

# Hyperspectral Imaging (HSI) Remote Sensing Course at George Mason University, Fall 2019

## GGG 740 – 001, (CRN 81862), Hyperspectral Imaging Systems

*Fall Semester 2019 - Credit Hours: 3*

**Description:** This course will provide students with the concepts, principles, and methods of earth remote sensing with hyperspectral imaging (HSI) technology in the visible through longwave infrared regions of the electromagnetic spectrum. Course emphases will be on scientific principles, algorithms, hands-on data analysis, and applications of HSI technology to real world problems. Specific topics to be covered include hyperspectral image formation, the nature of HSI data, data analysis and exploitation methods and techniques, data collection systems and system tradeoffs, and data conditioning/calibration. HSI data analysis and exploitation methods to be discussed include: data visualization (in hyperspace; the interpretation of scatter plots), algorithms (e.g., spectral angle mapping, spectral mixture analysis/subpixel analysis, spectral matched filters, and other techniques), atmospheric compensation, and product generation/export. Applications and case studies will be drawn from (but not limited to) the environmental, geological, and agricultural arenas. Ground, airborne, and spaceborne HSI systems will be covered.

**Course Objectives:** To provide students with an introduction to modern hyperspectral imaging remote sensing techniques and the fundamental science underpinning this technology. The course will: (1) prepare the student to undertake graduate research in HSI remote sensing and related areas; (2) prepare the student to participate in professional activities in HSI technology; (3) broaden the student's background in the general field of spectral remote sensing and image processing; and (4) prepare the student to independently discover applications of this important enabling technology to areas of interest to potential end users of HSI data and products.

**Prerequisites:** An introductory course in remote sensing or digital image processing; other academic or industrial/professional experience in remote sensing; or permission of instructor.

**Required Materials:** Student license of the ENVI<sup>®</sup> software package (ENVI + IDL); see: (<https://www.harrisgeospatial.com/Industry-Solutions/Academic#students>)

**Textbook:** *Hyperspectral Imaging Remote Sensing: Physics, Sensors, and Algorithms* by Manolakis, Lockwood, and Cooley, Cambridge University Press, 1<sup>st</sup> ed., 2016, ISBN-13: 978-1107083660. [This book is used in the course for reference; it is not the basis of the curriculum.](#)

**Grading:** Mid-Term Take-Home Exam – 25%; Take-Home Final Exam – 25%  
Homework Assignments – 25%; Mini-Project – 25%

**Instructor:** Dr. Ronald G. Resmini

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**Class:** Fairfax campus, Exploratory Hall, room 2312, Mondays, 4:30 p.m. to 7:10 p.m.  
First day of class: 26<sup>th</sup> of August and last day of class: 2<sup>nd</sup> of December, 2019.

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