RMS 5105. Fundamentals of Remote Sensing. 3 Hours.
Introduces remote sensing principles, datasets, and basic interpretation/analysis. Covers four general categories: physical processes/theories involved in remote sensing, e.g., the nature and properties of electromagnetic radiation and how it is affected by interactions with the atmosphere and earth’s surface; different sensor types and platforms, including optical, thermal, and microwave systems, from UAVs to environmental satellites; different applications of remote sensing such as land-use, land-change, vegetation, natural hazards, precision agriculture, and military; and starting methods of remote sensing to analyze images and extract desired information. Software used includes ArcGIS Pro, ArcGIS Online, GIMP, and FOSS.

RMS 6110. Introduction to Machine Learning for Image Data. 3 Hours.
Explores a range of machine learning routines, including image classifications and clustering, PCAs, and data reduction. Students perform exercises corresponding to concepts introduced in weekly lessons. Focuses on computer thinking, algorithms involved in preprocessing, spectral and spatial enhancement, spatial analysis, and linear transformations. Utilizes a variety of data types and an opportunity to experience the journey of geospatial image data from its origin (raw data) to its end (transformation) in the context of the process, scope, and real-world scenarios. Examples provided with GBDX notebooks and customized work flows as entry to Python, cloud-based analytics, and web-based GUI software: ENVI, ArcGIS, and GBDX.

RMS 6215. Unmanned Aerial Systems for Geospatial Analysts. 3 Hours.
Covers the concept of unmanned aerial systems (UAS), CubeSats, and LiDAR for collision avoidance. Offers students an overview of the components of a command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network. Focuses on new technologies (UAS and CubeSats) and their applications in remote sensing, including the skills needed to recognize, evaluate, and develop systems and overall networks for a range of functions in the military, security, scientific, and commercial applications in government and market ventures. Software utilized includes PixElement (Platform as a Service); DroneMapper (free version); DroneDeploy (for flight planning); Photogrammetry (TBC).

RMS 6225. Value of Information and Geospatial Analytics. 3 Hours.
Focuses on Value of Information (VOI) theory as applied to solving geospatial intelligence problems. Introduces students to VOI theory by working with a series of case studies where various types of data are introduced at different times in the problem-solving process. Offers students an opportunity to develop an understanding of the value of numerous data types (satellite, airborne, terrestrial; LiDAR; existing maps and GIS data; open source data including social media), the incremental value of each piece of data, and how to quantify the incremental value. Analyzes VOI theory as it relates to geospatial intelligence and demonstrates how to set up an analytic problem to calculate the value of data within that analytic problem construct. Software: GIS and remote sensing analytic software; VOI analytic framework (e.g., SAS).

RMS 6230. Remote Sensing and Global Change. 3 Hours.
Analyzes various components of the Earth systems and how those components are changing. Offers students an opportunity to make extensive use of observations and measurements from space. Focuses on global environmental change and climate change, that is, on the human impact on the planet and the modification of environments by human activity. Among the topics covered are ozone, SST, glacier distribution, and terrain impacts of human activity. Requires a research paper that includes elements of remote sensing data analysis.

RMS 6240. Introduction to Radar and LiDAR Remote Sensing. 3 Hours.
Introduces the techniques and methods of active imaging used in radar and Light Detection and Ranging (LiDAR). Covers the underlying principles of the measurement techniques and the interaction of microwaves and LiDAR signals with natural surfaces and the atmosphere. Regarding radar, the course focuses on the role of synthetic aperture radar (SAR) systems and their application to monitoring aspects of the Earth’s surface, including 3-D. Regarding LiDAR, the course introduces the different airborne and satellite systems and applications in terrestrial surfaces, principally for urban applications. Students complete a weekly lab project related to the processing and analysis of these data. Software: ArcGIS; ENVI; LIDAR Analyst; ESA SNAP Toolbox; ASF MapReady; ASF SAR Training Processor; USDA FS FUSION; FugroViewer.

RMS 6250. Spatial Analytics for Vegetation and Precision Agriculture. 3 Hours.
Explores a range of Earth observation and geospatial statistical routines required for vegetation analysis ranging from forests to precision Ag. Synoptic perspectives allow spatial patterns of surface phenomena to be studied, vegetative features extracted, and base maps created. Students perform exercises to create derived products, such as normalized difference vegetation indices and soil maps used to track the length of growing seasons or as operational and business data for day-to-day farm operations. Includes high to low spatial and spectral data from CubeSats, UAVs, and airborne and terrestrial LiDAR. Software: Desktop Analyst software (Arc or Q), GeoMesa, rapidlasso, and GeoDa.

RMS 6260. Remote Sensing for Archaeology and Cultural Resource Management. 3 Hours.
Provides an overview of the application of remote sensing to archaeological research (survey and analysis) and archaeological heritage/cultural resource management. Remote sensing is complementary and integrative to other geospatial disciplines utilized in archaeology and cultural resource management. Includes utility of single-band, multispectral, hyperspectral, RADAR, LiDAR data, and DEMs obtained from airborne and space-borne platforms. Includes a brief survey of all geospatial disciplines (GIS, GPS, CAD, surveying, etc.); types of data most often used; and GIS integration for contextual analysis. Students complete a final project of their choosing. Software used includes FOSS and proprietary.

Search RMS Courses using FocusSearch (http://catalog.northeastern.edu/class-search/?subject=RMS)
RSMS 6270. Remote Sensing for Disaster Management. 3 Hours.
Offers students an opportunity to understand the use of spatial information in disaster management and to acquire a comprehensive overview and hands-on skills in the application of remote sensing. The course is in five modules: (1) remote sensing theory, sensor/platform combinations, spectral imaging theories, atmospheric and radiometric correction, as well as sources for data download and analysis; (2) the use of remote sensing and GIS tools for use in wildfire management; (3) the use of remote sensing for flood mapping and analysis; (4) man-made disasters, such as oil spills, and consequence management of terrorist attacks or pre-event planning to mitigate effects of a terrorist attack; and (5) a final project in which students analyze a set of data and produce a final report.

RSMS 6280. Automated Feature Extraction for the Geospatial Professional. 3 Hours.
Introduces machine learning and automated feature extraction software and how it is utilized for image interpretation. Explores a variety of techniques and work flows associated with collecting features of interest from multiple data sources, e.g., aerial and satellite imagery, LiDAR, and elevation data. Students use AFE software to solve real-world problems in exercises corresponding to concepts introduced in weekly lessons. Offers students an opportunity to learn how to use feature extraction to create industry-standard analytical products and develop processing models for automation. Discusses the fundamentals of machine learning, supervised and unsupervised classification, hierarchical learning, postprocessing, cleanup, automation, modeling, and publication. Software: Esri ArcGIS 10.5; Feature Analyst for ArcGIS; LIDAR Analyst; ENVI; ENVI LiDAR.

RSMS 6290. Spectroscopic Image Analysis. 3 Hours.
Explores the various techniques and work flows associated with nonliteral imagery analysis using hyperspectral data from numerous airborne and space-borne hyperspectral imaging (HSI) sensors. The course is divided into four modules: (1) basic theoretical concepts that underpin HSI analysis; (2) data preparation and other ancillary concepts such as spectral libraries and atmospheric correction that are critical to nonliteral analysis but are preprocessing steps; (3) nonliteral exploitation techniques, covered in sufficient depth to give the students an opportunity to understand the different methods and procedures used; (4) a final project where students are expected to conduct nonliteral analysis of a hyperspectral image from pre- through postprocessing. The ENVI software system is used extensively each week.

RSMS 6293. Allied Technologies in Remote Sensing. 3 Hours.
Includes an overview of unmanned aerial systems (UAS), small satellites (CubeSats), and photogrammetry and GPS. Includes a review of digital elevation models, datums, projections, coordinate systems and scale for integration with components of a command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network. Focuses on various technology applications and skills to recognize, evaluate, and develop systems and overall networks for a range of functions. These include military, security, scientific, and commercial applications in government and market ventures. Software used includes PixElement (Platform as a Service), DroneMapper (free version), DroneDeploy (for flight planning), and drone2map.

RSMS 6962. Elective. 1-4 Hours.
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RSMS 6983. Topics. 1-4 Hours.
Covers special topics in remote sensing. May be repeated without limit.