

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

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

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

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

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

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

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

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

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

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



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<b>Prerequisite Courses:</b> None	<b>Unit Type:</b> theoretical	<b>Number of Units:</b> 2	<b>Course Title:</b> Principles and methods of urban and rural studies
Complementary education: Yes Excursion : Yes Lab, Seminar, Workshop : No		<b>Number of hours:</b> 32	<b>Specialist lecturer to teach:</b> Urban Geographer Rural Geographer
<b>Objectives:</b> Familiarity with different urban and rural development theories			
<b>Syllabus:</b> <ol style="list-style-type: none"> <li>1. Definitions and concepts of rural development (Introduction to concepts of village, city and classification of their types, urban-rural relationship, and development and its types, sustainable development, regional development and local development)</li> <li>2. Introduction to special resources, rural and urban development studies and the use of resources</li> <li>3. Role of development theories in the analysis of the urban and rural processes and the stages of the evolution of urban and rural theories</li> <li>4. Introduction to theories of urban and rural development (classical theories of rural development, urban development, regional development, explaining the relationship between city and village)</li> <li>5. New theories of sustainable development and rural and urban management (healthy cities and villages, rural and urban social welfare, globalization, social changes, economic changes, the physical and ecological development, technology development, virtual villages and towns, leisure and tourism)</li> <li>6. A brief introduction to the methodology and techniques for measuring the urban and rural sustainable development</li> <li>7. Understanding the relationship between urban and rural sustainable development and sustainable urban and rural planning</li> </ol>			
<b>references</b> <ul style="list-style-type: none"> <li>• Hesamian Farrokh and Etemad Gini, 1363, Urbanization in Iran, Agah Publication</li> <li>• Shokoei Hosein, 1382, New Perspective in Urban Geography, Gitashenasi Publication</li> <li>• Shieh Esmail, 1376, An Introduction to Urban Planning, Elm Sanat Publication.</li> </ul>			

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<b>Prerequisite Courses:</b> Principle and Physics of Remote Sensing Advanced digital image processing	<b>Unit Type:</b> theoretical and practical	<b>Number of Units:</b> 2	<b>Course Title:</b> Principles of Application of Remote Sensing and GIS in Urban and Rural
Complementary education: Yes Lab : Yes Excursion, Seminar, Workshop : No		<b>Number of hours:</b> 48	<b>Specialist lecturer to teach:</b> Remote Sensing Expert
<b>Objectives:</b> Learning Processing Techniques and Images Analysis for Urban and Rural Development Management			
<b>Syllabus:</b> <ol style="list-style-type: none"> <li>1. Principles and methods of image processing from urban sites</li> <li>2. Classification techniques at urban environment</li> <li>3. Remote sensing techniques and rural and urban development monitoring</li> <li>4. 3D modeling of urban factors by using DTM</li> <li>5. Management of natural disasters by using RS</li> <li>6. Environmental assessment and population monitoring by using GIS/RS</li> <li>7. Urban and rural cadastre mapping</li> <li>8. Site selection by using GIS/RS</li> </ol>			
<b>references</b> <ul style="list-style-type: none"> <li>• Pole kouran, 1373, Principles of Remote Sensing</li> <li>• Urban Remote Sensing, Qihoo Weng, Dale A, Quattrochi, Taylor &amp; Francis,2006,412p</li> <li>• Applied Remote Sensing For Urban Planning, Goverence And Sustainability,Maik Netzband, William Stefanow, Charles Redman, Springer Verlag,2007, 278p</li> <li>• Remote Sensing Techniques For Regional Development, R K Bireswar , Concept Publishing Company, 2000</li> <li>• Hyperspectral Remote Sensing: Principle and Applications, Marcus Borengasser, William S.Hungate, Russell Watkins, CRC Press,2007</li> <li>• Introduction to Microwave Remote Sensing, 2006, Taylor &amp; Francis Group, Lain H.Woodhouse</li> <li>• Lidar Techniques and Remote Sensing in The atmosphere Understanding the use of Laser Light In The Atmosphere, 2009,144</li> </ul>			

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<b>Prerequisite Courses:</b> Principle and Physics of Remote Sensing Advanced digital image processing	<b>Unit Type:</b> theoretical and practical	<b>Number of Units:</b> 2	<b>Course Title:</b> application of Remote Sensing in Urban and Rural Studies
Complementary education: Yes Lab : Yes Excursion, Seminar, Workshop : No		<b>Number of hours:</b> 48	<b>Specialist lecturer to teach:</b> Expert of Remote Sensing
<b>Objectives:</b> Familiarity with application of remote sensing images in urban and rural studies			
<b>Syllabus:</b> <ol style="list-style-type: none"> <li>1. History and application of Remote Sensing in Urban and Rural Studies.</li> <li>2. Types of Remote Sensing data in Urban and Rural Studies.</li> <li>3. Methods and types of sufficient Platform and Sensors for Urban and Rural studies.</li> <li>4. Principles of detection and data extraction of residences in RS images (Airborne &amp; Satellite).</li> <li>5. Field studies Techniques and Remote Sensing data controlling in Residential areas.</li> <li>6. Multispectral processing in Urban and Rural Studies.</li> <li>7. Photogrammetry of Airborne and Satellite data and application in urban areas.</li> <li>8. Processing of PAN images with high ground resolution in Urban and Rural studies.</li> <li>9. Active Remote Sensing (Radar and Lidar) and Application to Urban and Rural studies.</li> <li>10. Hyperspectral Remote Sensing and Application to Urban and Rural studies.</li> <li>11. Thermal Remote Sensing and Application to Urban and Rural Management.</li> <li>12. GPS and Application for monitoring of urban areas.</li> <li>13. Practical work: Processing of types of images based on above instructions.</li> </ol>			
<b>references</b> <ul style="list-style-type: none"> <li>• Pole kouran, 1373, Principles of Remote Sensing</li> <li>• Urban Remote Sensing, Qihoo Weng, Dale A, Quattrochi, Taylor &amp; Francis, 2006, 412p</li> <li>• Applied Remote Sensing For Urban Planning, Governance And Sustainability, Maik Netzband, William Stefanow, Charles Redman, Springer Verlag, 2007, 278p</li> <li>• Hyperspectral Remote Sensing: Principle and Applications, Marcus Borengasser, William S. Hungate, Russell Watkins, CRC Press, 2007</li> <li>• Introduction to Microwave Remote Sensing, 2006, Taylor &amp; Francis Group, Lain H. Woodhouse</li> <li>• Lidar Techniques and Remote Sensing in The atmosphere Understanding the use of Laser Light In The Atmosphere, 2009, 144</li> </ul>			

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<b>Prerequisite Courses:</b> Advanced Geographic Information System Databases Management Digital Terrain Models	<b>Unit Type:</b> theoretical and practical	<b>Number of Units:</b> 2	<b>Course Title:</b> Application of GIS in urban and rural studies
Complementary education: Yes Lab : Yes Excursion, Seminar, Workshop : No		<b>Number of hours:</b> 48	<b>Specialist lecturer to teach:</b> Geographic Information System Expert
<b>Objectives:</b> Familiarity with application of remote sensing and geographic information system in urban and rural studies			
<b>Syllabus:</b> <ol style="list-style-type: none"> <li>1. History of using GIS in urban and rural planning studies</li> <li>2. Development of professional Geographical information system in urban and rural planning management studies.</li> <li>3. Kinds of urban and rural planning studies model and Implementation in GIS</li> <li>4. GIS Data bases Properties in urban and rural planning studies</li> <li>5. Urban and rural site selection using Geographic Information System</li> <li>6. Application of GIS in routing and flow analysis</li> <li>7. Using Location based service for optimizing urban facilities management</li> <li>8. Using land Information System in cadastre</li> <li>9. Preparing Standard data infrastructure for urban due creating integrated and distributed spatial databases for urban management</li> <li>10. Familiarity with Errors source</li> </ol>			
<b>references</b> <ul style="list-style-type: none"> <li>• Farajzadeh Manouchehr, 1384, An Introduction to application of geographic information system in tourism planning, Samt Publication</li> <li>• Edward Inskip, 1991, Tourism planning, John Willey &amp; Sons Publication</li> <li>• Mendelstohn Gohn M., 1996 Education planning and management and the use of geographic information system, UNESCO Publishing.</li> <li>• Marin David, 1990, Geographic Information system and their socioeconomic application, Rutledge publisher.</li> </ul>			

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<b>Prerequisite Courses:</b> Advanced Geographic Information System Databases Management Digital Terrain Models	<b>Unit Type:</b> theoretical and practical	<b>Number of Units:</b> 2	<b>Course Title:</b> Modeling of urban and rural studies in GIS
Complementary education: Yes Lab : Yes Excursion, Seminar, Workshop : No		<b>Number of hours:</b> 48	<b>Specialist lecturer to teach:</b> Geographic Information System Expert
<b>Objectives:</b> Familiarity with Urban and rural studies modeling in geographic information system			
<b>Syllabus:</b> 1. Urban Development modeling by using GIS 2. Natural disaster classification and mapping of urban and rural area 3. Health GIS 4. Air and noise pollution models studies 5. Modeling of an pollution 6. Modeling of traffic			
<b>references</b> <ul style="list-style-type: none"> <li>• Farajzadeh Manouchehr, 1384, An Introduction to application of geographic information system in tourism planning, Samt Publication</li> <li>• Edward Inskeep, 1991, Tourism planning, John Willey &amp; Sons Publication</li> <li>• Mendelstohn Gohn M., 1996 Education planning and management and the use of geographic information system, UNESCO Publishing.</li> <li>• Marin David, 1990, Geographic Information system and their socioeconomic application, Rutledge publisher.</li> </ul>			