduate grading

Grades will be based upon students' performance on the homework exercises, midterm, class attendance and final term paper and presentation. The weighted contribution of each of these items to your final grade is given below:

- Homework 15%
- Quiz 20%
- Midterm: 25%
- Final Exam 30%
- Class Attendance 5%

Grading scale: (A=90-100, B=80-89, C=70-79, D=60-69, F=<60)

Graduate grading

Grades will be based upon students' performance on the homework exercises, midterm, class attendance and final term paper and presentation. The weighted contribution of each of these items to your final grade is given below:

- Midterm 30%
- Homework 20%
- Final Project 50%

Grading scale: (A=90-100, B=80-89, C=70-79, F=<70)

Detailed Schedule

Week one	Introduction to Earth science satellite remote sensing
Week two	Physical fundamentals of remote sensing
Week three	Top atmospheric solar radiation (Quiz one)
Week four	Atmospheric absorption and scattering
Week five	Radiation transfer in the atmosphere (Quiz 2)
Week six	Applications radiation transfer principles to remote sensing
Week seven	Platform for remote sensing and Raw Data Record (RDR) data products
Week eight	Satellite orbit and geo-location simulation
Week nine	Mid-term
Week ten	Sensor Data Record (SDR) data products
Week eleven	SDR algorithms and calibrations (Quiz 3)
Week twelve	Atmospheric correction and surface reflectance
Week thirteen	Selected Environmental Data Record (EDR) data products (Quiz 4)
Week fourteen	Selected Climate Data Record (CDR) data products
Week fifteen	Final exam

Required Textbook: None

Reference Books

1. Kuo-Nan Liou, 2002, An Introduction to Atmospheric Radiation, Second Edition, Academic Press, ISBN 0-12-451451-0
2. Charles Elachi, 1987, Introduction to the Physics of Remote Sensing, Wiley Series in Remote Sensing, John Wiley & Sons Inc., ISBN-0-471-84810-7.

3. Wiley J. Larson and James R. Wertz, 1997, Space Mission Analysis and Design, Space Technology Series. Kluwer Academic Publishers, ISBN 1-881883-01-9 (paperback), ISBN 0-7923-1998-2 (hardback).

University Policies

The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.

GMU email accounts

Students must use their Mason email accounts-either the existing MEMO system or a new MASONLIVE account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.

Honor Code

Students must strictly follow the honor code, both for individual and teamwork. No exception will be made. University policy requires that faculty members report incidents of Honor Code Violation. Scholastic dishonesty includes but is not limited to plagiarism (reference your sources and quotations), copying others' work, limiting others' access to course materials, sabotaging others' work, turning in the same paper or project for two classes without permission from all instructors, and many other things. You are responsible for the GMU Scholastic Honor Code, found in the GMU University Catalogue.

Students with Disabilities

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474. All academic accommodations must be arranged through that office.

Student use of electronic devices

The use of computers, either lab desktops or personal laptops, is required for the course. You will only be permitted to work on material related to the class, however. Engaging in activities not related to the course will result in a significant deduction in your participation grade. Please be respectful of your peers and instructor and avoid email, social media, and other distracting uses of computers.

Class Cancellation

If a class is cancelled due to inclement weather or other reasons, the syllabus will be updated as early as possible. Best efforts will be made to send each student an email with information on the

cancellation of class. Make up classes will be scheduled during the next lecture. When an exam is cancelled, it will be given during the next lecture.