

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: None	Unit Type: theoretical	Number of Units: 2	Course Title: Research Methodology For Remote Sensing And Geographic Information System
Complementary education: yes Lab, excursion, Seminar : No Workshop: yes		Number of hours: 32	Specialist lecturer to teach: Expert of Remote Sensing And Geospatial Information System
Objectives: Familiarity with methods of research and steps			
Syllabus: <ol style="list-style-type: none"> 1. Definitions, phenomena, research principles and know-how 2. Research subject fields in RS/GIS 3. Subjective research approaches 4. Documenting research procedures 5. Data gathering methods 6. Data analysis methods 7. Research start-up 8. Implementing a sample evaluating plan 9. Current state of researches in GIS/RS 			
references <ul style="list-style-type: none"> • Hafeznia Mohammad Reza, 1377, An Introduction to research method in humanity science, Samat publication • Liaghat Gholam Hosein, 1377, Research method in engineering science, Iran industrial and scientific investigation organization 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: None	Unit Type: theoretical	Number of Units: 2	Course Title: Principle and Physics of Remote Sensing
Complementary education: No Lab, excursion, Seminar, Workshop : No		Number of hours: 32	Specialist lecturer to teach: Remote Sensing Expert
Objectives: Familiarity with fundamentals of remote sensing including physics of remote sensing, types of platforms and sensors			
Syllabus: <ol style="list-style-type: none"> 1. Introduction (definition, history and application of RS) 2. Remote sensing physics (Electromagnetic spectrum, electromagnetic radiation laws, spectral reflectance curve, digital imagery, satellite imagery(optical, thermal and radar), spatial, spectral, radiometric and temporal resolution) 3. Optical remote sensing systems (cameras and aerial photography, multi spectral scanning systems, thermal distortions in optical imaging system, geometric imagery) 4. Microwave imaging (Active and passive radar remote sensing, radar history, radar basics, viewing geometry and spatial resolution, radar image distortions, target interaction and image appearance) 5. Satellite sensors (optical satellite sensors, radar satellite sensors, other satellite sensors) 6. Image analysis (Visual interpretation, digital processing) 			
references <ul style="list-style-type: none"> • Mobasheri Mohammad Reza, 1386, Fundamentals of remote sensing physics and satellite technology , Khaje Nasir Toosi publication • Corran Poul, 1985 , principle of remote sensing • Jensen John R, 2000 , Remote Sensing of the Environment • Stewart Robert H, 1985, Methods of Satellite Oceanography 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Principle and Physics of Remote Sensing	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Advanced digital image processing
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Remote Sensing Expert
Objectives: Familiarity with digital images processing including atmospheric, geometric and radiometric corrections			
Syllabus: <ol style="list-style-type: none"> 1. The basic components of remote sensing systems 2. Atmospheric correction, determination of sensor fault and other sources of radiometric error 3. Geometric error correction using ground control points, mathematical modeling and orbital parameters of the sensor 4. Geometric correction methods 5. Types of filters for processing images 6. Fourier analysis and its applications, and image filtering based on Fourier analysis 7. Principles of pattern recognition, satellite images interpretation and classification techniques, advantages and limitations of visual interpretation and digital classification, thematic mapping techniques using visual interpretation of data 8. Extracting information from satellite images (numerical methods in the classification of satellite data, supervised methods, unsupervised methods, the hybrid method classification, the concept of classes and spectral information) 9. Clustering algorithms used in image processing 10. Supervised classification algorithms 11. Modify the classification 12. Assessing classification accuracy, and methods of sampling 			
references <ul style="list-style-type: none"> • Mizer Pol M, 1377, Computerized processing of remote sensing images, Samt publication • Couran pol, 1373, Principles of Remote Sensing, Iran Remote Sensing Center Publication • Alavipanah Seyed Kazem, 1382 , Application Of Remote Sensing in Earth Science, Tehran University Publication • Bordick Haward, 1378, Digital Illustration, National Cartographic Center Publication • Zeybary Mahmoud And Majd Alireza, 1380, Familiarity With Remote Sensing Technique And Application In Natural Resources, Tehran University Publication • Jenson John R, 1986, Englewood Clffe, Introductory Digital Image Processing, N.J. Prentice-Hall Publisher 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: None	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Advanced Geographic Information System
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Geographic Information System Expert
Objectives: Familiarity with kinds of spatial analysis in geographic information system and work with them			
Syllabus: <ol style="list-style-type: none"> 1. An introduction to GIS and application of GIS 2. Data transformation (Vector-Raster and converting point, line and polygon layers in vector model) 3. Fundamental function in GIS include data operations, connectivity, overlay operations, scaler operation, reclassification and neighborhood operations 4. Advanced function in GIS include statistical modeling, multivariate analysis, correlation technique, time series analysis, Geostatistical analysis 5. Spatial exploratory data analysis 			
references <ul style="list-style-type: none"> • Korilus Sara And Karor Steave, 1381, An Introduction to Geographic Information Systems, National Cartographic Center Publication • Aronove Stane, 1375, Geographic Information Systems, National Cartographic Center Publication • Melczewski Jacck, 2000, GIS And Multicriteria , John Wiley & Sons Publisher. • Osullivan David and Unwin David, 2002, Geographic Information Analysis, John Wiley & Sons Publisher • Fortheringham Stewrt, 1994, Spatial Analysis And GIS, Taylor & Francis Publisher 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Principle and Physics of Remote Sensing	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Thermal Remote Sensing
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Remote Sensing Expert
Objectives: Familiarity with Concepts Of Thermal Remote Sensing, Processing and Application of Thermal Images			
Syllabus: <ol style="list-style-type: none"> 1. The importance and the history of thermal remote sensing 2. Process and characteristics of temperature 3. Thermal properties, energy balance, and radiative behavior of materials 4. Thermal infrared sensors 5. Reconstruction and interpretation of thermal infrared images 6. Applications of thermal remote sensing 			
references <ul style="list-style-type: none"> • Alavi panah Seyed Kazem, 1385, Thermal Remote Sensing and Application in Earth Science, Tehran University Publication • Dale A. Quattrochi, Jeffrey C. Luvall, 2005, Thermal Remote Sensing In Land Surface Processes 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Principle and Physics of Remote Sensing	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Microwave and radar images
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Remote Sensing Expert
Objectives: Learning How to Process and Functions of Radar Images			
Syllabus: <ol style="list-style-type: none"> 1. Physics principles and characteristics of microwave remote sensing 2. Principles and types of active and passive radar 3. Principle of sending and receiving microwaves 4. Geometry and spatial resolution of radar imaging 5. Platform and radar sensors (RAR, SAR, AMI, SLAR, SIR) 6. Radar polarization and its applications 7. Radar image characteristic 8. Noise in radar images, and noise reduction method 9. Geometric correction of radar images 10. Synthetic Aperture Radar Systems 11. Types of Radar Images and Its applications 12. Principles of radar image processing and related software 13. Radar altimetry, three-dimensional data production (DEM) 14. Interferometry techniques and measuring changes in the earth's crust 15. Important applications of radar images (agriculture, soil, weather, etc.) 16. Lab Exercises: Processing radar images according to the above steps 			
references <ul style="list-style-type: none"> • Pole Koran, 1373, Principle of Remote Sensing, Iran Remote Sensing Center Publication • Steinberg, Bernard D., Microwave Imaging Techniques, 1991, New York, J, Wiley • Introduction to Microwave Remote sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Advanced Geographic Information System	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Database Management
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Geographic Information System Expert
Objectives: Familiarity With Basic Concepts Of Databases And How to Create, Update and Output From Them			
Syllabus: <ol style="list-style-type: none"> 1. Information and database technology (definition, history, application, database models) 2. The relational model (concept, relation database design process and relation database laws) 3. JSP queries (examples and power of jsp queries, parametric and inner nested queries, queries using set operators) 4. World modeling and spatial databases(raster, vector, geodatabase) 5. Database design(need analysis, conceptual, logic and physical design, spatial data management in GIS) 6. Database software(inserting, updating, management, programming) 7. Practical exercise (database design using by a database software) 			
references <ul style="list-style-type: none"> • Miranda Li Pao, 1380, Storing And Retrieval Of Information, Ferdosi Mashhad University Publication • Jenifer Rolie, 1380, Principle of Geographic Information System, Samt Publication • Hagon Rex, 1990, A Practical Guide To Database Design, Prentice Hall,. • Grauer Robert, 1992, Database Management Using dbase IV and SQL, Mc Graw-Hill • Jones J.A., 1997, Database In Theory and Practice, ITP Publisher 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Advanced Geographic Information System	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Digital Terrain Modeling
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Geographic Information System Expert
Objectives: Familiarity with how to collecting, creating digital height models and their application.			
Syllabus: <ol style="list-style-type: none"> 1. Introduction (definition, concepts and elements of DTM) 2. Surface representation (Models in DTM generation, DTM generation using by surveying, photogrammetry, remote sensing data and digitized contours) 3. Interpolation methods (Trend surface analysis, spline, local interpolation methods(TIN based and Grid based)), kriging(ordinary, universal, indicator and co kriging)) 4. DTM analysis , visualization and procedure (slope, aspect, contour, hillshade, viewshade, shaded relief DTM images, perspective view, drainage line) 5. DTM application (discussion about DTM application in ortho photo generation, resource management, transportation, civil, hydrology and volume calculation) 6. Practical exercise (DTM generation, visualization and analysis in a GIS software environment) 			
references <ul style="list-style-type: none"> • Baro, Geographic Information System, Samt Publication,1387 • Li Zhilyn , 1386, Digital Terrain Modeling (Principles and Methods). • Unwin David J., 1994, Visualization in Geographic Information System, John Wiley Publisher. 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: None	Unit Type: theoretical	Number of Units: 2	Course Title: Principles and methods of water and soil Studies
Complementary education: Yes Excursion : Yes Lab, Seminar, Workshop : No		Number of hours: 32	Specialist lecturer to teach: Natural Geographer
Objectives: Familiarity with basic concepts of soil and water studies			
Syllabus: <ol style="list-style-type: none"> 1. Principles and concept of planning and sustainable development 2. Environmental planning processes 3. History of application of RS and GIS in Water and Soil studies 4. Problems and challenges of environmental planning and management in Iran 5. Different kind of necessary and applicable data in planning and study of water and soil 6. Environmental disasters in water and soil study 7. rule of RS in information recourses generation for water and soil study 8. Different kind of planning and study projects of water and soil in Iran 			
references <ul style="list-style-type: none"> • Makhdoum Majid, 1380, Environment evaluation and planning using GIS, Tehran university publication. • Makhdoum Majid, 1372, Foundation for land use planning, Tehran university publication • lourise and vien ,1381, Environmental Management, Environmental protection organization publication • Environmental planning for land development, translated by Dr. Bahreyni and Dr. Keyvan. Tehran university publication, 1381 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Principle and Physics of Remote Sensing Advanced digital image processing	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Basic of application of Remote Sensing in water and soil study
Complementary education: Yes Lab : Yes Excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Remote Sensing Expert
Objectives: Learning how to process and application of remote sensing images in soil and water studies			
Syllabus: <ol style="list-style-type: none"> 1. Physics and spectral characteristics of different water and soli 2. Principles of working and different kind of suitable platforms and sensors for water and soil study (Active and passive) 3. Principles and methods for different kind of water and soil recognition in satellite images 4. Multi- spectral images processing for water and soil information extraction 5. Hyper spectral remote sensing and its application in water and soil study 6. Radar Remote Sensing and its application in water and soil study 7. Thermal Remote sensing and its application in water and soil study 8. 3 dimensional analysis in soil and water study 9. Practice: processing of an Image based on above mentioned stages 			
references <ul style="list-style-type: none"> • Zeybari Mahmoud, Majd Alireza,1383, Familiarity with remote sensing technique and application in natural resource, Tehran university publication • Alizadeh Rabiei Hasan, 1372, Remote sensing (Principles and application), Samt publication • pole kouran, 1373, Principles of remote sensing, Iran remote sensing center publication • Remote sensing of the environment, John R. Jensen, Prentice-Hall, Inc, 2004 • Application of GIS and remote sensing in environmental management, K B Chari S A Abbasi, Discovery Publishing House, 2005, 360p • Textbook of Environmental Remote sensing, Samitra mujhejee, Macmillan Indian Limited, 2004, 220p • Hyperspectral Remote Sensing: Principle and Applications, Marcus Borengasser, William S. Hungate, Russell Watkins, CRC Press, 2007 • Introduction to Microwave remote sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse. 2006 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Principle and Physics of Remote Sensing Advanced digital image processing	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Application of remote sensing in soil and water studies
Complementary education: Yes Lab : Yes Excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Remote Sensing Expert
Objectives: Learning how to using remote sensing in soil and water management			
Syllabus: 1- History and application of Remote Sensing in Soil and Water studies 2- Remote Sensing data analysis and Physiographical mapping. 3- Remote sensing monitoring of soil erosion hazard. 4- Techniques to determine the status of soil and land resources in RS 5- Techniques to determine the status of groundwater and surface water in RS images. 6- Remote sensing techniques to study flooding in images. 7- Monitoring techniques to determine the status of soil and water phenomena and changes in RS. <i>Practical work: Processing of types of images based on above instructions.</i>			
references <ul style="list-style-type: none"> • Zeybari Mahmoud, Majd Alireza,1383, Familiarity with remote sensing technique and application in natural resource, Tehran university publication • Alizadeh Rabiei Hasan, 1372, Remote sensing (Principles and application), Samt publication • pole kouran, 1373, Principles of remote sensing, Iran remote sensing center publication • Remote sensing of the environment, John R. Jensen, Prentice-Hall, Inc, 2004 • Application of GIS and remote sensing in environmental management, K B Chari S A Abbasi, Discovery Publishing House, 2005, 360p • Textbook of Environmental Remote sensing, Samitra mujhejee, Macmillan Indian Limited, 2004, 220p • Hyperspectral Remote Sensing: Principle and Applications, Marcus Borengasser, William S. Hungate, Russell Watkins, CRC Press, 2007 • Introduction to Microwave remote sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse. 2006 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Advanced Geographic Information System Databases Management Digital Terrain Models	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Application of GIS in soil and water studies
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Geographic Information System Expert
Objectives: Learning how to use geographic information system in soil and water			
Syllabus: <ol style="list-style-type: none"> 1. Use of GIS in soil and water planning in Iran 2. GIS databases Properties in soil and water planning and management 3. Types of GIS Functions in soil and water management 4. Using Environmental models in soil and water planning 5. Agriculture soil zoning 6. Using GIS in Precision Agriculture 			
references <ul style="list-style-type: none"> • Gharagozlou Alireza, 1383, Environmental evaluating and planning using GIS, National Cartographic Center Publication • Scally Robert, 2006, GIS for Environmental Management, Esri Press • Lang Laura, 1998, Managing Natural Resources Whit GIS, Esri Press • Wang Fahuri, 2006, Quantitative Methods and Application in GIS, CRC Press 			

Syllabus for Remote Sensing And Geographic Information System (MSc Course)

Prerequisite Courses: Advanced Geographic Information System Databases Management Digital Terrain Models	Unit Type: theoretical and practical	Number of Units: 2	Course Title: Soil and Water management modeling in GIS
Complementary education: Yes Lab : Yes excursion, Seminar, Workshop : No		Number of hours: 48	Specialist lecturer to teach: Geographic Information System Expert
Objectives: Learning how to use geographic information system in natural resources			
Syllabus: <ol style="list-style-type: none"> 1. Introduction to soil and water modeling method in GIS 2. Soil and water management modeling using GIS 3. Natural hazards zoning such as spill of soil, Liquefaction, earthquake and Landslide 4. soil erosion modeling and zoning 5. flood modeling and zoning 6. study about modeling of air, soil and water pollutions 7. Design of Natural Disaster Warning Systems in soil and water management 			
references <ul style="list-style-type: none"> • Gharagozlou Alireza, 1383, Environmental evaluating and planning using GIS, National Cartographic Center Publication • Scally Robert, 2006, GIS for Environmental Management, Esri Press • Lang Laura, 1998, Managing Natural Resources Whit GIS, Esri Press • Wang Fahuri, 2006, Quantitative Methods and Application in GIS, CRC Press 			