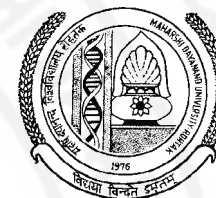


# Maharshi Dayanand University

## Rohtak



Ordinances, Syllabus and Courses of  
Reading for  
One Year Post Graduate Diploma in  
Remote Sensing and Geographical  
Information System  
Examination

Session - 2008-2009

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**Outlines of tests, syllabi and courses of reading for one year Postgraduate Diploma in Remote sensing and geographic information system for the session 2008-09.**

**Scheme of Examinations**

Course Structure	Semester- I	Marks	Time
<b>Paper- I : Fundamentals of Remote Sensing</b>	<b>100</b>		
(a) Theory	70	3 hrs.	
(b) Internal Assessment	30		
<b>Paper- II : Fundamentals of Geographic Information Systems (GIS)</b>	<b>100</b>		
(a) Theory	70	3 hrs.	
(b) Internal Assessment	30		
<b>Paper- III : Fundamentals of Image Processing</b>	<b>100</b>		
(a) Theory	70	3 hrs.	
(b) Internal Assessment	30		
<b>Paper- IV : Practicals</b>			
A - Remote Sensing and image Interpretation			
B - Geographic Information Systems			
C - Image Processing			

- Note :** i. There shall be separate examination of the three components of the Paper IV - A, B, C.  
ii. The options shall be floated based on availability of infrastructure and other resources in the department

**Outlines of tests, syllabi and courses of reading for one year Postgraduate Diploma in Remote sensing and geographic information system for the session 2008-09.**

**Scheme of Examinations**

Course Structure	Semester- II	Marks	Time
<b>Paper- V : Digital Mapping and Global Positioning System (GPS)</b>	<b>100</b>		
(a) Theory	70	3 hrs.	
(b) Internal Assessment	30		
<b>Paper- VI : Thematic Applications of remote Sensing and geographic Information Systems</b>	<b>100</b>		
<b>(with reference to any one of the following :</b>			
1. Urban & Regional Planning			
2. Geomorphology			
(a) Theory	70	3 hrs.	
(b) Internal Assessment	30		
<b>Paper- VII : Practicals</b>			
<b>D- Digital Mapping and Global Positioning System</b>	<b>60</b>	<b>4 hrs.</b>	
<b>E- Thematic Applications of Remote Sensing and Geographical Information System</b>	<b>60</b>	<b>4 hrs.</b>	
1. Urban & Regional Planning			
2. Geomorphology			
<b>Note :</b>	The Students shall conduct the practical of the same option opted in paper VI. The practical examination shall be conducted for each optional papers.		
<b>Project Report :</b>			
(a) Report			<b>200 Marks</b>
(b) Viva-Voce			<b>150 Marks</b>
<b>Grand Total :</b>			<b>1000 Marks</b>

**Note :** Project work should emphasize the application of Remote Sensing, GIS and GPS.

**Paper- I Fundamentals of Remote Sensing****(a) Theory**

<b>Time (in hrs.)</b>	<b>: 3</b>
<b>Total Marks</b>	<b>: 100</b>
<b>(a) Theory</b>	<b>: 70</b>
<b>(b) Internal Assessment</b>	<b>: 30</b>

**Unit-I****Introduction to Remote Sensing :**

Introduction, development and applications of Remote Sensing; electromagnetic radiation and Remote sensing ; energy interactions in atmosphere; energy interactions with earth surface features and spectral signatures.

**Unit-II****Concepts :**

Basic concepts and advantages of : Thermal Remote Sensing, Microwave Remote Sensing, Hyper Spectral Remote Sensing; Remote Sensing below ground surface; ground investigations in Remote Sensing.

**Unit-III****Sensors and Platforms :**

Sensors : Passive and Active;

Platforms : airborne and space borne;

Image data characteristics : spatial, spectral, radiometric and temporal;

Satellite missions with their image characteristics

**Unit-IV****Indian Space Programme :**

History and development of Indian Space Programme;

IRS Satellite Series;

Oceansat 1 and Oceansat 2;

Metereological Satellites - INSAT Series,

Future Missions.

**Note : 1. Theory**

- (i) A compulsory question containing 10 short answer type questions shall be set covering the whole syllabus. Student with attempt any 7 short answer type questions in about 25-30 words each. Each short answer type question will carry 2 marks (total 14 marks).
- (ii) A total of eight questions will be set out of the whole syllabus, at least 2 from each unit. The candidates will attempt 4 questions selecting one from each unit. All questions will carry equal marks. These will be in addition to the compulsory question at serial number 1.

**Note : 2. Internal Assessment**

Refer to clause 14 of the relevant ordinance for details on conduct and criteria for internal assessment.

**Recommended Readings :**

1. American society for Photogrammetry and Remote Sensing, 1999, *Remote Sensing for the Earth Sciences*, Manual of Remote Sensing, 3rd ed., vol. 3, Wiley, New York.
2. A very, T.E., and G.L. Berlin, 1992, *Fundamentals of Remote Sensing and Airphoto Interpretation*, 5th ed., Macmillan, New York.
3. Campbell, J.B., 1996, *Introduction to Remote Sensing*, 2<sup>nd</sup> ed., Guilford, New York.
4. Curran, Paul J., 1985, *Principles of Remote Sensing*, Longman, London & New York.
5. Drury, S.A., 1998, *Images of the Earth : A Guide to Remote Sensing*, 2<sup>nd</sup> ed., Oxford University Press, Oxford.
6. Elachi, C., 1987, *Introduction to the Physics and Techniques of Remote Sensing*, Wiley, New York.
7. Gupta, R.P., 2000, *Remote Sensing Geology*, Springer-Verlag, New York.
8. Jensen, J.R., 2000, *Remote Sensing of the Environmental : An Earth Resource Perspective*, Printce Hall, Upper Saddle River, New Jersey.

9. Joseph, G., 2005, *Fundamentals of Remote Sensing*, Universities Press Hyderabad.
10. Lillesand, T. and R. Kiefer, 1999, *Remote Sensing and Image Interpretation*, Wiley, New York.
11. Mather, P.M., 1999 *Computer processing of remotely sensed images ; and introduction*, Wiley, Chichester.
12. Sabins, F. Jr. 1997, *Remote Sensing : Principles and Interpretation*, 3<sup>rd</sup> ed., W.H. Freeman, New York.
13. Singh, R.B. and S. Murai, ed., 1998, *Space Informatics for Sustainable Development*, Oxford University Press, Oxford.
14. Star, J.L., J.E. Estes and K.C. McGwire, 1997, *Integration of GIS and Remote Sensing*, Cambridge University Press, Cambridge.

6  
**Paper- II Fundamentals of Geographic Information Systems (GIS)**

**(a) Theory**

<b>Time (in hrs.)</b>	<b>: 3</b>
<b>Total Marks</b>	<b>: 100</b>
<b>(a) Theory</b>	<b>: 70</b>
<b>(b) Internal Assessment</b>	<b>: 30</b>

**Unit-I**

**Concepts and Definitions :**

Geographic Information System (GIS) : Definition and applications; GIS and Remote Sensing interface; Components and elements of GIS; Development of GIS technology; Geographic objects : point, line, area and their computer representation; Analog and digital maps.

**Unit-II**

**Functional Components :**

Data input/ capturing, storage and manipulation, query, data analysis and presentation, topology creation, data quality and errors in GIS.

**Unit-III**

**Data Management and Structure :**

Nature of Geographic data : Spatial and attribute data; Sources of data; Concept of vector and raster based models : Attribute data management : Data Base Management System (DBMS); Data Structures : relational, hierarchical and network; Linking spatial and attribute data.

**Unit-IV**

**GIS and Spatial Analysis :**

Neighbourhood analysis : buffers, Network analysis; Overlays analysis - raster and vector based overlay and their applications in geography; Presentation of GIS output.

**Note : 1. Theory**

- (i) A compulsory question containing 10 short answer type questions shall be set covering the whole syllabus. Student with attempt any 7 short answer type questions in about 25-30 words each. Each short answer type question will carry 2 marks (total 14 marks).
- (ii) A total of eight questions will be set out of the whole syllabus, at least 2 from each unit. The candidates will attempt 4 questions selecting one from each unit. All questions will carry equal marks. These will be in addition to the compulsory question at serial number 1.

**Note : 2. Internal Assessment**

Refer to clause 14 of the relevant ordinance for details on conduct and criteria for internal assessment.

**Recommended Readings :**

1. Burrough, P.A. and R.A. McDonnell, 1998, Principles of Geographic Information System, Oxford University Press, Oxford.
2. Chang, K.T., 2006, Introduction to Geographic Information System, Tata Mc Grw-Hill, New Delhi.
3. Curran, Paul J., 1985, *Principles of Remote Sensing*, Longman, London & New York.
4. De Mers and N. Michael, 1999, Fundamentals of Geographic Information System, John Wiley and Sons, New York.
5. Environmental Systems Research Institute (ESRI), 1997, Getting to know Arc View GIS, Geo information International, Cambridge.
6. Heywood, I. et. al., 2004, An Introduction to Geographic Information Systems, Pearson Education, Delhi.
7. Jensen, J.R., 2000, *Remote Sensing of the Environmental : An Earth Resource Perspective*, Printce Hall, Upper Saddle River, New Jersey.
8. Joseph, G., 2005, *Fundamentals of Remote Sensing*, Universities Press Hyderabad.

9. Lillesand, T. and R. Kiefer, 1999, *Remote Sensing and Image Interpretation*, Wiley, London.
10. Longley, P.A., M. F. Goodchild, D.J. Maguire and D.W. Rhind, 2001 Geographic Information Systems and Sciences, Wiley, Chichester.
11. Sabins, F. Jr. 1997, *Remote Sensing : Principles and Interpretation*, 3<sup>rd</sup> ed., W.H. Freeman, New York.
12. Sing, R.B. (ed.) 1991, Environmental Monitoring : application of Remote Sensing and GIS Geocarto Int. Centre, Hong Kong.
13. Singh, R.B. and S. Murai, ed., 1998, Space Informatics for Sustainable Development, Oxford University Press, Oxford.

**Paper- III Fundamentals of Image Processing****(a) Theory**

<b>Time (in hrs.)</b>	<b>: 3</b>
<b>Total Marks</b>	<b>: 100</b>
<b>(a) Theory</b>	<b>: 70</b>
<b>(b) Internal Assessment</b>	<b>: 30</b>

**Unit-I****Image Processing Types : Visual and Digital**

**Visual Interpretation** : Introduction and need of image interpretation ; image quality; elements of image interpretation and convergence of evidence; multiple images in image interpretation; equipments of image interpretation

**Digital Processing** : Introduction and need of Digital Image Processing. Digital Image; Digital Image Data Format; Colour Composites; Best Band FCC Display.

**Unit-II****Image Restoration :**

Radiometric and geometric distortions; Radiometric Correction- Techniques; Geometric Correction : Input, Output driven Resampling; Interpolation Techniques - Nearest Neighbour, Bilinear and Cubic Convolution.

**Unit-III****Image Enhancement :**

Contrast, causes of low contrast in image, Contrast enhancement - Linear and Non-linear; Histogram Equalization, Density Slicing; Spatial Filtering- Low pass and High pass, Edge Enhancement; Image Transformation- Band Ratinig and Principal Component Analysis.

**Unit-IV****Image Classification :**

Unsupervised Classification; Supervised Classification : various classification algorithms i.e. Parallelepiped, Minimum

distance to Means Gaussian Maximum likelihood; Accuracy assessment; Image Fusion : Techniques and advantages.

**Note : 1. Theory**

- (i) A compulsory question containing 10 short answer type questions shall be set covering the whole syllabus. Student with attempt any 7 short answer type questions in about 25-30 words each. Each short answer type question will carry 2 marks (total 14 marks).
- (ii) A total of eight questions will be set out of the whole syllabus, at least 2 from each unit. The candidates will attempt 4 questions selecting one from each unit. All questions will carry equal marks. These will be in addition to the compulsory question at serial number 1.

**Note : 2. Internal Assessment**

Refer to clause 14 of the relevant ordinance for details on conduct and criteria for internal assessment.

**Recommended Readings :**

1. Jahne, B., 1991, Digital Image Processing, Springer- Verlag, New York.
2. Jain, A.K. 1989, Fundamentals of Digital Image Processing, Prentice Hall, New York.
3. Jonson, J. R.1996, Introductory Digital Image Processing, Prentice Hall Inc., New York.
4. Lillsand, T.M. and R.W. Kiefer, 1999,Remote Sensing and Image Interpretation 4th Ed. Wiley, New York.
5. Mathur, P.M. 1999, Computer Procesing of Remotely Sensed Images an introduction, Wiley, Chichester.
6. Mullar, J.P. 1986, Digital Image Processing in remote Sensing, Taylor & Francis, New York.
7. Pratt, W.K. 1991, Digital Image Processing, Wiley, New York.
8. Richards, J. A., 1986, Remote Sensing Digital Image Analysis, Springer - Verlag, New York.
9. Russ, J. C. 1992, Image Processing Handbook , FLCRC Press, Boca Raton.
10. Schowengerdt, R.A., Techniques for image processing and classification in Remote Sensing, Academic Press, New York.

**Paper- IV Practicals****A- Remote Sensing and Image Interpretation**

**Time (in hrs.) : 4**  
**Marks : 60**

Exercises will be taken on following topics :

1. Study of a satellite image - annotation (IRS - IB, IRS- IC etc.)
2. Collection of radiant temperatures and plotting values of diurnal values.
3. Use of Spectroradiometer :production and analysis of spectral reflectance curves.
4. Visual interpretation of a satellite image and separating physical and cultural features.
5. Identification of objects on multiband and FCC
6. Interpretation, delineation and mapping of urban land-use on satellite images.
7. Study of thermal image and interpretation of various features.
8. Study of Radar image and interpretation of various features
9. Preparation of image interpretation keys.
10. Selection of resolution of image and its requisition.

Distribution of Marks :

**(i) Lab Work Test : 30 Marks**  
**(ii) Record and Viva- Voce : 15+15 Marks**

**Note**

- (a) Each student would conduct and report atleast seven of the 10 exercises.
- (b) The Lab Work test shall consist of four questions. Candidates are required to attempt any two questions. All questions will carry equal marks.
- (c) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.
- (d) The Department shall conduct one field visit to a related field/ area to collect ground truth. The teacher engaged in this process shall be paid TA/DA as per university rules.

**Paper- IV Practicals****B - Geographic Information Systems (GIS)**

**Marks : 60**  
**Time (in hrs.) : 4**

Exercises in digital environment will be taken on following topics

1. Window/ Digital environmental Basics, file and directory organization and management.
2. Familiarization with GIS software.
3. Spatial data creation : creating shape files and Digitization.
4. Editing layers : Snap tolerance, editing polygon.
5. Calculation of area/ perimeter.
6. Joint and link operations.
7. Buffer creation and analysis.
8. Overlay analysis.
9. Network analysis : a. finding shortest route.  
b. finding optimum path.  
c. finding closet facility.
10. Exercise on data structures : a. hierarchical  
b. relational  
c. network

11. Programming in C

Distribution of Marks :

**(i) Lab Work Test : 30 Marks**  
**(ii) Record and Viva- Voce : 15+15 Marks**

**Note**

- (a) Each student would conduct and report atleast seven of the 10 exercises.
- (b) The Lab Work test shall consist of four questions.



Candidates are required to attempt any two questions.  
All questions will carry equal marks.

- (c) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.
- (d) The Department shall conduct one field visit to a related field/ area to collect ground truth. The teacher engaged in this process shall be paid TA/DA as per university rules.

### Paper- IV Practicals

#### C - Image Processing

**Marks : 60**  
**Time (in hrs.) : 4**

Exercises in digital environment will be taken on following topics

1. Familiarization with ERDAS.
2. Visualization of satellite image data.
3. Loading and import of data in ERDAS.
4. Creating subset of image.
5. Displaying individual pixel value and image information.
6. Histogram display.
7. Geo-referencing and mosaic.
8. Classification- supervised and unsupervised.
9. Image enhancement techniques- image contrast, histogram equalization and density slicing.
10. Filtering techniques- low pass, high pass filter.

Distribution of Marks :

**(i) Lab Work Test : 30 Marks**  
**(ii) Record and Viva- Voce : 15+15 Marks**

#### Note

- (a) Each student would conduct and report atleast seven of the 10 exercises.
- (b) The Lab Work test shall consist of four questions. Candidates are required to attempt any two questions. All questions will carry equal marks.
- (c) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.
- (d) The Department shall conduct one field visit to a related field/ area to collect ground truth. The teacher engaged in this process shall be paid TA/DA as per university rules.



**Paper- V Digital Mapping and Global Positioning System (GPS)**

<b>Time (in hrs.)</b>	<b>: 3</b>
<b>Total Marks</b>	<b>: 100</b>
<b>(a) Theory</b>	<b>: 70</b>
<b>(b) Internal Assessment</b>	<b>: 30</b>

**Unit-I**

Introduction and elements of digital cartography Scale, Content, Projection, Layout, Symbols, Use of Colours and Pattern, Topography, Generalization, Compilation of Map.

Introduction to GIS software.

**Unit-II**

Digital representation of graphic features - point, line and area.

Preparation of thematic maps : Drainage, Transport Network, Urban Lanuse.

**Unit-III**

Introduction and definition of Global Positioning System. Satellite Constellations, Segments of Global Positioning System, Signals and codes.

**Unit-IV**

GPS receivers, Error and accuracy of Global Positioning System observation and measurement. Global Positioning System data and Geographical Information System. GPS applications in Surveying and mapping.

**Note : 1. Theory**

- (i) A compulsory question containing 10 short answer type questions shall be set covering the whole syllabus. Student with attempt any 7 short answer type questions in about 25-30 words each. Each short answer type question will carry 2 marks (total 14 marks).
- (ii) A total of eight questions will be set out of the whole syllabus, at least 2 from each unit. The candidates will

attempt 4 questions selecting one from each unit. All questions will carry equal marks. These will be in addition to the compulsory question at serial number 1.

**Note : 2. Internal Assessment**

Refer to clause 14 of the relevant ordinance for details on conduct and criteria for internal assessment.

**Recommended Readings :**

1. Clarke, K. 1995 : Analytical and Computer Cartography. 2<sup>nd</sup> ed., Upper Saddle River.
2. Garmin Corporation, 2000 : GPS Guide for Beginners Available at : <http://www.garmin.com/manuals/gps4beg.pdf>.
3. LLIffe, J.C. 2000 : Datum and Map Projections for remote Sensing, GIS and Surveying. New York : CRC Press.
4. Kevany, M. J. 1994 : use of GPS in GIS data collection. Computers, Environment and Urban Systems, 18 (4) 257-63.
5. Robinson, A.H. Morrison, J.L. Muehrcke, P.C. Kimerling, A.J. and Guptill, S.C. 1995 : Elements of Cartography. 6<sup>th</sup> edn. New York : John Wiley & Sons, Inc.
6. Trimble Navigation Limited 1996 : Mapping Systems : general Refernces, Sunnyvale, CA : Trimble Navigation Limited.
7. Van Sickle, J. 2001 : GPS for Land Surveyors. Second edition. Chelsea, MI : Ann Arbor Press.
8. A user's Guide to the Global Positining System- Canada, Published by Authority Natural Resources Canada. 1995.
9. AC- Automated Cartographic Enviroment by PCI Geomatics Canada.
10. ESRI, 1994, Map Projections : Georeferenceing Spatial Data. Environmental Systems Research Institute, Inc. USA.
11. Robinson, H. and et. al, 1995. Elements of Carography, John Woky & Sons, INC New York PPI-19
12. Taylor, D.R.F. (Eds.) 1980. The Computer inContemporary Cartography. John Wiley and Sons. New York.

## Paper- VI-1 Thematic Applications of RS & GIS in Urban and Regional Planning

<b>Time (in hrs.)</b>	<b>: 3</b>
<b>Total Marks</b>	<b>: 100</b>
<b>(a) Theory</b>	<b>: 70</b>
<b>(b) Internal Assessment</b>	<b>: 30</b>

### Unit-I

Introduction and Need of Urban and Regional Planning. Issues in Urban and regional Planning in India. Application of Aerial Photographs and satellite imageries in urban and regional planning. Urban Information System. Requirement and Availability of remote sensing data for urban planning.

### Unit-II

Physical Planning of Urban area : Introduction, Issues and Management.

Urban Land use Planning - Issues and Techniques.

### Unit-III

Land use/ Land cover mapping. Classification system for urban land use classification. Creation and updation of Urban land use maps. (Case studies from Indian Cities). Urban sprawl - Introduction, issues in urban sprawl in India. Mapping of urban sprawl with aerial photos and satellite imageries. Case study of : Chandigarh and Rohtak.

### Unit-IV

Urban hazards : Meaning, Types, Planning and Mapping.

(Application of Aerial Photographs and satellite imageries).

A case study from Indian cities.

Traffic Management - Introduction and Issues.

Application of aerial photographs in traffic management. A case study.

#### **Note : 1. Theory**

- (i) A compulsory question containing 10 short answer type questions shall be set covering the whole syllabus. Student with attempt any 7 short answer type questions in about 25-30 words each. Each short answer type question will carry 2 marks (total 14 marks).
- (ii) A total of eight questions will be set out of the whole

syllabus, at least 2 from each unit. The candidates will attempt 4 questions selecting one from each unit. All questions will carry equal marks. These will be in addition to the compulsory question at serial number 1.

#### **Note : 2. Internal Assessment**

Refer to clause 14 of the relevant ordinance for details on conduct and criteria for internal assessment.

#### **Recommended Readings :**

1. A very, T.E., and G.L. Berlin, 1985, *Interpretation of Aerial Photographs, Burgess Minneapolis.*
2. Branch, m. C., 1971, *City Planning and Aerial Information, Harvard University, Press., Cambridge.*
3. Lauder, D.T., 1959, *Aerial Photo Interpretation, Mc Graw Hill, New York.*
4. Lindgren, D.T. 1985 *Land use Planning and Remote Sensing, Nijhoff, Dordrecht.*
5. Rhind, David and Hudson ray, 1980, *Landuse, Methuen Pub., New York.*
6. Sokhi, B. S. and SM Rashid, 1999, *Remote Sensing of Urban Environment, Manak Publishers, New Delhi*
7. Way, D., 1978, *terrain Analysis : A Guide to site selection using Aerial Photo Interpretation, Dowden, Hutchinson & Ross, stroudsburg.*
8. Buruside, C.D., 1979, *Mapping from Aerial Photographs, Grands, London*
9. Gautam, N. C. 1970, *Urban Landuse Study through Aerial Photo Interpretation Techniques, Pink Publishing House, Mathura.*
10. Nag, Prithvish, 1992, *Thematic Cartography and remote Sensing, Concept, New Delhi.*
11. Sunderam, K. V., 1977, *Urban and Regional Planning in India, Concept, New Delhi.*
12. Taylor, John, L. Williams, David C., 1981, *Urban Planning Practice in Developing Countries, Pergamon Press.*

## Paper- VI-2 Thematic Applications of RS & GIS in Geomorphology

Time (in hrs.)	: 3
Total Marks	: 100
(a) Theory	: 70
(b) Internal Assessment	: 30

### Unit-I

#### General Geomorphology

Geomorphic processes and landforms - weathering, fluvial, aeolian, glacial and groundwater etc. Igneous, sedimentary and metamorphic rocks- forms, structure - Fault, fold and their field location.

### Unit-II

#### Geomorphic Applications

Principles and recognition elements for terrain evaluation, mapping of terrain, classification of land forms, Interpretation of erosional and depositional land forms. Interpretation of drainage system, Study of land slide and floods - case studies.

### Unit-III

#### Lithologic and Stratigraphic Applications

Spectral characteristics of lithologic/ stratigraphic features, factors affecting tonal appearance of rocks, Identification and mapping of rock types, Study of faults, folds, lineaments and lithologic boundaries, Case Studies.

### Unit-IV

#### Hydrogeomorphological Applications

Hydrologic features and its elements; Surface water and ground water studies, Interpretation techniques for targeting ground water potential zones; Delineation of watershed, watershed prioritization and management- case studies.

#### **Note : 1. Theory**

(i) A compulsory question containing 10 short answer type

questions shall be set covering the whole syllabus. Student with attempt any 7 short answer type questions in about 25-30 words each. Each short answer type question will carry 2 marks (total 14 marks).

(ii) A total of eight questions will be set out of the whole syllabus, at least 2 from each unit. The candidates will attempt 4 questions selecting one from each unit. All questions will carry equal marks. These will be in addition to the compulsory question at serial number 1.

#### **Note : 2. Internal Assessment**

Refer to clause 14 of the relevant ordinance for details on conduct and criteria for internal assessment.

#### **Recommended Readings :**

1. Agarwal, C. S. and P.K. Garg, 2000, A Text Book on remote Sensing in Natural Resources Monitoring and Management, Wheeler, Publishing Co., New Delhi.
2. American Society of Photogrammetry, 1993, Manual of Remote Sensing, Falls Church, Virginia.
3. Arthur L. Bloom, Geomorphology, Prentice Hall, New Delhi.
4. Burrough. P.A., 1986, Geographical Information Systems for Land Resources Systems, Oxford University Press, New York.
5. Druary, S.A., 1987, A Image Interpretation in Geology, Allen and Unwin Ltd. London.
6. Greedy, Alan, F., 1974, Application of Remote Sensing with Special References to Geosciences, Gregory Geo-Science.
7. P. Dayal, Text Book of Geomorphology Shukla book depot, Patna.
8. Siegal, B. S. & Gillespie, A. R., 1986, remote Sensing in geology, John Wiley Publications.
9. Smith, William, L., 1977, Remote Sensing Applications for Mineral Exploration Dawden Hutchingers and Ross Inc.
10. Townsend, J.T.G., 1981, Terrain Analysis and Remote Sensing, George Allen and Unwin.

11. Verbyla, David, L. 2005, Satellite Remote Sensing of Natural Resources, Lewis Publishers, New York.
12. Verstappen, H., 1977, Remote Sensing in Geomorphology, Elsevier Scientific Publications, Netherlands.
13. Way, D., 1978, Terrain Analysis : A Guide to Site selection using Aerial Photo Interpretation, Down, Hutchinson & Ross, Stroudsburg.

**Paper- VII(D) Practicals****Digital Mapping & Global Positioning System****Marks : 60****Time (in hrs.) : 4**

Exercises will be taken on following topics

1. Geo-referencing
2. Digitization of geographic features
3. Entry of non-spatial data
4. Designing and layout of map
5. Map output
6. Introduction and operation of GPS instrument
7. GPS survey of any natural landscape
8. Preparation of outlay map.
9. GPS Survey of any cultural landscape.
10. Preparation of outlay map.

Distribution of Marks :

**(i) Lab Work Test : 30 Marks****(ii) Record and Viva- Voce : 15+15 Marks****Note**

- (a) Each student would conduct and report atleast seven of the 10 exercises.
- (b) The Lab Work test shall consist of four questions. Candidates are required to attempt any two questions. All questions will carry equal marks.
- (c) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.
- (d) The Department shall conduct one field visit to a related field/ area to collect ground truth. The teacher engaged in this process shall be paid TA/DA as per university rules.

**Recommended Readings :**

1. A user's Guide to the Global Positioning System- cnada, Published by Authority Natural Resources Canada, 1995.
2. AC-Automated Cartographic environment by PCI Geomatics Canada.
3. ESRI, 1994, Map Projections : Georeferenceing Spatial Data. Environmental Systems Research Institute, Inc. USA.
4. Robinson, H and et. al, 1995. Elements of Cartography, John Woky & Sons, INC New York. PPI -19.
5. Taylor, D.R.F. (Eds.), 1980. The Computer in Contemporary Cartography. John Wiley and Songs, New York.

**Paper- VII(E)-I Thematic Application of RS & GIS in Urban and Regional Planning.****Marks : 60****Time (in hrs.): 4****Exercises will be taken on the following topics :**

1. Identification and description of objects in Urban area on aerial photopgraphs.
2. Identification and Mapping of Urban land uses on aerial photographs.
3. Identification and mapping of urban landuses on satellite imageries.
4. Monitoring of Urban growth/ change using aerial photographs
5. Monitoring of urban growth using satellite imageries.
6. Visual Interpretation of urban area on aerial photographs.
7. Urban Sprawl - Multidate mapping with GIS Softwares.
8. Population estimation through remotely sensed data - one exercise.
9. On screen digitization and mapping of various urban land use/ landcover on satellite imageries.
10. Digital interpretation of urban area on satellite images.

Distribution of Marks :

**(i) Lab Work Test : 30 Marks****(ii) Record and Viva- Voce : 15+15 Marks****Note**

- (a) Each student would conduct and report atleast seven of the 10 exercises.
- (b) The Lab Work test shall consist of four questions. Cadidates are required to attempt any two questions. All questions will carry equal marks.

- (c) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.
- (d) The Department shall conduct one field visit to a related field/ area to collect ground truth. The teacher engaged in this process shall be paid TA/DA as per university rules.

#### Recommended Readings :

1. A very, T.E., and G.L. Berlin, 1985, *Interpretation of Aerial Photographs, Burgess Minneapolis.*
2. Branch, m. C., 1971, *City Planning and Aerial Infomation, Harvrd Univerity, Press., Cambridge.*
3. Lauder, D.T., 1959, *Aerial Photo Interpretation, Mc Graw Hill, New York.*
4. Lindgren, D.T. 1985 *Land use Planing and Remote Sensing, Nijhoff, Dordrecht.*
5. Rhind, David and Hudson ray, 1980, *Landuse, Methuen Pub., New York.*
6. Sokhi, B. S. and SM Rashid, 1999, *Remote Sensing of Urban Environment, Manak Publishers, New Delhi*
7. Way, D., 1978, *terrain Analysis : A Guide to site selection using Aerial Photo Interpretation, Dowden, Hutchinson & Ross, stroudsburg.*
8. Buruside, C.D., 1979, *Mapping from Aerial Photographs, Grands, London*
9. Gautam, N. C. 1970, *Urban Landuse Study through Aerial Photo Interpretation Techniques, Pink Publishing House, Mathura.*
10. Nag, Prithvish, 1992, *Thematic Cartography and remote Sensing, Concept, New Delhi.*
11. Sunderam, K. V., 1977, *Urban and Regional Planning in India, Concept, New Delhi.*
12. Taylor, John, L. Williams, David C., 1981, *Urban Planning Practice in Developing Couries, Pergamon Press.*

#### Paper- VII(E)-2 Praticals

#### Thematic Applications of Remote Sensing and Geographic Infomation Systems in Geomorphology.

**Marks : 60**

**Time (in hrs.): 4**

#### Exercises will be taken on the following topics :

1. Identification and mapping of geomorphological fetaures from topographical maps, aerial photographs and satellite imageries. (One exercise each ) Total = 3
2. Measurement and mapping of slope from topographical maps, aerial photographs. (One exercise each ) Total = 2
3. Identification and mapping of different types of rocks from aerial photographs and satellite Imageries. (One exercise each ) Total = 2
4. Surface water mapping from satellite imagery. Total = 1
5. Delineation of watersheds from topographical maps, aerial photographs and satellite imageries. Total = 1
6. Delineation of flood plains and flood enundation mapping through satellite imageries. Total = 1

#### Distribution of Marks :

**(i) Lab Work Test : 30 Marks**

**(ii) Record and Viva- Voce : 15+15 Marks**

#### Note

- (a) Each student would conduct and report atleast seven of the 10 exercises.
- (b) The Lab Work test shall consist of four questions. Cadidates are required to attempt any two questions. All questions will carry equal marks.
- (c) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.
- (d) The Department shall conduct one field visit to a related field/ area to collect ground truth. The teacher engaged in this process shall be paid TA/DA as per university rules.