M.Sc in Geographic Information Systems & Remote Sensing: Curricula

**Mandatory courses**

1. Computer and Graphic Software
2. Physics and Principles of Remote Sensing
3. Photogrammetry
4. Digital Image Processing and Interpretation
5. Geographic Information Systems Principles
6. Digital Terrain Model Structure DTM
7. Spatial Analysis using Geographic Information System

**Optional courses for Urban and Rural Studies**

1. Application of GIS and Remote Sensing in Urban and Rural Environment
2. Rural Development Planning in Iran
3. Urban Planning
4. Computer Programming
5. Software Programming
6. Soil Erosion
7. Environmental Studies in Rural Planning
8. Rural Management

**Optional Courses for Soil and Water Resources**

1. Soil Erosion
2. Computer Programming
3. Software Programming
4. Water Resources Planning in Iran
5. Satellite-based Oceanography
6. Satellite-Based Meteorology
7. Satellite Image Interpretation in Soil and Water Resources
8. Surface Water Hydrological Studies with emphasis on Iran
9. Underground Water Hydrological Studies with Emphasis on Iran

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Syllabus for Remote Sensing And Geographic Information System (MSc Course)
<table>
<thead>
<tr>
<th><strong>Prerequisite Courses:</strong></th>
<th><strong>Unit Type:</strong></th>
<th><strong>Number of Units:</strong></th>
<th><strong>Course Title:</strong></th>
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<tbody>
<tr>
<td>None</td>
<td>theoretical</td>
<td>2</td>
<td>Research Methodology For Remote Sensing And Geographic Information System</td>
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Complementary education: yes
Lab, excursion, Seminar : No
Workshop: yes

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<th><strong>Number of hours:</strong></th>
<th><strong>Specialist lecturer to teach:</strong></th>
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<tr>
<td>32</td>
<td>Expert of Remote Sensing And Geospatial Information System</td>
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</table>

**Objectives:**
Familiarity with methods of research and steps

**Syllabus:**
- Definitions, phenomena, research principles and know-how
- Research subject fields in RS/GIS
- Subjective research approaches
- Documenting research procedures
- Data gathering methods
- Data analysis methods
- Research start-up
- Implementing a sample evaluating plan
- Current state of researches in GIS/RS

**References**
- 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

<table>
<thead>
<tr>
<th>Prerequisite Courses: None</th>
<th>Unit Type: theoretical</th>
<th>Number of Units: 2</th>
<th>Course Title: Principle and Physics of Remote Sensing</th>
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<tr>
<td>Complementary education: No Lab, excursion, Seminar, Workshop: No</td>
<td>Number of hours: 32</td>
<td>Specialist lecturer to teach: Remote Sensing Expert</td>
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</tbody>
</table>

**Objectives:**
Familiarity with fundamentals of remote sensing including physics of remote sensing, types of platforms and sensors

### Syllabus:
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
- Mobasher Mohammad Reza, 1386, Fundamentals of remote sensing physics and satellite technology, Khaje Nasir Toosi publication
- Corran Poul, 1985, principle of remote sensing
- Stewart Robert H, 1985, Methods of Satellite Oceanography
Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
<thead>
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<th>Prerequisite Courses:</th>
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<tr>
<td>Principle and Physics of Remote Sensing</td>
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<td>Advanced digital image processing</td>
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<tbody>
<tr>
<td>Yes</td>
<td>48</td>
<td>Remote Sensing Expert</td>
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</table>

Objectives:
Familiarity with digital images processing including atmospheric, geometric and radiometric corrections

Syllabus:
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:
- Mizer Pol M, 1377, Computerized processing of remote sensing images, Samt publication
- Couran pol, 1373, Principles of Remote Sensing, Iran Remote Sensing Center 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
<table>
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<tr>
<th>Prerequisite Courses: None</th>
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<th>Number of Units: 2</th>
<th>Course Title: Advanced Geographic Information System</th>
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<td>Lab: Yes</td>
<td>Number of hours: 48</td>
<td>Specialist lecturer to teach: Geographic Information System Expert</td>
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<td>excursion, Seminar, Workshop: No</td>
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**Objectives:**
Familiarity with kinds of spatial analysis in geographic information system and work with them.

**Syllabus:**
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**
- 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 Stewart, 1994, Spatial Analysis And GIS, Taylor & Francis Publisher
### Syllabus for Remote Sensing And Geographic Information System (MSc Course)

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<th>Prerequisite Courses:</th>
<th>Unit Type:</th>
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<th>Course Title:</th>
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<td>Principle and Physics of Remote Sensing</td>
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excursion, Seminar, Workshop: No  

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<tr>
<td>48</td>
<td>Remote Sensing Expert</td>
</tr>
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</table>

**Objectives:**  
Familiarity with Concepts Of Thermal Remote Sensing, Processing and Application of Thermal Images

**Syllabus:**  
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:**  
- Alavi panah Seyed Kazem, 1385, Thermal Remote Sensing and Application in Earth Science, Tehran University Publication  
<table>
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<th>Prerequisite Courses:</th>
<th>Unit Type: theoretical and practical</th>
<th>Number of Units: 2</th>
<th>Course Title: Microwave and radar images</th>
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**Objectives:**
Learning How to Process and Functions of Radar Images

**Syllabus:**
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**
- 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)

<table>
<thead>
<tr>
<th>Prerequisite Courses:</th>
<th>Unit Type: theoretical and practical</th>
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<th>Course Title: Database Management</th>
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<td>Specialist lecturer to teach: Geographic Information System Expert</td>
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<td>excursion, Seminar, Workshop: No</td>
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**Objectives:**
Familiarity With Basic Concepts Of Databases And How to Create, Update and Output From Them

**Syllabus:**
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**
- Miranda Li Pao, 1380, Storing And Retrieval Of Information, Ferdosi Mashhad University Publication
- Jenifer Rolie, 1380, Principle of Geographic Information System, Samt Publication
- Jones J.A., 1997, Database In Theory and Practice, ITP Publisher
<table>
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<tr>
<th>Prerequisite Courses:</th>
<th>Unit Type:</th>
<th>Number of Units:</th>
<th>Course Title:</th>
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<td>Advanced Geographic Information System</td>
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<td>2</td>
<td>Digital Terrain Modeling</td>
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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:**  
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**  
- 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.
## Soil & Water Studies

| Syllabus for Remote Sensing And Geographic Information System (MSc Course) |
|---|---|---|---|
| **Prerequisite Courses:** | **Unit Type:** theoretical | **Number of Units:** | **Course Title:** Principles and methods of water and soil Studies |
| None | | 2 | |
| Complementary education: Yes | | 32 | Specialist lecturer to teach: Natural Geographer |
| Excursion : Yes | | | |
| Lab, Seminar, Workshop : No | | | |

### Objectives:
Familiarity with basic concepts of soil and water studies

### Syllabus:
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
- 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
<table>
<thead>
<tr>
<th>Prerequisite Courses:</th>
<th>Unit Type: theoretical and practical</th>
<th>Number of Units: 2</th>
<th>Course Title: Basic of application of Remote Sensing in water and soil study</th>
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<td>Complementary education: Yes</td>
<td>Number of hours: 48</td>
<td>Specialist lecturer to teach: Remote Sensing Expert</td>
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<td>Lab : Yes</td>
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<td>Excursion, Seminar, Workshop : No</td>
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</tbody>
</table>

**Objectives:**
Learning how to process and application of remote sensing images in soil and water studies

**Syllabus:**
1. Physics and spectral characteristics of different water and soil
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**
- 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. Jense, Prentice-Hall, Inc, 2004
- Application of GIS and remote sensing in environmental management, K B Chari S A Abbasi, Discovery Publishing House, 2005, 360p
- Introduction to Microwave remote sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse,2006
Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
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<th>Prerequisite Courses:</th>
<th>Unit Type:</th>
<th>Number of Units:</th>
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<tr>
<td>Principle and Physics of Remote Sensing</td>
<td>theoretical and practical</td>
<td>2</td>
<td>Application of remote sensing in soil and water studies</td>
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<tr>
<td>Advanced digital image processing</td>
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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.

Practical work: Processing of types of images based on above instructions.

References
- 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
- Application of GIS and remote sensing in environmental management,K B Chari S A Abbasi, Discovery Publishing House, 2005, 360p
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<th>Unit Type:</th>
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<th>Course Title:</th>
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<tr>
<td>Advanced Geographic Information System Databases Management Digital Terrain Models</td>
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<td>2</td>
<td>Application of GIS in soil and water studies</td>
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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:
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
- Gharagozlou Alireza, 1383, Environmental evaluating and planning using GIS, National Cartographic Center Publication
- Wang Fahuri, 2006, Quantitative Methods and Application in GIS, CRC Press
**Syllabus for Remote Sensing And Geographic Information System (MSc Course)**

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<tr>
<th>Prerequisite Courses:</th>
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<th>Number of hours: 48</th>
<th>Specialist lecturer to teach: Geographic Information System Expert</th>
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**Objectives:**
Learning how to use geographic information system in natural resources

**Syllabus:**
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**
- Gharagozlou Alireza, 1383, Environmental evaluating and planning using GIS, National Cartographic Center Publication
- Wang Fahuri, 2006, Quantitative Methods and Application in GIS, CRC Press
• Urban And Rural Studies

<table>
<thead>
<tr>
<th>Prerequisite Courses: None</th>
<th>Unit Type: theoretical</th>
<th>Number of Units: 2</th>
<th>Course Title: Principles and methods of urban and rural studies</th>
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Complementary education: Yes
Excursion: Yes
Lab, Seminar, Workshop: No

Objectives:
Familiarity with different urban and rural development theories

Syllabus:
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)
2. Introduction to special resources, rural and urban development studies and the use of resources
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
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)
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)
6. A brief introduction to the methodology and techniques for measuring the urban and rural sustainable development
7. Understanding the relationship between urban and rural sustainable development and sustainable urban and rural planning

References
- Hesamian Farrokh and Etemad Gini, 1363, Urbanization in Iran, Agah Publication
- Shokoei Hosein, 1382, New Perspective in Urban Geography, Gitashenasi Publication
- Shieh Esmaiil, 1376, An Introduction to Urban Planning, Elm Sanat Publication.
### Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
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<tr>
<th>Prerequisite Courses:</th>
<th>Unit Type: theoretical and practical</th>
<th>Number of Units: 2</th>
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Lab : Yes |
Excursion, Seminar, Workshop : No |
| Number of hours: 48 |
Specialist lecturer to teach: Remote Sensing Expert |

### Objectives:
Learning Processing Techniques and Images Analysis for Urban and Rural Development Management

### Syllabus:
1. Principles and methods of image processing from urban sites
2. Classification techniques at urban environment
3. Remote sensing techniques and rural and urban development monitoring
4. 3D modeling of urban factors by using DTM
5. Management of natural disasters by using RS
6. Environmental assessment and population monitoring by using GIS/RS
7. Urban and rural cadastre mapping
8. Site selection by using GIS/RS

### References
- Pole kouran, 1373, Principles of Remote Sensing
- Urban Remote Sensing, Qihoo Weng, Dale A, Quattrochi, Taylor & Francis, 2006, 412p
- Introduction to Microwave Remote Sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse
Syllabus for Remote Sensing And Geographic Information System (MSc Course)

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<td>Principle and Physics of Remote Sensing</td>
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<td>2</td>
<td>application of Remote Sensing in Urban and Rural Studies</td>
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Complementary education: Yes
Lab : Yes
Excursion, Seminar, Workshop : No

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<th>Number of hours:</th>
<th>Specialist lecturer to teach:</th>
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<tbody>
<tr>
<td>48</td>
<td>Expert of Remote Sensing</td>
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</table>

Objectives:
Familiarity with application of remote sensing images in urban and rural studies

Syllabus:
5. Field studies Techniques and Remote Sensing data controlling in Residential areas.
7. Photogrammetry of Airborne and Satellite data and application in urban areas.
8. Processing of PAN images with high ground resolution in Urban and Rural studies.
9. Active Remote Sensing (Radar and Lidar) and Application to Urban and Rural studies.
12. GPS and Application for monitoring of urban areas.
13. Practical work: Processing of types of images based on above instructions.

References
- Pole kouran, 1373, Principles of Remote Sensing
- Urban Remote Sensing, Qihoo Weng, Dale A, Quattrochi, Taylor & Francis, 2006, 412p
- Introduction to Microwave Remote Sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse
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<th>Prerequisite Courses:</th>
<th>Unit Type: theoretical and practical</th>
<th>Number of Units:</th>
<th>Course Title: Application of GIS in urban and rural studies</th>
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<tbody>
<tr>
<td>Advanced Geographic Information System Databases Management Digital Terrain Models</td>
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</table>

Complementary education: Yes
Lab: Yes
Excursion, Seminar, Workshop: No

Number of hours: 48
Specialist lecturer to teach: Geographic Information System Expert

Objectives:
Familiarity with application of remote sensing and geographic information system in urban and rural studies

Syllabus:
1. History of using GIS in urban and rural planning studies
2. Development of professional Geographical information system in urban and rural planning management studies.
3. Kinds of urban and rural planning studies model and Implementation in GIS
4. GIS Data bases Properties in urban and rural planning studies
5. Urban and rural site selection using Geographic Information System
6. Application of GIS in routing and flow analysis
7. Using Location based service for optimizing urban facilities management
8. Using land Information System in cadastre
9. Preparing Standard data infrastructure for urban due creating integrated and distributed spatial databases for urban management
10. Familiarity with Errors source

References
- Farajzadeh Manouchehr, 1384, An Introduction to application of geographic information system in tourism planning, Samt Publication
- Edward Inskeep, 1991, Tourism planning, John Willey & Sons Publication
- Mendelstohn Gohn M., 1996 Education planning and management and the use of geographic information system, UNESCO Publishing.
- Marin David, 1990, Geographic Information system and their socioeconomic application, Rutledge publisher.
### Syllabus

**Prerequisite Courses:**
- Advanced Geographic Information System
- Databases Management
- Digital Terrain Models

**Unit Type:** theoretical and practical

**Number of Units:** 2

**Course Title:** Modeling of urban and rural studies in GIS

**Complementary education:** Yes

**Lab:** Yes

**Excursion, Seminar, Workshop:** No

**Number of hours:** 48

**Specialist lecturer to teach:** Geographic Information System Expert

### Objectives:
Familiarity with Urban and rural studies modeling in geographic information system

### Syllabus:
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 air pollution
6. Modeling of traffic

### References
- Farajzadeh Manouchehr, 1384, An Introduction to application of geographic information system in tourism planning, Samt Publication
- Edward Inskeep, 1991, Tourism planning, John Willey & Sons Publication
- Mendelstohn Gohn M., 1996 Education planning and management and the use of geographic information system, UNESCO Publishing.
- Marin David, 1990, Geographic Information system and their socioeconomic application, Rutledge publisher.
### Natural Hazards Management

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

<table>
<thead>
<tr>
<th>Prerequisite Courses: None</th>
<th>Unit Type: theoretical</th>
<th>Number of Units: 2</th>
<th>Course Title: Principle of environmental hazards management</th>
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<tr>
<td>Complementary education: Yes</td>
<td>Lab, Seminar, Workshop: No</td>
<td>Number of hours: 32</td>
<td>Specialist lecturer to teach: Geographer</td>
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</table>

#### Objectives:
Learning how to identify natural hazards and principles of management

#### Syllabus:
1. Concepts and definitions (hazard, disaster,…)
2. Scope of assessment of natural hazards
3. Principle of natural hazards types and their categories
4. Literature review of natural hazard studies in Iran and world
5. Structure and Mechanism of earth hazards such as earthquake, tsunami, landslide and land subsidence
6. Structure and mechanism of climate and hydrological hazards such as flood, drought, storm and ocean hazards
7. Natural hazards identification techniques
8. Natural hazards zoning methods
9. Natural hazards risk analysis models
10. Natural hazard risk mitigation and management techniques
11. basis of hazards mitigation and their control methods
12. Disaster concepts and disaster management strategy

#### References
- Natural Hazards, Keyt esmith, Samt,1382
- Natural Hazards Analysis, John Pine, Auerbach Publication, 2003,304p
- Flood Hazard Management, John W Handmer, Routledge, 1987,297p
- Landslide Risk Management, Oldrich Hunger, Robin Fell, Rejean Couture, Erik Eberhardt, Taylor & Francis, 2005, 776
# Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
<thead>
<tr>
<th><strong>Prerequisite Courses:</strong></th>
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<th><strong>Course Title:</strong></th>
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<tbody>
<tr>
<td>Principle and Physics of Remote Sensing</td>
<td>theoretical and practical</td>
<td>2</td>
<td>Basic of RS application in Environmental Hazardous Management</td>
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<tr>
<td>Advanced digital image processing</td>
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<tr>
<th><strong>Complementary education:</strong></th>
<th><strong>Number of hours:</strong></th>
<th><strong>Specialist lecturer to teach:</strong></th>
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<tbody>
<tr>
<td>Yes</td>
<td>48</td>
<td>Remote Sensing Expert</td>
</tr>
<tr>
<td>Lab : Yes</td>
<td></td>
<td></td>
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<tr>
<td>Excursion, Seminar, Workshop : No</td>
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</tbody>
</table>

## Objectives:
Learning how to process and application of remote sensing images in natural hazards studies

## Syllabus:
1. History and application of remote sensing images in Environmental hazardous detection studies.
2. Physical phenomena of environmental hazardous concern to RS data.
3. Principle and physics of electromagnetic waves contain sufficient spectrum frequencies to detect environmental hazardous.
4. Methods and types of sufficient Platform and Sensors for Environmental hazardous studies.
5. Detection and surveillance Methods of environmental hazardous in Radar, thermal and visible images.
6. Analysis techniques of images and hazardous zones extraction.
7. Remote sensing tools launched on the ground platforms for environmental hazardous surveillance.
8. Multispectral processing and hazardous zones data extraction.

## references
- Pole Kouran, 1373, Principles of remote sensing, Iran Remote Sensing Center Publication
- Processing remote sensing data for Flood Hazard Assessment, Volker Berkhahn, Sebastian Rath, And Erik Pasche. ASCE, 2005
- Introduction to Environmental Remote Sensing, Eric Chartes Barrett, Leonard Frank Curtis, 199,457p
- Interdiction to Microwave Remote Sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse
### Syllabus for Remote Sensing And Geographic Information System (MSc Course)

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<th>Prerequisite Courses:</th>
<th>Unit Type:</th>
<th>Number of Units:</th>
<th>Course Title:</th>
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<tr>
<td>Advanced digital image processing</td>
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Complementary education: Yes  
Lab: Yes  
Excursion, Seminar, Workshop: No  
Number of hours: 48  
Specialist lecturer to teach: Expert of Remote Sensing

### Objectives:
Familiarity with application of remote sensing images in natural hazards management

### Syllabus:
1. Photogrammetric techniques for identifying high-risk zone  
2. Image analysis techniques and linear phenomena extraction  
3. Techniques to determine the risks from environmental hazards through remote sensing images  
4. GPS and monitoring risky area centers  
5. Radar remote sensing and its application in the detection of unstable slopes (landslide & rock falling)  
6. Radar remote sensing and its application in the detection of subsidence  
7. Thermal remote sensing and its application in seismic studies  
8. Field study techniques and remote sensing data control  
9. Lab Exercises: Processing samples of Images according to the above steps

### References
- Pole Kouran, 1373, Principles of remote sensing, Iran Remote Sensing Center Publication  
- Mapping hazardous Terrain using remote sensing, R M Teeuw, GSL Special Publications, 2007, 184p  
- Interdiction to Microwave Remote Sensing, 2006, Taylor & Francis Group, Lain H. Woodhouse  
### Syllabus for Remote Sensing And Geographic Information System (MSc Course)

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<th>Prerequisite Courses:</th>
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<th>Number of Units:</th>
<th>Course Title:</th>
<th>Specialist lecturer to teach:</th>
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<tbody>
<tr>
<td>Advanced Geographic Information System</td>
<td>theoretical and practical</td>
<td>2</td>
<td>Application Of GIS In Natural Hazards Management</td>
<td>Geographic Information System Expert</td>
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<tr>
<td>Databases management</td>
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<tr>
<td>Digital Terrain Models</td>
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</table>

**Complementary education:** Yes
**Lab:** Yes
**Excursion, Seminar, Workshop:** No

**Number of hours:** 48

**Specialist lecturer to teach:** Geographic Information System Expert

**Objectives:**
Familiarity with application of remote sensing and Geographic information system in natural hazards studies

**Syllabus:**
1. Introducing Types of Natural Disasters Such as earthquakes, Landslide, Liquefaction, Subsidence, rock fall
2. Identify effective factors in creation of natural disasters
3. Method for data preparation related to the natural disaster in GIS environment
4. The use of methods and multi-criteria decision algorithms on zoning of hazard and disasters
5. Investigation of information and conceptual errors in zoning of natural hazards

**References**
- Wang Fahui, 2006, Quantitative Methods and Application in GIS, CRC Press
<table>
<thead>
<tr>
<th>Prerequisite Courses:</th>
<th>Unit Type: theoretical and practical</th>
<th>Number of Units: 2</th>
<th>Course Title: Environmental Hazards management modeling in GIS</th>
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<tbody>
<tr>
<td>Advanced Geographic Information System Databases management Digital Terrain Models</td>
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Complementary education: Yes
Lab: Yes
Excursion, Seminar, Workshop: No
Number of hours: 48
Specialist lecturer to teach: Geographic Information System Expert

Objectives:
Familiarity with natural hazards studies modeling with geographic information system

Syllabus:
1. Introduction to Environmental Hazards management modeling method in GIS
2. Using dynamic methods in hazard Identification
3. Design of Natural Disaster Warning Systems
4. Optimal management of natural disasters for loss reducing using Mobile GIS and Location based services

References
- Wang Fahui, 2006, Quantitative Methods and Application in GIS, CRC Press
- Satellite Aerology

<table>
<thead>
<tr>
<th>Prerequisite Courses: None</th>
<th>Unit Type: theoretical</th>
<th>Number of Units: 2</th>
<th>Course Title: General Meteorology</th>
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<tr>
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<td>Specialist lecturer to teach: Climatologist</td>
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<tr>
<td>Excursion : Yes</td>
<td>Lab, Seminar, Workshop : No</td>
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</table>

**Objectives:**
Familiarity with Meteorology

**Syllabus:**
1. Change of Seasons
2. Effect of The Sun on Atmospheric changes
3. Atmospheric Thermodynamics
4. Adiabatic Rules
5. Heat Transfer in the Atmosphere
6. The structure of The Atmosphere
7. Steam and Effects on The Energy transfer
8. Atmospheric systems
9. Cloud physics
10. Common Atmospheric Phenomena
11. Cloud Types

**References**
- General Aerology, Robert Mizer
- Principles of Aerology, Dr. Bahlool Alijani and Dr. Kaviani, Samt Publication, 1374
### Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
<thead>
<tr>
<th>Prerequisite Courses:</th>
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<th>Course Title:</th>
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<tr>
<td>Principle and Physics of Remote Sensing</td>
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<td>2</td>
<td>Basic of application of remote sensing in Meteorology</td>
</tr>
<tr>
<td>Advanced digital image processing</td>
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<tr>
<th>Complementary education:</th>
<th>Number of hours:</th>
<th>Specialist lecturer to teach:</th>
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<tbody>
<tr>
<td>Yes</td>
<td>48</td>
<td>Remote Sensing Expert</td>
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<tr>
<td>Lab : Yes</td>
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<tr>
<td>Excursion, Seminar, Workshop : No</td>
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</table>

### Objectives:
Familiarity with Kinds of satellite images and how to interpret

### Syllabus:
1. History and application of remote sensing in Meteorology studies
2. Physical properties of atmospheric phenomena Associated to remote sensing
3. Principles and Physics of Electromagnetic spectrum Associated to appropriate spectral ranges for atmospheric phenomena
4. Principles and Types of appropriate platforms and sensors for atmospheric phenomena studies
5. Images analyzing techniques and extracting atmospheric phenomena
6. Multi spectral Image processing and extracting Atmospheric phenomena Information

### references
- Image in Weather forecasting, Cambridge University Press, 1995
- Mobasheri Mohamad reza, 2002, Satellite Meteorology and now casting, WMO, RMTC
### Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
<thead>
<tr>
<th>Prerequisite Courses</th>
<th>Unit Type: theoretical and practical</th>
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<th>Course Title: Application of Remote sensing in Meteorology</th>
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Complementary education: Yes
Lab: Yes
Excursion, Seminar, Workshop: No

**Number of hours:** 48

**Specialist lecturer to teach:** Remote Sensing Expert

**Objectives:**
Familiarity with Kinds of satellite images and how to interpret

**Syllabus:**
1. The interaction of the electromagnetic spectrum with Atmospheric Phenomena
2. Determining Cloud texture using Satellite Images
3. Determining different kind of fronts using Satellite Images
4. Estimation of cloud temperature
5. Cloud height
6. Atmospheric Phenomena Forecasting
7. Extracting Meteorology Parameters using Satellite Images
8. Appropriate Sensors for satellite Meteorology and Platforms
9. Appropriate Bands for extracting Information

**references**
- Image in Weather forecasting, Cambridge University Press, 1995
- Mobasheri Mohamad reza, 2002, Satellite Meteorology and now casting, WMO, RMTC
Syllabus for Remote Sensing And Geographic Information System (MSc Course)

<table>
<thead>
<tr>
<th>Prerequisite Courses: Advanced Geographic information system Databases management Digital terrain models</th>
<th>Unit Type: theoretical and practical</th>
<th>Number of Units: 2</th>
<th>Course Title: GIS application in Satellite Meteorology</th>
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<td>Number of hours: 48</td>
<td>Specialist lecturer to teach: Geographic Information System Expert</td>
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Objectives:
Familiarity with using remote sensing and geospatial information system in Aerology

Syllabus:
1. Metrological parameters forecasting using by GIS
2. Metrological patterns analysis with spatial parameters
3. Investigation about spatial and temporal dynamic of air masses
4. Air pollution management by GIS
5. Investigation about global warming and its pattern using by GIS
6. Assessment about climate pattern maps error
7. Preparation of spatial data infrastructure for development of Integrated database in metrology
8. Using of Web GIS and LBS in informing about metrology

References
- Farajzadeh Manouchehr, 1384, Climatology Techniques, Samt Publication
<table>
<thead>
<tr>
<th>Syllabus for Remote Sensing And Geographic Information System (MSc Course)</th>
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<tbody>
<tr>
<td><strong>Prerequisite Courses:</strong> Advanced Geographic information system, Databases management, Digital terrain models</td>
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<td><strong>Unit Type:</strong> theoretical and practical</td>
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<td><strong>Number of Units:</strong> 2</td>
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<td><strong>Course Title:</strong> Satellite Meteorology modeling in GIS</td>
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<td>Lab: Yes</td>
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<td>Excursion, Seminar, Workshop: No</td>
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<tr>
<td><strong>Number of hours:</strong> 48</td>
</tr>
<tr>
<td><strong>Specialist lecturer to teach:</strong> Geographic Information System Expert</td>
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</table>

**Objectives:**
Familiarity with Aerology studies modeling with geographic information system

**Syllabus:**
1. Weather forecasting using by GIS
2. Weather Spatial changing modeling
3. Metrological crisis modeling
4. Snowmelt modeling based on metrological parameters
5. Micro climate modeling in precision agriculture
6. Climate-Associated disease modeling using by GIS

**references**
- Farajzadeh Manouchehr, 1384, Climatology Techniques, Samt Publication