Master of Science in Geography

Course Structure and Syllabus

1st to 4th Semester

Academic Session 2016-18

Centre for Geography and Geology

Central University of Punjab

Bathinda

Course Structure and Syllabus for M.Sc. Geography											
Course Code	**Course Title**	**Credit Hours**				**% Weightage**				**E**	**CBCS**
		L	**T**	**P**	**Cr**	**A**	**B**	**C**	**D**		
Semester-I											
Core courses											
GEO.501	Geomorphology	4	1	-	4	25	25	25	25	100	Co
GEO.502	Principles of Climatology	4	1	-	4	25	25	25	25	100	Co
GEO.503	Human Ecology	4	1	-	4	25	25	25	25	100	Co
GEO.504	Computer applications and Quantitative Methods	2	-	-	2	25	25	25	25	100	Fd
GEO.505	Computer applications and Quantitative Methods-Practical	-	-	4	2	-	-	-	100	100	Fd
GEO.506	Cartography- Theory	2	-	-	2	25	25	25	25	100	Fd
GEO.507	Cartography- Practical	-	-	4	2	-	-	-	100	100	Fd
GEO.599	Assignment based Seminar-I	1	-	-	1	-	-	-	100	100	Co
Elective courses: Select any one of the interdisciplinary courses listed below											
IC.	Interdisciplinary course from other discipline	2	-	-	2	-	25	-	25	50	El
	Total	**19**	**3**	**8**	**23**	**-**	**-**	**-**	**-**	**850**	
Semester-II											
Core courses											
GEO.508	Oceanography	4	1	-	4	25	25	25	25	100	Co
GEO.509	Geography of India	4	1	-	4	25	25	25	25	100	Co
GEO.510	Statistical Techniques in Spatial Analysis- Practical	-	-	4	2	-	-	-	100	100	Fd
GEO.511	Evolution of Geographical Thought	4	1	-	4	25	25	25	25	100	Co
GEO.599	Assignment based Seminar-II	1	-	-	1	-	-	-	100	100	Co
Elective courses: Select any one of the interdisciplinary courses listed below											
IC.	Interdisciplinary course from other discipline	2	-	-	2	-	25	-	25	50	El
Compulsory and interdisciplinary course for M.Sc.											
GEO.512	Soil Pollution and Management	4	1	-	4	25	25	25	25	100	Fd
GEO.513	Soil Pollution and Management - Practical	-	-	4	2	-	-	-	100	100	Fd
	Total	**19**	**4**	**8**	**23**	**-**	**-**	**-**	**-**	**750**	
Semester-III											
Core courses											
GEO.601	Fundamentals of Remote Sensing	4	1	-	4	25	25	25	25	100	Co
GEO.602	Fundamentals of Remote Sensing-Practical	-	-	4	2	-	-	-	100	100	Co
GEO.603	Research Methodology in Geography and synopsis writing	4	-	-	4	25	25	25	25	100	Fd

GEO.604	Field visit (Max. ten days) and report writing	-	-	-	1	-	-	-	100	100	Co
GEO.699	Assignment based Seminar-III	1	-	-	1	-	-	-	100	100	Co
Optional courses I: Select any one from the followings:											
GEO.621	Sustainability Studies	4	1	-	4	25	25	25	25	100	Co
GEO.622	Social Geography	4	1	-	4	25	25	25	25	100	Co
GEO.623	Biogeography	4	1	-	4	25	25	25	25	100	Co
GEO.624	Gender Geography	4	1	-	4	25	25	25	25	100	Co
GEO.625	Geography of Health and Well-being	4	1	-	4	25	25	25	25	100	Co
GEO.626	Natural Resource Governance and Policy	4	1	-	4	25	25	25	25	100	Co
Optional courses II: Select any one special group based on specialisation from the followings:											
Group A											
GEO.627	Population Geography	4	1	-	4	25	25	25	25	100	El
GEO.628	Population Geography-Practical	-	-	4	2	-	-	-	100	100	El
Group B											
GEO.629	Fundamentals of Photogrammetry	4	1	-	4	25	25	25	25	100	El
GEO.630	Fundamentals of Photogrammetry - Practical	-	-	4	2	-	-	-	100	100	El
Group C											
GEO.631	Geography of Rural Settlement and Planning	4	1	-	4	25	25	25	25	100	El
GEO.632	Geography of Rural Settlement and Planning -Practical	-	-	4	2	-	-	-	100	100	El
Group D											
GEO.633	Geography of Disaster	4	1	-	4	25	25	25	25	100	El
GEO.634	Geography of Disaster - Practical	-	-	4	2	-	-	-	100	100	El
	Total	**17**	**3**	**8**	**22**	**-**	**-**	**-**	**-**	**800**	
Semester-IV											
Core courses											
GEO.605	Fundamentals of GIS and GPS	4	1	-	4	25	25	25	25	100	Co
GEO.606	Fundamentals of GIS and GPS-Practical	-	-	4	2	-	-	-	100	100	Co
GEO.700	Dissertation/Project work and Viva voce	-	-	-	10	-	-	-	100	300	Co
Elective courses: Select any one special group based on specialisation from the followings:											
Group A											
GEO.635	Gender, Health and Development	4	1	-	4	25	25	25	25	100	El
GEO.636	Gender, Health and Development - Practical	-	-	4	2	-	-	-	100	100	El
Group B											
GEO.637	Digital Image Processing & Information Extraction	4	1	-	4	25	25	25	25	100	El
GEO.638	Digital Image Processing &	-	-	4	2	-	-	-	100	100	El

	Information Extraction -Practical										
Group C											
GEO.639	Geography of Urban System and Planning	4	1	-	4	25	25	25	25	100	El
GEO.640	Geography of Urban System and Planning -Practical	-	-	4	2	-	-	-	100	100	El
Group D											
GEO.641	Disaster Preparedness and Management	4	1	-	4	25	25	25	25	100	El
GEO.642	Disaster Preparedness and Management - Practical	-	-	4	2	-	-	-	100	100	El
	Total	**8**	**2**	**8**	**22**	**-**	**-**	**-**	**-**	**700**	
	Grand total	**63**	**12**	**32**	**90**	**-**	**-**	**-**	**-**	**3100**	

A: Continuous Assessment: Based on Objective Type Tests **B:** Mid-Term Test-1: Based on Objective Type and Subjective Type Test **C:** Mid-Term Test-2: Based on Objective Type and Subjective Type Test **D:** End-Term Exam (Final): Based on Objective Type Tests **E:** Total Marks	Choice Based Credit System (CBCS): CO: Core Course Fd: Foundation Course El: Elective Course
L: Lectures T: Tutorial P: Practical Cr: Credits	

Semester-I

Course Title: Geomorphology

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.501

Course Description:
It introduces the basic concepts of geomorphology. It covers various geomorphic processes that would help in understanding different landforms on the earths' surface.

Unit I (12 Lectures)

Fundamental Concepts in Geomorphology:

- Geological structures and landforms
- Principles of uniformitarianism
- Isostasy – Doctrine of Isostasy; Views of Airy and Pratt
- Mountain Building Theories – concepts of Kober, Daly and Holmes.

Unit II: (12 Lectures)

Earth Movements

- Planetary evolution of the earth and its internal structure. Heterogeneity of the earth's crust. Major tectonic features of the Oceanic and Continental crust. Seafloor spreading and Plate Tectonics. Island arcs, Oceanic islands and volcanic arcs. Continental drift — geological and geophysical evidence, mechanics, objections, present status.
- Gravity and magnetic anomalies at Mid-ocean ridges, deep sea trenches, continental shield areas and mountain chains. Palaeomagnetism. Isostasy, orogeny and epeirogeny. Seismic belts of the earth. Seismicity and plate movements. Geodynamics of the Indian plate.

Unit III: (16 Lectures)

Exogenic Processes

- Cycle of Erosion - concepts of Davis and Penck
- Weathering and soil formation
- Dynamics of fluvial process and resulting landforms
- Dynamics of glacial process and resulting landforms.
- Dynamics of Aeolian process and resulting landforms.

Unit IV: (16 Lectures)

Applied Geomorphology

- Terrain classification and its applications
- Oil exploitation
- Engineering projects
- Drainage network analysis – Stream orders, Sinuosity index and
- Drainage density

Suggested readings:

1. Thornbury, W.D. (1969) Principles of Geomorphology, New York: John Wiley and Sons. 2nd edition, December 2004.
2. Singh, Savindra (1998). Geomorphology, Allahabad: Prayag Pustak Bhawan.

Additional readings:

1. Bloom, Arthur L., Geomorphology: A Systematic Analysis of Late Cainozoic Landforms, Pearson Education, Singapore, 3rd Edition, 2003.
2. Bloom, A.L. (1979) Geomorphology, New Delhi: Prentice Hall of India Pvt. Ltd.

3. Chorley, R.J., et.al. (1984): Geomorphology, John Wiley and Sons, New York.
4. Cooke, R.V. and Doornkomp, J.C. (1974): Geomorphology in Environment Management – An Introduction, Clarendon Press, Oxford.
5. Davis, W. M. (1909). Geographical Essays, Dover, Boston.
6. Embleton, C. and King, C.A.M. (1975). Glacial Geomorphology, London: Edward Arnold.
7. Fairbridge, R.W. (1968). Encyclopedia of Geomorphology, New York: Reinholds.
8. Gondie, S.A. (2004) (Eds). Encyclopedia of Geomorphology, Routledge, London.
9. Hart, M.G. (1986). Geomorphology, Pure and Applied, George Allen and Unwin, London.
10. Hails, J.R. (1977). Applied Geomorphology, Elsevier, Amsterdam Morisawa, M (1968) Streams, New York: McGraw Hill.
11. Pitty, A.F. (1982) The Nature of Geomorphology, New York: Methuen.
12. Rice, R.J. (1990). Fundamentals of Geomorphology, London: ELBSL.
13. Schumn, S. (1977). The Fluvial System, New York: John Wiley and Sons.
14. Small, R.J. (1978). The Study of Landforms, Cambridge: Cambridge University.
15. Sparks, B.W. (1972): Geomorphology, Longman Group Ltd.
16. Steers, J.A. (1937) The Unstable Earth, Methuen and Co., Ltd, London.
17. Strahler, A.N. (1992) Physical Geography, New York: John Wiley and Sons.
18. Strahler, Alan and Arthur Strahler. (1996). Physical Geography: Science and Systems of the Human Environment, John Wiley & Sons, New York, 3rd Edition, 2005.

Course Title: Principles of Climatology

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.502

Course Description:
It introduces the basic concepts of climatology. The paper covers understanding the atmospheric condition and various agents affecting the earth surface. It includes applied climatology that would study inter relationship of man and climate.

Unit I (04 Lectures)

Nature and Scope of Climatology, development of applied climatology, climate impact, Earth's Atmosphere: Evolution, Structure and Composition.

Unit II: (14 Lectures)

Solar radiation and Terrestrial radiation, Latitudinal and seasonal variation, effect of atmosphere, greenhouse effect and distribution of solar radiation over the earth; global heat budget. Temperature: Concept, measurement, scales, daily and annual cycles of temperature; vertical distribution; world distribution.

Unit III: (14 Lectures)

Atmospheric pressure and winds: Vertical variation of pressure; horizontal variation of pressure; forces affecting wind: pressure systems; surface winds.

Atmospheric moisture and precipitation: Concept and measurement of atmospheric moisture; condensation - forms of condensation; adiabatic temperature changes, hydrologic cycle; formation and types of precipitation; global distribution of precipitation.

Unit IV: (12 Lectures)

Models of general circulation of the atmosphere, Jet stream, Air masses and fronts, characteristics, movements, frontogenesis– extra tropical cyclones, tropical cyclones, ENSO phenomena; **Classification of climates:** Empirical and generic, Climatic classification with special reference to Koppen and Thornthwaite.

Unit V: (12 Lectures)

Applied Climatology: Climate and the physical environment: soil, and water resources, flora and fauna. Climate and human environment: agricultural and industrial. Climate, urbanization and urban planning. Weather forecasting and recent trends in climatology. Micro climates. Urban climate – industrial transport and commercial activities.

Suggested readings:

1. Savindra Singh (2005). 'Climatology', Prayag Pustak Bhavan, Allahabad.
2. Lal, D.S. (1998). 'Climatology', Chaitanya Publishing House, Allahabad.

Additional readings:

1. Barry, G.G. and Chorley. (1976). Atmosphere, Weather and Climate, Methuen and Co., London.
2. Barret, E.C. (1974). Climatology from Satellites, Methuen London.
3. Critchfield, H.F., (1987). General Climatology, Prentice-Hall of India Pvt. Ltd., New Delhi.
4. Lowa Lutgens, Federic K. & Tarbuck Edward J (1995). 'The Atmosphere: An Introduction to Meteorology', Prentice Hall, New Jersey.
5. Thompson, R.D. and Allen, P. (1997). 'Applied Climatology: Principles and Practice', Routledge, London and New York.
6. Oliver, John E. (1973). 'Climate and Mans Environment: An Introduction to Applied Climatology', John Wiley & Sons, New York, London.
7. Mather, J.R. (1974). 'Climatology: Fundamentals and Applications', McGraw-Hill, New York.

Course Title: Human Ecology

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.503

Course description:

The course introduce to the concept of ecology with reference to human ecology. The course design will help in better understanding to human and it environment relationship that forms a foundation of geography.

Unit I (10 Lectures)

Human Ecology:

Evolution & Development; Key Concepts: Anthropocentricism, cultural lag, the commons and theories; Environmental ethics.

Unit II: (12 Lectures)

Humans and environment:

Humans and the Biosphere: Coevolution and coadaptation of human system and ecosystems; Resources, technologies, environment and consumerism: Problems and consequences; Geographies of wealth, hunger and health**.**

Unit III: (12 Lectures)

Humans and biophysical system:
Humans as agents of larger social system; Human population size, growth and biophysical carrying capacity of Earth; Positive and negative feedback of human numbers and quality of life; Alteration of biogeography, material cycles and energy flow**.**

Unit IV: (12 Lectures)

Global change adaptation:
Environmental crises and human reintegration. The end of duality: Adaptation and behavioural change; Environmental Management (undoing misdeeds): Eco regional and watershed Management strategies; Landscapes restoration and conservation of biodiversity.

Unit V: (10 Lectures)

Case studies of human induced ecological changes: (a) Hill ecosystems with specific reference to Punjab Shivalik. (b) Wetland ecosystems with specific reference to the Punjab wetlands. (c) Agricultural ecosystems with specific reference to the Green Revolution in Punjab.

Suggested readings:

1. Agarwal, A., Narain, S. and Sen, S. (1999). 'The Citizens' Fifth Report, Centre for Science and Environment, New Delhi.
2. Beeby, A. and Brennan, A. (2008). First Ecology: Ecological Principles and Environmental Issues, 3 rd Edition, Oxford University Press.
3. Brar, Karanjot Kaur. (1999). Green Revolution: Ecological Implications, Dominant Publishers, Delhi.
4. Chandna, R.C. (1998). Environmental Awareness, Kalyani Publishers, New Delhi.
5. Dhabriya, S.S. (1988). Desert Spread and Desertification: An Analysis of the Identified Aravalli Gaps on the Desert Fringe, Environmental Research Publication-1, Environmentalist, Jaipur, 1988.
6. Dhabriya, S.S. (1988). Ecocrisis in the Aravalli Hill Region, Environmental Research Publication-2, Environmentalist, Jaipur.
7. Dieter Steiner and Marcus Nauser (eds.): Human Ecology; New York: Routledge, 1993
8. Ehrlich, P.R., A.H. Ehrlich and J.P. Holdren: Human Ecology, San Francisco: W.H. Freeman & Co.; 1973
9. George A. Theodorson (ed.): Studies in Human Ecology, New York:
10. Global Environment Outlook (2000). Earthscan Publications, London.
11. Golley, Frank B. (1998). A Primer for Environmental Literacy, Universities Press (India) Limited, Hyderabad.
12. Harper & Row, 1961Ernst, W.G. (ed.), Earth Systems: Processes and Issues, Cambridge University Press, U.K., 2000.
13. Kormondy, Edward J. (1989). Concepts of Ecology, Third Edition, Prentice-Hall of India, New Delhi.
14. Odum, Eugene P. (1971). Fundamentals of Ecology, Natraj Publishers, Dehra Dun.
15. Osborne, P. (2000). Tropical Ecosystems and Ecological Concepts, Cambridge University Press, U.K.

Course Title: Computer applications and Quantitative Methods

L	T	P	Cr	Marks
2	-	-	2	**100**

Course Code: GEO.504

Course description:
This paper outlined general concepts on computer and statistics for the student. The course design would benefit the student in computer and statistics requirement in other papers.

Unit I (10 Lectures)

Fundamentals of computers: Parts of computers, Hardware, BIOS, Operating systems, Binary system, Logic gates and Boolean Algebra.
Application software: Spreadsheet applications, Word-processing applications, Presentation applications, Internet browsers, Reference Management, and Image processing applications.

Unit II: (10 Lectures)

Computer Language: Basic DOS commands, AutoHotKey scripting language, HTML and basic structure of a webpage, Designing websites.
World Wide Web: Origin and concepts, Latency and bandwidth, Searching the internet, Advanced web-search using Boolean logic, Cloud computing.

Unit III: (12 Lectures)

Geographic pattern and its measures:
Nearest Neighbour Analysis; Gini's Co-efficient; Lorenz curves; Location quotient; Rank size rule.

Unite IV: (12 Lectures)

Measures of disparities and potential model:
Gravity and potential models; Delimitation of hinterlands; Combinational analysis of Weaver, S.M. Rafiulla's method, Measures of Disparities: Kendall's ranking method.

Suggested readings:

1. Bhatt, Pramod Chandra P. An Introduction to Operating Systems: Concepts and Practice. Second edition, New Delhi: PHI Learning Pvt. Ltd., 2008.
2. Burt J.E. Barber. G.E. Rigby D.L. (2009). Elementary Statistics for Geographers, Guilford Press, New York.
3. Date, C. J. An Introduction to Database Systems. Massachusetts: Addison-Wesley
4. Longman, 7th Edition, 2000.
5. David, Cyganski, John A. Orrand R.F. Vaz. Information Technology: Inside and Outside. New Jersey: Prentice Hall, 2000.
6. Douglas, Gretchen and Mark Connell. Fundamentals of MS Office 2007. Second edition, Dubuque: Kendall Hunt Publication Company, 2007.
7. Gookin, D. (2007). MS Word for Dummies. Wiley.
8. Harvey, G. (2007). MS Excel for Dummies. Wiley
9. Jamsa, Kris A. DOS: The Pocket Reference. Berkeley: Osborne McGraw-Hill, 1993.
10. Murdock, Everett E. DOS The Easy Way:A Complete Guide to Microsoft's MS DOS. H O T Press, Easy Way Downloadable Books, 1988.
11. Narang, Rajesh. Database Management System. New Delhi: PHI Learning Pvt. Ltd., 2006.
12. Rajaraman, V. Fundamentals of Computers. New Delhi: PHI Learning Pvt. Ltd., 2003.Sanders, Donald H. Computers Today. Singapore: McGraw Hill Publishing, 198.
13. Richardson L. (2000). Writing: A method of inquiry. In N. Denzin and Y. Lincoln, eds. Handbook of Qualitative Research. Thousand Oaks, CA: Sage Publications, pp. 923-948.
14. Silverman D. (2000). Analyzing talk and text. In N. Denzin and Y. Lincoln, eds. Handbook of

Qualitative Research. Thousand Oaks, CA: Sage Publications, pp. 821-834.Waitt, G. (2010). Doing Foucaldian Discourse Analysis—Revealing Social Realities. In I.Hay, Ed. Qualitative Research Methods in Human Geography. Third Edition. Oxford: Oxford University Press, pp. 217-240.
15. Sinha, P.K., Computer Fundamentals, BPB Publications.

GEO.505	Computer Applications Quantitative Methods-Practical	-	-	4	2	-	-	-	100	100	Fd

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Course Title: Cartography- Theory

L	T	P	Cr	Marks
2	-	-	2	**100**

Course Code: GEO.506

Course description:
The main foundation of geography lies with cartography. Cartography is the art, science, and ethics of mapmaking and map use. It focuses upon the design of maps, information visualization, and semiotics.

Unit I (8 lectures)

Introduction to Cartography; Nature and Scope of Cartography;
Map Projections I: Geodesy & the Geographic Coordinate System;
Map Projections II - types and distortion patterns.

Unit II: (10 lectures)

Geographical mapping : History of Geographical mapping in survey of India; definition of geographic map, series and description of Geographical maps, Sources of Data for compilation and reference, conventional and digital method; Digital Geographical data base (DGDB);
Fundamentals of Cartography: Generalization and exaggeration: Selection, Simplification and Ommittance. Contents of Geodata base; Standardization; **Fundamentals of direction, scale, legends;** Classification of maps; Elements of maps: Generalization, Symbolization and Classification. Hypsometric Tints.

Unit III: (10 lectures)

Assignment:
Prepare a term paper on the following:

- International Map of the World (IMW); State Map series; Political map of India; Physical map of India; Map of India and adjacent countries.

Suggested readings:

1. Dickinson.G.C. 1968: Statistical Mapping and Presentation of Statistics. Arnold, London.
2. Keates, J.S. (1998). Cartographic Design and Production, Longman, London.
3. Lawrence. G.R.P,1971 : Cartographic Methods, Methuen , London.

Additional Readings:

4. Misra, R.P. and Ramesh, A. (1989). Fundamental of Cartography, Concept Publishing Company, New Delhi.
5. Monkhouse, F.J. (1994). Maps and Diagrams, Methuen and Co., London.
6. Raisz, E. (1962). Principles of Cartography, McGraw Hill, New York.
7. Robinson, A.H. et al. (1992). Elements of Cartography, John Willy & Sons, New York, 6th

edition.
8. Ramamurthy, K. (1982). Maps Interpretation: India Landscapes through Survey of India, Topographic Maps, R.K. Mutt Road, Madras.
9. Wood Clifford H. and Keller C. (1996). Cartographic Design- Theoretical and Practical Perspectives, John Wiley & Sons.

Course Title: Cartography- Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.507

Course description:
The main foundation of geography lies with cartography. Cartography is the art, science, and ethics of mapmaking and map use. It focuses upon the design of maps, information visualization, and semiotics. Practical on cartographic tools and techniques related to data distribution and understanding topographical maps is the basic elements of the course design.

Unit-I

- Map Scale: horizontal and vertical, vertical exaggeration
- Scale and Cognitive Maps; Common Scales
- Scale factor
- Conventional Map Projection- Sinusoidal projection, Mollweide's Projection, UTM projection.
- Topographic Map basics.
- Enlargement and reduction of Maps

Unit-II

Mapping socio-economic data

- Mapping of Qualitative and Quantitative data
- Use of dot, circle, pie, sphere, square, block, bar diagram
- Choropleth, isopleths and diagrammatic maps
- Cartograms
- Flow diagram
- Draw maps for Population Density, Rural –Urban population; Patterns of irrigation or any other.

Suggested readings:

1. Dickinson.G.C. 1968: Statistical Mapping and Presentation of Statistics. Arnold, London.
2. Keates, J.S. (1998). Cartographic Design and Production, Longman, London.
3. Lawrence. G.R.P,1971 : Cartographic Methods, Methuen , London.

Additional Readings:

4. Misra, R.P. and Ramesh, A. (1989). Fundamental of Cartography, Concept Publishing Company, New Delhi.
5. Monkhouse, F.J. (1994). Maps and Diagrams, Methuen and Co., London.
6. Raisz, E. (1962). Principles of Cartography, McGraw Hill, New York.
7. Robinson, A.H. et al. (1992). Elements of Cartography, John Willy & Sons, New York, 6th edition.
8. Ramamurthy, K. (1982). Maps Interpretation: India Landscapes through Survey of India, Topographic Maps, R.K. Mutt Road, Madras.
9. Wood Clifford H. and Keller C. (1996). Cartographic Design- Theoretical and Practical Perspectives, John Wiley & Sons.

Semester-II

Course Title: Oceanography

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.508

Course description:
The course introduces to the study of oceans. As continents are surrounded by oceans, understanding of oceans would help in understanding natural phenomena.

Unit I (11 lectures)

Nature and Scope of Oceanography – Major features of Ocean basins, continental margin and deep ocean basins – Bottom relief of Indian, Atlantic and Pacific Oceans.

Unit II: (11 lectures)

Physical and chemical properties of sea water, sources and factors affecting the distribution of temperature and salinity.

Unit III: (11 lectures)

Circulation patterns in the ocean – ocean currents, water masses, waves, tides and tsunamis, their types and theories of origin.

Unit IV: (11 lectures)

Marine biological environment, bio zones – Plankton, Nekton and Benthos, ocean deposits, coral reef, theories of their origin.

Unit V: (12 lectures)

Impacts of Humans on the Marine Environment – Laws of the sea, marine resources, development and pollution, EEZ and resource utilization.

Suggested readings:

1. Davis Richard, J.A. (1986). Oceanography – An Introduction to Marine Environment, wm. C. Brown, Iowa.
2. David Ross (1973). Introduction to Oceanography.
3. Duxbury, C.A. and Duxbury, B. (1996): An Introduction to World's Oceans, C.Brown Iowa (2nd Ed.).
4. Garrison, T. (2001). Oceanography – An Introduction to Marine Science, Books/Cole, Pacific Grove, USA.
5. Gross M.Grant (1987). Oceanography – A view of the Earth, Prentice Hall Inc. New Jersey.
6. Singh Savindra (20). Oceanography, Allahabad.
7. Ummerkutty, A.N.P. (1985). Science of the Oceans and Human Life, National Book Trust, New Delhi.

Course Title: Geography of India

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.509

Course description:
India is a vast country with diversity physically as well as ethnically. The course would help in understanding India and its geographical entity for students.

Unit I (12 Lectures)

Physical aspects and Resources:

Making of India through geological times, structure and relief, physiographic divisions, drainage systems and watersheds, climate characteristics, mechanism of the Indian monsoon, soil-water resources, forest types, distribution and utilization.

Unit II: (9 Lectures)

Agriculture:

Salient features of agriculture, agricultural regions, major crops, problems and prospects, green revolution and its impact, white, blue and yellow revolutions.

Unit III: (15 Lectures)

Industry:

Evolution of industries**:** Locational factors of cotton, jute, textile, iron and steel, aluminium, fertilizer, paper, chemical and pharmaceutical, automobile, cottage and agro-based industries; Industrial houses and complexes including public sector undertakings; Industrial regionalisation; New industrial policies; Multinationals and liberalization; Special Economic Zones; Tourism including eco -tourism.

Unit IV: (10 Lectures)

Population structure and composition:

Size, distribution and density; dynamics of population – Migration and urbanization, population policy.

Unit V: (10 Lectures)

Dynamic, prospective and problem regions of India, Regional disparities in the levels of economic development, Globalisation and its impact on Indian economy and society.

Suggested readings:

1. Deshpande, C.D. (1992). India: A Regional Interpretation, ICSSR & Northern Book Centre, New Delhi.
2. Dutt, Ashok K. (Ed.) (1972). Indian – Resources, Potentialities and Planning, Kendall/Hunt Publishing Company, Dubuque.
3. Government of India (2007). National School Atlas, NATMO, Kolkatta.
4. Gautam, A. (2006). Advance Geography of India, Sharda Pustak Bhawan, Allahabad.
5. India. (2013). A Reference Annual: Ministry of Information & Broadcasting, GOI, New Delhi.
6. Khullar D.R. (2005). India-A comprehensive geography, Kalyani Publishers, Ludhiana.
7. Nagi P. and Smita Sen Gupta (1993). Geography of India, Concept Publishing Company, New Delhi.
8. Ramesh A. (Ed.) (1981). Resource Geography, Heritage Publishers, New Delhi.
9. Tiwari, R.C. (2006). Geography of India, Prayag Pustak Bhavan, Allahabad.
10. Wadia, D.N. (1953). Minerals of India, National Book Trust, New Delhi.

Course Title: Course Title: Statistical Techniques in Spatial Analysis-Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.510

Course description:

This paper outlined general concepts on computer and statistics for the student. The course design would benefit the student in computer and statistics requirement in other papers.

Unit I (10 Lectures)

Overview of statistics: Difference between parametric and non-parametric statistics, Univariant and multivariate analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing.

Unit II: (10 Lectures)

Descriptive statistics: Measures of central tendency and dispersal, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and skewness.

Unit III: (12 Lectures)

Experimental design and analysis: Sampling techniques, Sampling theory, Steps in sampling, Collection of data-types and methods.

Comparing means of two or more groups: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Least significant difference (LSD), Kruskal–Wallis one-way ANOVA by ranks, Friedman two-Way ANOVA by ranks, $\chi 2$ test.

Unite IV: (12 Lectures)

Regression and correlation: Standard errors of regression coefficients, Comparing two regression lines, Pearson product-moment correlation coefficient, Spearman rank correlation coefficient, power and sampling size in correlation and regression.

Suggested readings:

1. Bhatt, Pramod Chandra P. An Introduction to Operating Systems: Concepts and Practice. Second edition, New Delhi: PHI Learning Pvt. Ltd., 2008.
2. Burt J.E. Barber. G.E. Rigby D.L. (2009). Elementary Statistics for Geographers, Guilford Press, New York.
3. Date, C. J. An Introduction to Database Systems. Massachusetts: Addison-Wesley
4. Longman, 7th Edition, 2000.
5. David, Cyganski, John A. Orrand R.F. Vaz. Information Technology: Inside and Outside. New Jersey: Prentice Hall, 2000.
6. Douglas, Gretchen and Mark Connell. Fundamentals of MS Office 2007. Second edition, Dubuque: Kendall Hunt Publication Company, 2007.
7. Gookin, D. (2007). MS Word for Dummies. Wiley.
8. Harvey, G. (2007). MS Excel for Dummies. Wiley
9. Jamsa, Kris A. DOS: The Pocket Reference. Berkeley: Osborne McGraw-Hill, 1993.
10. Murdock, Everett E. DOS The Easy Way:A Complete Guide to Microsoft's MS DOS. H O T Press, Easy Way Downloadable Books, 1988.
11. Narang, Rajesh. Database Management System. New Delhi: PHI Learning Pvt. Ltd., 2006.
12. Rajaraman, V. Fundamentals of Computers. New Delhi: PHI Learning Pvt. Ltd., 2003.Sanders, Donald H. Computers Today. Singapore: McGraw Hill Publishing, 198.
13. Richardson L. (2000). Writing: A method of inquiry. In N. Denzin and Y. Lincoln, eds. Handbook of Qualitative Research. Thousand Oaks, CA: Sage Publications, pp. 923-948.
14. Silverman D. (2000). Analyzing talk and text. In N. Denzin and Y. Lincoln, eds. Handbook of Qualitative Research. Thousand Oaks, CA: Sage Publications, pp. 821-834.Waitt, G. (2010). Doing Foucaldian Discourse Analysis—Revealing Social Realities. In I.Hay, Ed. Qualitative Research Methods in Human Geography. Third Edition. Oxford: Oxford University Press, pp. 217-240.
15. Sinha, P.K., Computer Fundamentals, BPB Publications.

Course Title: Evolution of Geographical Thought

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.511

Course Description:
It introduces to life and works of various geographers and explains the development of geography as a discipline.

Unit I (12 lectures)

Basic Concepts: The field of Geography, its place in the classification of Sciences; Geography as a social science and natural science. **Evolution of Geographic Thought**: Changing paradigms – Environmentalism, Possibilism, areal differentiation, spatial organisation.

Unit II: (16 lectures)

Theory in Geography: structure, nature, type and applications in geography; human-environment interactions and social theory. **Philosophical debates in Contemporary Geography:** Critical understanding of positivism, behaviouralism, realism, Marxism, Structuralism, post-structuralism and postmodernism.

Unit III: (16 lectures)

Methods in Geographical Analysis: Epistemology of geography, critical assessment and debates on quantitative, qualitative, field and cartographic methods in geography.
Exceptionalism and the Schaefer-Hartshorne debate. Feminist geography.

Unit IV: (12 lectures)

Future of Geography: changing nature, concepts, approaches and methodologies of geography in a Globalising World. Progress and Contributions in Indian Geography.

Suggested readings:

1. Dikshit, R. D. (2004): Geographical Thought. A Critical History of Ideas. Prentice-Hall of India, New Delhi.

Additional reading:

1. Adams, P., Steven, H. and Karel, T. (eds.) (2001): Texture of Place. Exploring Humanistic Geographies. University of Minnesota Press, Minneapolis.
2. Anderson, K., Domosh, M., Pile, S. and Thrift, N. (eds.) (2003): Handbook of Cultural Geography. Sage Publications, London.
3. Barnes, T. and Gregory, D. (eds.) (1997): Readings in Human Geography: The Poetics and Politics of Inquiry. Arnold, London.
4. Bunkše, E. V. (2004): Geography and the Art of Life. John Hopkins University Press, Baltimore.
5. Buttimer, A. (1971): Society and Milieu in the French Geographic Tradition. Rand McNally, Chicago.
6. Daniels, P., Bradshaw, M., Shaw, D. and Sidaway, J. (2000): An Introduction to Human Geography. Issues for the 21st Century. Prentice Hall, London.
7. Dear, M. J. and Flusty, S. (2002): The Spaces of Postmodernity: Readings in Human Geography. Blackwell Publishers, Oxford.
8. Doel, M. (1999): Poststructuralist Geographies. The Diabolical Art of Spatial Science. Edinburgh University Press, Edinburgh
9. Gaile, G. and Wilmott, C. (eds.) (2003): Geography in America at the Dawn of the 21st Century. Oxford University Press, Oxford and New York.
10. Hartshorne (1939). The Nature of Geography. Association of American Geographers Lancaster Pennsylvania.

11. Hartshorne (1959). Perspective on the Nature of Geography Rand McNally and company Chicago.
12. Harvey, D. (1969): Explanation in Geography. Arnold, London.
13. Harvey, M. E. and Holly, P.B. (2002): Themes in Geographic Thought. Rawat Publications., Jaipur and New Delhi.
14. Hubbard, P., Kitchin, R., Bartley, B. and Fuller, D. (2002): Thinking Geographically: Space, Theory and Contemporary Human Geography. Continuum, London.
15. Johnston, R, Gregory D, Pratt G, Watts M. and Whatmore S. (2003): The Dictionary of Human Geography. Blackwell Publishers, Oxford. 5th edition.
16. Johnston, R.J. (1985): The Future of Geography, Metheun and Company Ltd., New York. (2003 edition published).
17. Johnston, R.J. and Sidaway, J.D. (2004): Geography and Geographers. 6th edition, Edward Arnold, London.
18. Kapur, A. (ed.) (2001): Indian Geography – Voice of Concern. Concept Publishing. Company, New Delhi.
19. Martin, G. (2005): All Possible Worlds. A History of Geographical Ideas. 4th edition, Oxford University Press, New York.
20. Mathews, J. A. and Herbert, D. T. (eds.) (2004): Unifying Geography. Common Heritage, Shared Future. Routledge, London.
21. Peet, R. (1998): Modern Geographical Thought. Blackwell Publishers Inc, Massachusetts.
22. Sack, R. D. (ed.) (2002): Progress. Geographical Essays. John Hopkins University Press, Baltimore.
23. Sauer, C. O. (1963): Land and Life. University of California Press, Berkeley.
24. Singh, R. L. and Singh, Rana P.B. (eds.) (1990): Literature and Humanistic Geography. National Geographical Society of India, BHU, Varanasi, Publication number 37
25. Singh, R. L. and Singh, Rana P.B. (eds.) (1992): The Roots of Indian Geography: Search and
26. Singh, Rana P.B. (ed.) (1993): Environmental Ethics. National Geographical. Society of India, BHU, Varanasi, Publication number 40.
27. Singh, Rana P.B. (ed.) (1994): The Spirit and Power of Place. National Geographical Society of India, BHU, Varanasi, Publication number 41.
28. Singh, Rana P. B. (2004): Cultural Landscapes and the Lifeworld. Indica Books, Varanasi.
29. Soja, E. (1989): Post-modern Geographies. Verso Press, London. Reprinted 1997: Rawat Publications, Jaipur and New Delhi.
30. Taylor, G. (ed.) (1953): Geography in the Twentieth Century. Methuen and Company Ltd. and Company, London.
31. Tuan, Yi-Fu (1977): Space and Place. The Perspective of Experience. Edward Arnold, London.
32. Singh, Ravi S (ed.) 2009. Indian Geography: Perspectives, Concerns and Issues. Jaipur/New Delhi: Rawat Publications.

Course Title: Soil Pollution and Management

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO 512

Unit I (16 Lectures)

Soil formation

Definition, rocks, minerals, soil forming factors, soil weathering- types and processes, soil formation, soil horizon, soil profiles, composition of soil, soil biota and their function in soil, humus, Soil microbes

in nutrient cycling, Soil types in India. Physico-chemical and biological properties of soil, sampling and analysis of soil quality.

Unit II: (14 Lectures)

Soil pollution

Definition, sources- point and non- point, soil pollutants – types and characteristics, routes. Soil pollutants – Types, pesticides – classification, formulation; residual toxicity, synthetic fertilizers, heavy metals, Industrial waste effluents and interaction with soil components. Effects and impacts of soil pollution, biomagnification. Thermal pollution – sources and impacts.

Unit III: (14 Lectures)

Soil erosion

Salt affected soil – Saline soils, Sodic soil, Usar, Kallar, Types of erosion – water and wind erosion, causes, soil loss equation. Land degradation – causes and impacts, types of waste lands in India, desertification and its Control.

Unit IV: (12 Lectures)

Soil management

Methodologies for soil conservation, conservation of arable land, techniques of reclamation and restoration of soil, wasteland reclamation, soil salinity management, remedial measures for soil pollution, bioremediation- in situ, ex situ, phytoremediation and biodegradation. Principles of weed management, Legal measures for land conservation at national and international level.

Suggested readings:

1. Botkin, Daniel B. and Keller, Edward A. Environmental Science: Earth as a Living Planet. 6th ed. John Wiley & Sons, USA. 2007.
2. Cunningham, W. P. and Cunningham, M. A. Principles of Environment Science. Enquiry and Applications. 2nd ed. Tata McGraw Hill, New Delhi. 2004.
3. Cutler, S.L, Environment Risks and Hazard. Prentice Hall of India, Delhi. 1999.
4. De, A.K., Environmental Chemistry. New Age International (P) Ltd. Publishers,New Delhi. 2000.
5. Hillel, D., Introduction to Soil Physics, Academic Press, New York. 1982.
6. Kapoor, B.S. Environmental Sanitation. S. Chand & Sons, New Delhi. . 2000.
7. Raven, Peter H., Berg, Linda R. and Hassenzahl, David M. Environment. 6th ed. John Wiley & Sons., USA. 2008.
8. Sanai, V.S. Fundamentals of Soil. Kalayani Publishers, New Delhi. 1990.
9. Sharma, B.K. Environmental Chemistry, Goel Publishing House, Meerut. 2000.
10. Sharma, P.D. Ecology and Environment, Rastogi Publications, New Delhi. 1997.
11. Singh, H.P., Batish, D.R. and Kohli, R.K. Handbook of Sustainable Weed Management. Haworth Press, Inc., USA. 2006.
12. Singh, R.A. Soil Physical Analysis, Kalayani Publishers, New Delhi. 1997.

Course Title: Soil Pollution and Management - Practical

Course Code: GEO.513

L	T	P	Cr	Marks
-	-	4	2	**100**

Unit I (14 Lectures)

- Determination of pH of water/soil sample.
- Determination of conductivity/TDS of the water sample.
- Determination of salinity of the soil sample.

- Determination of Total Organic Content.
- Determination of Total Kjehldahl Nitrogen (TKN), ammonical nitrogen etc. in soil samples.

Unit II: (14 Lectures)

- Determination of fluoride content in soil.
- Determination of bacterial population in soil samples by serial dilution and spread plate methods.
- Soil sieve analysis
- Standardization and use of Flame Photometer.
- Detection of heavy metal elements using Atomic absorption spectrophotometer.

Semester-III

Course Title: Fundamentals of Remote Sensing

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.601

Course Description:
It introduces the students to the basic concepts and the skills necessary to acquire remote sensing data and extract geo-information from them. The objective of this course is to give understanding of fundamentals of remote sensing.

Unit I (14 Lectures)

Fundamental Concepts of Remote Sensing:
Remote Sensing: Definition, Concept, History and Applications; Types of Remote Sensing; Remote Sensing Platforms and Scanning Systems.

Unit II: (14 Lectures)

EMR Principles and Interaction Mechanisms:
Radiation Principles; Electromagnetic Spectrum; Energy-Atmosphere Interaction; Atmospheric Windows; Energy-Earth Interaction; Spectral Signatures of Surface Features.

Unit III: (14 Lectures)

Remote Sensing platforms, sensors and satellite series:
RS Satellites- Polar sun-synchronous, geo-stationary; Platforms: Types and their orbital characteristics; Sensors types: active and passive; Sensors systems: whiskbroom and push broom; Principles and geometry of scanners and CCD arrays; Satellite RS data products or series: LANDSAT, SPOT, IRS, IKONOS, Quick bird.

Unit IV: (14 Lectures)

Image Processing and Interpretation:
Image: Meaning and Types (Analogue and Digital) and Characteristics; Resolution: Spatial, Spectral, Radiometric and Temporal; Basics of Image Processing; Elements of Image Interpretation. Ground Truth Collection, Visual Interpretation.

Suggested readings:

1. Cracknell, A and Hayes, L. (1990). Remote Sensing Year Book, Taylor and Francis, London.
2. Curran, P.J. (1985). Principles of Remote Sensing, Longman, London.
3. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984). Remote Sensing. Indian Academy of Science, Bangalore.
4. Floyd, F. and Sabins, Jr. (1986). Remote Sensing: Principles and Interpretation, W.H. Freeman, New York.
5. Guham, P. K. (2003). Remote Sensing for Beginners. Affiliated East-West Press Private Ltd., New Delhi.

Additional readings:

1. Hallert, B. (1960). Photogrammetry, McGraw Hill Book Company Inc., New York
2. Harry, C.A. (ed.) (1978). Digital Image Processing, IEEE Computer Society, California
3. Hord, R.M. (1982). Digital Image Processing of Remotely Sensed Data, Academic Press, New York.
4. Leuder, D.R. (1959). Aerial Photographic Interpretation: Principles and Application. McGraw

Hill, New York.
5. Lillesand, T.M. and Kiefer, R.W. (2000). Remote Sensing and Image Interpretation. 4th edition. John Wiley and Sons, New York.
6. Nag, P. (ed.) (1992). Thematic Cartography and Remote Sensing, Concept Publishing. Company, New Delhi.
7. Reeves, R.G. (ed.) (1983). Manual of Remote Sensing, Vols. 1 and 2, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia.
8. Siegel, B.S. and Gillespie, R. (1985). Remote Sensing in Geology, John Wiley and Sons, New York.
9. Silver, M. and Balmori, D. (eds.) (2003). Mapping in an Age of Digital Media. Wiley-Academy, New York and Chichester.
10. Spurr, R. (1960). Photogrammetry and Photo Interpretation, The Roland Press Company, London.
11. Survey of India, (1973). Photogrammetry, Survey of India, Dehradun.
12. Swain, P.H. and Davis, S.M. (ed.), (1978). Remote Sensing: The Quantitative Approach. McGraw Hill, New York.

Course Title: Fundamentals of Remote Sensing-Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.602

Course Description: The practical course gives operational skills necessary to acquire remote sensing data and extract geo-information from them.

Unit I | (14 Lectures)

Remote sensing and image interpretation:
Referencing layout and indent of Landsat TM or IRS imageries; Identification of objects / features on multiband imageries; Detection of defined objects/features; Preparation of Image interpretation keys; Interpretation, classification, delineation and mapping of land use/land cover from False Colour Composite (FCC); Transfer of information from imagery to base map.

Unit II: | (14 Lectures)

Image Processing:
Digital Image: Definition, size and Image Formats; Image Processing System : Image Registration : Image to map and Image to Image; Image Enhancement Techniques : Histogram Equalization. Contrast stretching, filtering and band rationing. Image Classification: selection of training sets, supervised and unsupervised classification.

Course Title: Research Methodology in Geography and synopsis writing

L	T	P	Cr	Marks
4	-	-	4	**100**

Course Code: GEO.603

Course Description:
The course will make the students aware about types, approaches and methods of research in geography and orient the students to design and prepare geographic research proposal, with

emphasis on problem identification, methodology design and literature review.

Unit I (12 Lectures)

Introduction to research in Geography: Concept and significance of research in geography; Philosophy and methods; Naturalism and anti-naturalism; realism and idealism, Critical thinking.

Research and Academic Integrity: Copyright issues, Conduct of ethical research, Belmont report and Plagiarism in research.

Unit II: (12 Lectures)

Scientific Research; Inductive and deductive approaches; Research design; Formulation of research problem; Development and testing of hypothesis; Techniques of data collection; Sampling and field survey.

Unit III: (16 Lectures)

Data Analysis, interpretation and report writing: Data classification and tabulation; Data analysis and interpretation; reference writing; APA, MLA, Chicago. Plagiarism and research ethics.

Unit IV: (16 Lectures)

Writing thesis, project report and research paper; Synopsis writing: procedure, content, methods, literature review.

Suggested readings:

1. Blackburn, J. and Holland, J. (eds.) (1998): Who Changes? Institutionalising Participation in Development. IT Publications, London.
2. Blaxter, L.; Hughes, C. and Tight, M. (1996): How to Research. Open University Press, Buckingham.
3. Crang, Mike 1999. Cultural Geography. Routledge, London.
4. Daniels, P., Bradshaw, M., et al. (2000): Human Geography: Issues for the 21st Century. Prentice Hall, London, and Pearson Publishers., Singapore. Indian reprint, 2003.
5. Denzin, N. K. and Lincoln, Y.S., (eds.) (2000): Handbook of Qualitative Research. Thousand Oaks CA. Sage Publications.

Additional readings:

1. Dikshit, R. D. (2003): The Art and Science of Geography: Integrated Readings. Prentice-Hall of India, New Delhi.
2. Dorling, D. and Simpson, L. (eds.) (1999): Statistics in Society. Edward Arnold, London.
3. Fisher, P. and Unwin, D., (eds.) (2002): Virtual Reality in Geography. Taylor and Francis, London.
4. Flowerdew, R. and Martin, D. (eds.) (1997): Methods in Human Geography. A Guide for Students Doing a Research Project. Longman, Harlow.
5. Hay, I. (ed.) (2000): Qualitative Research Methods in Human Geography. Oxford University Press, New York.
6. Henn, M., Mark W., and Nick F. (2006): A Short Introduction to Social Research, Vistaar Publications, New Delhi
7. Eyles J. and Smith D. M. (1988): Qualitative Methods in Human Geography, Polity Press, Dales Brewering Cambridge.
8. Kitchin, R. and Tate, N., (2001): Conducting Research into Human Geography. Theory, Methodology and Practice. Prentice-Hall, London.
9. Kitchin, R. and Fuller, D., (2003): The Academic's Guide to Publishing, Vistaar Publications, New Delhi
10. Limb, M. (2001): Qualitative Methodologies for Geographers. Issue and Debates. Edward Arnold, London.
11. Lofland, J. and Lofland, L.H. (1995): Analysing Social Setting. A Guide to Qualitative

Observation and Analysis. Wadsworth, Belmont, CA.
12. Longley, P., Goodchild, M.F., Maguire, D. and Rhind, D. (1999): Geographic Information Systems. Principles, Techniques, Management, Applications. John Wiley and Sons, New York.
13. Maso, I., Atkinson, P.A. Delamont, S. and Verhoeven, J.C. (eds.) (1995): Openness in Research. The Tension between Self and Other. Van Gorcum, Assen, Netherlands.
14. Mikkelsen, B. (2005): Methods for Development Work and Research: A New Guide for Practitioners. Sage Publications, London.
15. Mukherjee, N. (1993): Participatory Rural Appraisal: Methodology and Application. Concept Publishing Company, New Delhi.
16. Mukherjee, N. (2002): Participatory Learning and Action: with 100 Field Methods. Concept Publishing Company, New Delhi.
17. O' Leary, Z. (2005): The Essential Guide in Doing Research, Vistaar Publications, New Delhi
18. Pacione, M., (ed.) (1999): Applied Geography: Principle and Practice. Routledge, London.
19. Parsons, T. and Knight, P. G., (1995): How to Do Your Dissertation in Geography and Related Disciplines. Chapman and Hall, London.
20. Patrick M. and Chapman S. (1990): Research Methods(Third Edition), Routledge, London
21. Rachel, P. et al. (2001): Introducing Social Geographies. Arnold Hodder Group, London, and Oxford University Press, Oxford.

GEO.604	Field visit (Max. ten days) and report writing	-	-	-	1	-	-	-	-	100
GEO.699	Assignment based Seminar-III	1	-	-	1	-	-	-	-	100

Optional Courses I: Select any one of the courses listed below:

Course Title: Sustainability Studies

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.621

Course Description: The course gives interdisciplinary perspective to the students. It creates awareness and inculcates knowledge about concept and practices for sustainability.

Unit I (11 Lectures)

Sustainable Development: Definition, concept and historical developments; difference between economic growth, economic development and sustainable development; economic theories of sustainable development, reconciliation between political and theoretical discourses.

Unit II: (15 Lectures)

Geography and Sustainable Development: Sustainable development in disciplinary perspective, sustainable development and geographical agenda, geography and the pursuit of sustainable development. Sustainable Development and the Spatial Scale and Spatial Interaction : Structuring global scale, achieving sustainable development at local, regional, national and global scales, sustainable development and open economies, interaction between different spatial scales.

Unit III: (15 Lectures)

Sustainable Development of Urban Regions: Impacts of urban development, urban modelling and sustainability assessment, models of sustainable urban development, problems and prospects. **Making Cities Sustainable:** Continuity and change in urban problems, defining sustainable urban development, urban challenges in developing world.

Sustainable Economic Development: Business and the environment, sustainable economic

development as Eco-efficiency, sustainable farming, resource efficiency and resource redistribution, and sustainable futures.

Unit IV: (15 Lectures)

Climate change, Energy, and Sustainable Development: Climate change as a threat to sustainable development, current and future climate regimes, mitigating climate change.
Sustainable Development and International Relations: International relations theories, climate change And global discourse, discourses in conflict at international forums.
Future Perspectives: Existing strategies for sustainable development, consensus and contest, challenge of sustainable development, sustainable development and societal change.

Suggested readings:

1. Adams, W.M. (2001). Green Development: Environment and Sustainability in Developing Countries, 2nd edition, Routledge, London.
2. Barbier, E.B. (1987). The Concept of Sustainable Development, Environmental Conservation, 14(2), 101-110.
3. Daly, H.E. (1999). "Towards Some Operational Principles of Sustainable Development", Ecological Economics, 2(1), 1-6.
4. World Commission on Environment and Development (1987). Our Common Future, Oxford
5. University Press, Oxford.
6. Purvis, M. and Alan Grainger (2004). Exploring Sustainable Development: Geographical Perspectives, Earthscan, London.

Course Title: Social Geography

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.622

Course Description:
This course introduces some of the main themes of social geography in context of social structure and social changes. The course also place emphasis on spatial perspective of various social issues of India.

Unit I (11 Lectures)

Fundamental concepts:
Definition, scope and development of Social Geography; Relationship of social geography with other branches of Social Science. Concepts of social space, social area analysis and social wellbeing. Development of social geography in India.

Unit II: (15 Lectures)

Pattern and processes:
World Distribution of religious and linguistic groups; Cultural realm and their distribution; Socio-economic and environmental issues of the developed and developing countries; Process and problems of social change in the traditional societies.

Unit III: (15 Lectures)

Social structure of India:
Distribution of racial and linguistic groups of India; Distribution of various social groups (i.e. SC, ST, OBC) and their socio-economic issues; Regional imbalances with-reference to literacy, health, poverty and crimes in India; Levels of social wellbeing in India/HDI.

Unit IV: (15 Lectures)

Social issues in India:
Unity in diversity; Regional consciousness and national integration; Social conflicts and violence.; Emphasis of social planning during X^{th} and XI^{th} Five Year Plans.

Suggested readings:

1. Ahmed, A. (1999). Social Geography, Rawat Publication, Jaipur.
2. Carter, John and Jones, T.(1989),Social Geography: An Introduction to Contemporary Issues, Edward Arnold, London.
3. Chandana R.C.(1989), Spatial Dimensions of Scheduled Castes in India, Intellectual Publishers House, New Delhi.
4. Crane, R.I.(1973), Regions and Regionalism in South Asia Studies: An Exploratory Study, Durham, Duke University.
5. D.M. Smith (1995), Geography and Social Justice, Black-well.

Additional readings:

1. Dube, S.C. (1991). Indian Societies, National Book Trust of India, New Delhi.
2. Dube, S.C, Tribal Heritage of India, Vias Publishing Co, New Delhi.
3. Ghurye,G.S.(1963), The Scheduled Tribes, Bombay, Popular Prakashan.
4. Guha, B.S.(1944), Racial Elements in Indian Population, Oxford University Press, Bombay.
5. Knox,P.(1982), Urban Social Geography:An Introduction, Longman, London.
6. Konx, P.L.(1975), Social Well –being: A Spatial Perspective, Oxford London.
7. Manson, P., "Unity and Diversity: An Introductory Review" in P, Manson (ed.) India and Ceylon: Unity and Diversity pp. 1-19.
8. Morris, D. et. Al.(1982), Measuring the Condition of India's Poor: The Physical Quality of life index, Promila, New Delhi.
9. Sakharov,IV.(1971), "Ethno Linguistic Geography of India. Facts and Problems", In Economic and Socio-cultural Dimensions of Regionalization, Cencus of India, Monograph.No.7.
10. Singh, K.S.(1985), Tribal Society in India, Manohar.
11. Smith, D.M.(1977), Human Geography: A Welfare Approach, Edward Arnold.
12. Smith D.M., Geography of Social Well Being.
13. Sopher, D.E.(1980), An Exploration of India: Cornell University, London.

Course Title: Biogeography

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.623

Course Description:
The course focuses on ecological factors that shape the distribution of organisms and their changes over time and provides geographical and historical background for the field of biogeography. It also highlights biogeographical consequences of global change like climate change.

Unit I (15 Lectures)

Bases: Biogeography, nature, scope, significance, approaches, history, recent developments. Spatial dimension in biogeography, pattern and causes of plant and animal distributions, factors influencing the distribution of life, bio-geographical regions and realms. Historical biogeography, Patterns of life in the past and today. Biodiversity and the source of novelty in life.

Unit II: (15 Lectures)

Biogeography and Ecosystem. Definition, scope and significance of biogeography; Basic ecological principles; Geo-biochemical cycles: carbon, nitrogen, oxygen and phosphorus cycles; Biome and biomass; World distribution of plants and animals; Biodiversity: depletion and conservation.

Unit III: (11 Lectures)

Biogeography of the seas; island biogeography. Habitat fragmentation; biogeography of linear landscape features.

Unit IV: (15 Lectures)

Biogeographical information, collection, retrieval and application. Projecting into the future: Climate change; biogeographical consequences of global change; changing communities and biomes; effect of climate change on biological diversity.

Suggested readings:

1. Brown, J. H., & A. C. Gibson, Biogeography, St. Louis, Mosby, 1983.
2. Brown, J.H. and Lomolino, M.V., Biogeography, Second Edition, Sinauer Associates, Inc. Sunderland, Massachusetts, 1998.
3. Cox, C.B., Moore, P.D., Biogeography, An Ecological and Evolutionary Approach, 5th ed., Blackwell Science, Cambridge, 1993.
4. MacDonald, Glen, Biogeography : Introduction to Space, Time and Life, John Wiley, New York, 2002.
5. Robinson, H., Biogeography, The English Language Book Society and Macdonald and Evans, London, 1982.

Additional readings:

1. Spellerberg, Ian F. and John, W.D. Sawyer, An Introduction to Applied Biogeography, Cambridge University Press, Cambridge, 1999.
2. Tivy, Joy, Biogeography, A Study of Plants in the Ecosphere, Longman Scientific & Technical, UK, 1993.
3. Tivy, Joy and Greg O'Hare, Human Impact on the Ecosystem, Oliver & Boyd, Edinburgh, 1981.

Course Title: Gender Geography

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.624

Course Description:

The course describes approaches, movement and development of gender geography. It also highlights the gender dimension of social differentiation and role of women in the development processes and environmental management.

Unit I (15 Lectures)

Feminism and feminist movement, Feminist epistemology, scope, nature and development of gender geography.

Unit II: (15 Lectures)

Quality of life among female in the developed and developing countries; sex-ratio and child and maternal mortuary rate, Literacy and education; Status of females in the society in Development and Developing countries with special reference to India.

Unit III: (11 Lectures)

Gender and Work: Historical developments in the sexual division of labour, Crime against women with special reference to domestic violence; Participation in economic activities: Primary, Secondary and Tertiary Sector, Domestic work and its significance.

Unit IV: (15 Lectures)

Empowerment of women: education, economic opportunities, access to health services; Involvement in decision making processes from local bodies to parliaments: Role of women in development, environmental management and disaster management.

Suggested readings:

1. Boserup, E. 1989, Women's Role in Economic Development Earthscan, London.
2. Dankelman, I & Davidson, J. 1989, Women and environment in the Third world, Earthsan, London.
3. Deblig, H,J. 1996, Human geography-Culture, society and space (5thedition), John Wiley, New York.
4. Johnston, R.J. et, al(eds), 1996. The health of women, A global respective, Westview press, Boulder.
5. Koblinsky, M.et. Al (eds), 1993. The health of women-A global respective, Westview press, Boulder.
6. Lee, D, 1988. Women in geography –A Comprehensive Bibliography, Boca Raton, Florida.

Course Title: Geography of Health and Well-being

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.625

Course Description:

This course examines the geographical dimension of Human health and wellbeing, major diseases and domestic public health issues. It also includes integration of GIS in health and infrastructure mapping and spatial analysis in GIS.

Unit I (15 Lectures)

Basic Concepts, Scope and significance of Health, Disease and Wellbeing; Approaches to the Study of Health Geography: Ecological, Social and Spatial; Approaches to the Study of Wellbeing: Need-based, Relative standard and capability; Geographical factors affecting Human Health and Wellbeing.

Unit II: (15 Lectures)

WHO Classification of Diseases and their Major Types: Genetic; Communicable and Non-communicable; Occupational and Deficiency Diseases; Epidemics and Pandemic.

Unit III: (11 Lectures)

Ecology, Etiology, Diffusion and Distribution Pattern of Malaria, Tuberculosis, Hepatitis, AIDS, Glycemia and Cardiovascular Diseases; Poverty; Food Security; Nutrition Deficiency; Health and Sanitation Facilities.

Unit IV: (15 Lectures)

Role of WHO, UNICEF, Red Cross; Indian Health Care Planning: Child and Family Health Welfare, Immunization, Rural Health and Health for All Programmes, National Health Care Infrastructure; Health GIS.

Suggested readings:

1. Cliff, A. & Haggett, P. (1989). Atlas of Disease Distribution, Basil Blackwell, Oxford.
2. Digby,A, & Stewart, L. (eds.) (1996). Gender, Health and Welfare, Routledge, New York.
3. Fouberg, E.H., Murphy, A.B., H. J. de Blij.(2009). Human Geography: People, Place, and Culture, Wiley and Sons,Eagle Lake.
4. Hardill,I., Graham. D.T., Kofman, E. (2001). Human geography of the UK: an introduction, Routledge, N.Y.
5. Hazara, J. (ed) (1997). Health Care Planning in Developing Countries, University of Calcutta, Kolkata.

Additional readings:

1. Knox, P.L. (1975). Social Well-being: A Spatial Perspective, Oxford University Press
2. Learmonth, A.T.A. (1978). Patterns of Disease and Hunger, a Study in Medical Geography, Davisd and Charls, Victoria.
3. May, J.M. (1970). The World Atlas of Diseases, National Book Trust, New Delhi

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Course Title: Natural Resource Governance and Policy

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.626

Course Description:
The course gives introduction to the components of environment and environment crisis. It includes various approaches and tools of environmental planning and management.

Unit I (11 Lectures)

Introduction: Legal and political environments in resource management. Global and local governance, challenges of good governance. Ostrom design principles and basic frameworks, organizational structure and stakeholders in NRM and livelihood.

Local utilization and institutions: Joint Forest Management Committees (JFMCs), watershed committees, irrigation committees, Forest Rights Act (FRA) committees, Biodiversity Management Committees (BMCs), etc.

Unit II: (15 Lectures)

Overview of legal policy instruments in Natural Resource Management: National Forest Policy of 1988, National Environment Policy of 2004, National Conservation Policy, National Action Plan on Climate Change of 2008, Coastal Protection Act. Wildlife Protection Act of 1972, Forest Protection Act of 1980, Environment Protection Act of 1986, ICZM-Indian Coastal zone management, Water Act, 1981. Biological Diversity Act of 2002 and Rule 2004, Forest Rights Act of 2006. Green Tribunal Act, 2009. The precautionary principle and common responsibilities.

Unit III: (15 Lectures)

Non-Timber Forest Products (NTFP) related policies and other acts: (PESA 1996, FRA 2006), sustainable harvesting rules of MP, Nistar Rights in MP and Chhattisgarh, product specific policies, taxation, Institutional/Organizational Arrangements. NTFP Deregulation, Policy of Odisha.

Conflicts in resource management: Resource management planning, protecting traditional knowledge, customary laws and practice related to traditional knowledge, implications for access benefit sharing

Unit IV: (15 Lectures)

International and National efforts: CITES and other international treaties and conventions, roles of international organizations and NGOS with special reference to UN and specialized agencies, institutional regulatory bodies and authorities: direct intervention by the state, green business and green ethics, stakeholder analysis, understanding and managing governance issue, governance tactics and tools, CSR (Corporate Social Responsibility) as a tool for sustainable NRM based business.

Suggested readings:

1. Knight, Richard L., editor, et al. 1995. A New Century for Natural Resources Management. Island Press.
2. Heal, Geoffrey. 2000. Nature and the Marketplace: Capturing The Value Of Ecosystem Services. Island Press.

Additional readings:

1. Bhattacharya P., Kandya A.K. and Krishna Kumar 2008. Joint Forest Management in India, Aavishkar Publisher, Jaipur.
2. Daily, Gretchen, editor, et al. 1997. Nature's Services: Societal Dependence on Natural Ecosystems. Island Press.
3. Kareiva, Peter, et al. 2011. Natural Capital: Theory and Practice of Mapping Ecosystem Services. Oxford.
4. Kareiva, Peter, and Michelle Marview. 2010. Conservation Science: Balancing the Needs of People and Nature. Roberts and Company

Optional courses II: Select any one special group based on specialisation:

Group A

Course Title: Population Geography

Course Code: GEO.627

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Description:

The course introduces population concepts and their importance. It explains how human population is distributed over earth surface and interacts with developmental process.

Unit I (10 Lectures)

Bases: Concepts, scope and methodology of population geography; Data sources; Population dynamics: fertility, mortality and migration; Concepts of ageing: young, stationary and stable population.

Unit II: (10 Lectures)

Migration: Concepts, pattern, determinants and consequences of migration and issues related to migration, Concept of mobility and migration, sources and quality of data, types of migration, census definition of migrants and its limitations; Migration theories: Ravenstien and Everetts Lee.

Unit III: (12 Lectures)

Spatial Distribution and Urbanisation: Spatial distribution: importance and pattern, factors affecting spatial distribution of population: physical, economic, social factors and Govt. policies. Urbanization

definition and Importance; Important aspects of urbanization process-level; Forces of urbanization and components of urban population growth in developing countries, over urbanization phenomena and urban primacy, Major urbanization problems and policies in developing countries with focus on India.

Unit IV: (12 Lectures)

Population Estimates and Projections: Concepts of population projections; population estimates, forecasts and projections, uses of population projections. Methods of interpolation; extrapolation using linear, exponential, polynomial, logistics, Gompertz curves.

Unit V: (12 Lectures)

Population and Development: Concepts of development and measures; Theories of development: Arthur Lewis's two-sector model; big push theory, Liebenstein's critical minimum effort theory, Harrod-Domar and Solow's growth models. Development strategies through the different five year plans. Millennium development goals and achievements with special reference to India.

Suggested readings:

1. Cohen, Robin, (1996). Theories of Migration, The International Library of Studies on Migration, Edward Elgar, Cheltenham
2. Eduardo Arriaga, (1975). “Selected Measures of Urbanization”, in Sydney Goldstein and David Sly (Eds.) Measures of Urbanization and Projections of Urban Population, IUSSP Belgium.
3. Government of India (2006). Population Projections for India and States, 2001-2026. New Delhi: Office of the Registrar General.
4. Haq, Mahbubul (1996). Reflections on Human Development, Delhi: Oxford University Press. Chapters 1 & 2.
5. Jones, H. R. (2000). Population Geography. 3rd edition. Paul Chapman, London.Navaneetham Kannan and George Groenewold, (1998): The Projection of Populations: Data Appraisal, Basic Methods and Applications, Population and Sustainable Development Teaching Texts, Thiruvananthapuram: Centre for Development Studies.

Additional readings:

1. Poston, D. L. and Michael, M. (2005). Handbook of Population, Springer Heidelberg, Germany.
2. Ray, Debraj (1998). Development Economics. Delhi: Oxford University Press. Chapters 3 & 4.
3. Sen, Amartya, (2002). The concept of development in Chenery Hollis and T.N. Srinivasan (eds), Handbook of Development Economics Vol. 1. Amsterdam: Elsevier. Chapter 1.
4. United Nations Development Programme (2006). Human Development Report 2006, New Delhi: Palgrave Macmillan Technical Note 1. pp. 393-99.
5. Zelinsky, W., Kosinski, L. A. and Prothero M. R. (eds.) (1970). Geography and a Crowding World. Oxford University Press, New York and Oxford.
6. Zelinsky, W. (1966). A Prologue to Population Geography. Prentice Hall, Englewood Cliffs, New Jersey.

Course Title: Advanced Population Geography-Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.628

Course Description:
The course describes various methods and techniques of representing population distribution, concentration and migration. Through this course students will also learn software modules for statistical data handling and analysis.

Unit I

Population growth of India and the world using arithmetic and semi-log scales; Population distribution map of India using dot and sphere/circle, cubes, combined; Density map of India by Choropleth; Age-sex structure of rural-urban population of India by Superimposed pyramid; Literacy Level by Compound pyramid; Occupational structure of India by Divided rectangle; Fertility, mortality and natural growth of population by Polygraph.

Unit II:

Population potential map by Isopleth; Scatter diagram; Life table calculation; Computation of HDI for India; Migration by Flow diagram; Centrographic analysis of population growth; Measurement of population concentration by cumulative curve. Population projection.

Unit III:

Introduction to SPSS-facilities, creating database structure, data entry, specifying scales, validation of data entry, importing and exporting data. Data Manipulation – recoding creating new variable, sorting, filtering and selection of specific data, generating simple frequencies, use of syntax editor. Correlation and regression analysis – interpretation and regression diagnostic test.

Suggested readings:

1. SPSS advanced models 14.0 - SPSS Inc.
2. Stata user's guide: Release 10., 2nd Edition. Stata Press.
3. Stata survey data reference manual: Release 8., 2nd Edition. Stata Press.
4. Cromley, Ellen K. and McLafferty, Sara L., (2002): GIS and public health. Guilford Press, New York.

Group B

Course Title: Fundamentals Of Photogrammetry

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.629

Course Description:
This course introduces photogrammetry as a data acquisition tool, and provides a general overview of its theory and working principles. Students will gain the ability to extract data from aerial photography.

Unit I (11 Lectures)

Photogrammetry: Definition and Categories ii. Historical Background: Early Developments in Aerial Surveying and Mapping; Problems of Aerial Photogrammetry; Application of Photogrammetry.

Unit II: (15 Lectures)

Aerial photos: types, scale, resolution; Geometric properties of aerial photos; Stereoscopy; Stereoscopic parallax; Relief displacement. Calculation of Height of Objects on Vertical Aerial Photograph.

Unit III: (15 Lectures)

Interpretation keys and their types; Aerial mosaics; Multi-spectral aerial photographs; Ground control for mapping from aerial photos; Rectification methods in aerial photos.

Unit IV: (15 Lectures)

Aerial photo interpretation in general resource evaluation; Geomorphic studies and mapping. Land use/Land cover mapping; Ortho-photos and Contour Extraction; Applications and limitation of Aerial Photography.

Suggested readings:

1. Cracknell, A. and Ladson, H (1990): Remote Sensing Year Book. Taylor and Francis, London.
2. Curran, P.J. (1988): Principles of Remote Sensing. ELBS Longman, Essex, U.K.
3. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science, Bangalore.
4. Floyd, F. S. Jr. (1997): Remote Sensing: Principles and Interpretation. W.H. Freeman, New York.
5. Hallert, B. (1960): Photogrammetry. McGraw Hill Book Company. Inc. New York
6. Leuder, D.R. (1959): Aerial Photographic Interpretation: Principles and Application, McGraw Hill, New York.

Additional readings:

1. Jensen, John R. Remote sensing of the Environment – An Earth Resource Perspective, Pearson Education, 2000.
2. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. 4th ed. John Wiley and Sons, New York.
3. Pratt W.K. Digital Image Processing, Wiley, New York, 1978.
4. Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation. Concept Publishing. Company, New Delhi.
5. Reeves, R.G. (ed.) (1983): Manual of Remote Sensing. Vols. 1 and 2, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia.
6. Rao D.P. (eds.): Remote Sensing for Earth Resources, Association of Exploration Geophysicist, Hyderabad, 1998.
7. Siegel, B.S. and Gillespie, R. (1985): Remote Sensing in Geology. John Wiley and Sons, New York.
8. Spurr, R. (1960): Photogrammetry and Photo Interpretation. The Roland Press Company, London.
9. Survey of India, (1973): Photogrammetry. Survey of India, Dehradun.
10. Swain, P.H. and Davis, S.M. (ed.) (1978): Remote Sensing: The Quantitative Approach. McGraw- Hill, New York.
11. Thomas M. Lilesand and Ralph W.Kefer, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, 1994.
12. Wolf P.R. and Dewitt, B. A. (2000): Elements of Photogrammetry with Applications in GIS. McGraw-Hill, New York.

Course Title: Fundamentals Of Photogrammetry - Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.630

Course Description:
The course will develop understanding of image interpretation and information extraction from Arial photographs and determination of height of objects.

Unit I

Stereoscopy; Stereoscopic parallax; Relief displacement. Calculation of Height of Objects on Vertical Aerial Photograph; Identification of objects and features; Determination of height of objects from single photographs.

Unit II:

Preparation of thematic maps on lithology and structure, Land use/ Land cover, Hydrogeomorphic mapping.

Group C

Course Title: Geography of Rural Settlement and Planning

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.631

Unit I (12 Lectures)

Bases, Evolution and Models. Nature, scope, definition and significance of Rural Settlement Geography; Human settlement as a system; Concepts and characteristics of rural settlements; Theories and models of settlement diffusion: Eric Bylund (Sweden), Gunnar Olsson (Sweden), David Grossman (Nigeria), John Hudson (USA), Contributions of Banaras School.

Unit II: (12 Lectures)

Spatiality and Histogenesis. Evolution and growth of rural settlements and their causes: Old and New Worlds; Siting and location of rural settlements; Distribution, spacing, and nature of dispersion; Types and patterns; Morphology of village: examples from Germany, Japan, Israel, African countries; Rural-service centres: nature, hierarchy, service area, and interaction.

Unit III: (10 Lectures)

Rural Dwellings. Traditional and folk rural house types: origin, evolution and characteristics; Typology based on building materials, plans, uses and architectural style; House types and their characteristics in different geographical environments: Monsoon Asia and Arid zone.

Unit IV: (12 Lectures)

Indian Village. Evolution and multiplicity; Regional morphological characteristics; Morphological interaction models: religio-ritual, secular-economic, and sacred-economic interlocking system; Transformation and planning of Indian village: models and plans.

Unit V: (10 Lectures)

Meaning, concept and scope of rural development and planning; rural development: Approaches, policies and paradigms; Basic infrastructures for rural development; People's participation in rural planning and rural industrialisation.

Suggested readings:

1. Eidt, R. C., Singh, K. N. and Singh, Rana, P.B., (eds.) (1977): Man, Culture and Settlement. Kalyani Publishers., New Delhi.
2. Ghosh, S. (1999): A Geography of Settlements. Orient Longman, Kolkata.
3. Hudson, F. S. (1976): A Geography of Settlements. MacDonald and Evans, New York.
4. Mitra, A. (1960): Report on House Types and Village Settlement Patterns in India. Publication Division, Govt. of India, New Delhi.
5. Mosley, M.J. (2005): Rural Development: Principles and Practice. Sage Publication, London.

Additional readings:

1. Oliver, P. (1987): Dwellings. The House across the World. University of Texas Press, Austin.
2. Rapoport, A. (1969): House, Form and Culture. Prentice-Hall, Inc., Englewood Cliffs, NJ.
3. Rykwert, J. (ed.) (2004): Settlements. University of Pennsylvania Press, University Park, USA.
4. Singh, R.L. (eds.) (1973): Rural Settlements in Monsoon Asia, National Geographical Society of India, Varanasi.
5. Singh, R. L., Singh, K.N. and Singh, Rana P.B., (eds.) (1975): Readings in Rural Settlement Geography, National Geographical Society of India, Varanasi.
6. Singh, R. L. and Singh, Rana P. B. (eds.) (1978): Transformation of Rural Habitat in Indian Perspective, National Geographical Society of India, Varanasi, Pub. 19.
7. Singh, R.L. and Singh, Rana P.B., (eds.) (1979): Place of Small Towns in India. National Geographical Society of India, Varanasi,
8. Singh, R.L., Singh, K.N and Singh Rana P.B., (eds.) (1976): Geographic Dimensions of Rural Settlements. National Geographical Society of India, Varanasi,
9. Singh, Rana P.B. (1977): Clan Settlements in the Saran Plain, National Geographical Society of India, Varanasi,
10. Singh, Rana P.B. and Singh, R.B. (1981): Changing Frontiers of Indian Village Ecology. National Geographical Society of India, Varanasi, Pub. 27.
11. Singh, R.Y. (2005). Geography of Settlements. Rawat Publications, Jaipur and New Delhi.
12. Singh, S.B. (1977). Rural Settlement Geography. U.B.B.P., Publications, Gorakhpur.
13. Tiwari, R. C. (2000). Settlement Geography; in Hindi. Prayag Pustak Bhawan Allahabad.
14. Wanmali, S. (1983). Service Centres in Rural India. B.R. Publications Corporation, New Delhi.
15. Wood, M. (2005). Rural Geography: Processes, Responses and Experiences of Rural Restructuring. Sage Publication, London.

Course Title Geography of Rural Settlement and Planning -Practical

Course Code: GEO.632

L	T	P	Cr	Marks
-	-	4	2	**100**

Unit I

Spatial Systems. Size classification of rural settlements by scatters diagrams; Rural settlement distribution and types in India; Density functions and pattern analysis of distribution of settlements: randomness and spacing indices, Testing Christaller's theory; Theoretical models of rural settlements and testing of different models.

Unit II:

Studies from India. Typological classification of rural settlements from maps; Rural service centres: indices, hierarchy, classification and ordering; Mapping the morphology of Indian villages; Planning of Indian villages: models, plans and case studies.

Unit III:

Rural Planning. Rural land use maps (India and UK); International colour scheme and its applicability in Indian context; Intensive rural land use survey and application of locational theories; Land capability: its determination and mapping; Sample field mapping and planning of land use in given rural areas.

Group D

Course Title: Geography of Disaster

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.633

Course Description:

The course in Geography, as a science of human-environment interactions, offers key analytical tools for understanding the complex causes and uneven impacts of disaster and hazards around the world. It explores various types and impacts of disasters.

Unit I (8 Lectures)

Concept of vulnerability, risk, mitigation, prevention, preparedness, response and recovery; Classification of Disasters.

Unit II: (14 Lectures)

Natural hazards and disasters – definition and areas, natural hazards, meteorological –cyclones, typhoons, hurricanes and droughts, forest fires, causes, assessment, effects and control measures. **Natural hazards** – Geological – earthquakes, volcanoes, causes, effects and control measures; **Natural hazards –** Geomorphic – landslides, soil erosion and gullying, coastal erosion causes, assessment, effects and control measures.

Unit III: (12 Lectures)

Natural hazards – hydrological – floods (river and seawater), failure of natural dams, Tsunamis, Salinisation, causes, assessment, effects and control measures. Risk and vulnerability assessment hazard zonation, Use of remote sensing and GIS in hazard studies.

Unit IV: (12 Lectures)

Man-made disaster: Fire, Terrorism, Food poisoning, strike and lockouts, accidents, fair and festivals, stampedes.

Unit V: (10 Lectures)

Impacts of Disasters: Social, Economic, political, environmental, health, psychological; Differential impacts: Caste, class, gender, age, location, disability.

Suggested readings:

1. Turk J. (1985). Introduction to Environmental Studies, Saunders, College Publication, Japan
2. Singh Savindra (2000). Environmental Geography, Parag Pustak Bhavan, Allahabad
3. Morrisawa M (Ed) (1994). Geomorphology and Natural Hazards, Elsevier, Amsterdam
4. Hart M. G. (1986). Geomorphology, Pure and Applied, George Allen and Unwin, London
5. Valdiya K. S. (1987). Environmental Geology, Tata McGraw Hill, New Delhi.

Additional readings:

1. Bryant Edward (2000). Natural Hazards, Cambridge University Press
2. Daly Herman E. (1996). Beyond Growth, Beacon Press, Boston
3. Daly Herman E and Twonseed Keneth N (Ed) (1993). Valuing the earth – Economics, Ecology and Ethics, MIT Press, London

4. Agarwal Anil and Narain Sunita (Ed) (1999). State of India's Environment The Citizens Report, Centre for Science and Environment, New Delhi
5. Rangachari R, Sengupta Nirmal, et al (2000). WCD Case Study Large Dams : India's Experience Final Report, Secretariate of World Commission on Dams
6. Dupont, R.R. Baxter, T.E. and Theodore, L. (1998). Environmental Management :- Problems and Solutions, CRC Press
7. Smith, K. (2001). Environmental Hazards : Assessing Risk and Reducing Disaster, Routledge.

Course Title Geography of Disaster-Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.634

Course Description:
The course place emphasis on analytical geographical tools to study disasters. Students will learn to do mapping and prepare hazard zones using remote sensing and GIS techniques.

Unit I

Risk and vulnerability assessment hazard zonation, Use of remote sensing and GIS in hazard studies.

Unit II:

Hazards zonation/ mapping: meteorological –cyclones, typhoons, hurricanes and droughts, forest fires, causes, assessment, effects and control measures. Natural hazards – Geological – earthquakes, volcanoes, causes, effects and control measures; Natural hazards – Geomorphic – landslides, soil erosion and gullying, coastal erosion causes, assessment, effects and control measures.

Semester-IV

Course Title: Fundamentals of GIS and GPS

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.605

Course Description:

The course introduces students to the fundamentals of GIS, GPS, data models, data sources, databases and Global Positioning Systems (GPS) and geospatial metadata. It prepares the candidate for the geospatial analysis.

Unit I (13 Lectures)

Concept and definition of GIS, History and development of GIS technology, applications of GIS in various sectors (case study examples); GIS database (types, structures) and data model; Data input: spatial and non-spatial; Scanning and Digitizing; Data import and export.

Unit II: (15 Lectures)

Geographic information and spatial data types (map, attributes, image data); Data processing systems (inputs and output devices); Data entry and preparations (inputs, editing and attributing); Geo-referencing; linking spatial and non-spatial data; Attribute handling. Functional Elements: Data Acquisition and Topology Creation; Data Management and Structure.

Unit III: (12 Lectures)

Spatial analysis: overlay, buffer and proximity, network analysis; Creation of digital elevation models (DEM): contours and spot heights; Determination of slope, aspect and hill shading; Data interpolation: point and line data; Output generation and layouts.

Unit IV: (16 Lectures)

Introduction to GPS, history of positioning system; Segments of GPS; GPS Applications. User interface with global positioning receivers; GNSS and types (NAVSTAR, GLONASS, GALILEO) introduction to DGPS, wide area augmentation system (WAAS); Collection of ground control points using hand held GPS receiver.

Suggested readings:

1. Bonham, Carter G.F. (1995): Information Systems for Geoscientists – Modelling with GIS. Pergamon, Oxford.
2. Burrough, P.A. and McDonnell, R. (1998): Principles of Geographic Information Systems. Oxford University Press, Oxford.
3. Chang, K.T. (2003): Introduction to Geographic Information Systems. Tata McGraw Hill Publications Company, New Delhi.
4. Chauniyal, D. D. (2004): Remote Sensing and Geographic Information Systems. (in Hindi). Sharda Pustak Bhawan, Allahabad.
5. Demers, M. N. (2000): Fundamentals of Geographic Information Systems. John Wiley and Sons, Singapore.

Additional readings:

1. ESRI (1993): Understanding GIS. Redlands, USA
2. Fraser Taylor, D.R. (1991): Geographic Information Systems. Pergamon Press, Oxford.
3. George, J. (2003): Fundamentals of Remote Sensing. Universities Press Private Ltd, Hyderabad.
4. Girard, M. C. and Girard, C. M. (2003): Processing of Remote Sensing Data. Oxford and IBH, New Delhi.
5. Glen, E. M. and Harold, C. S. (1993): GIS Data Conversion Handbook. Fort Collins, Colorado, GIS

Word Inc.
6. Goodchild, M.F.; Park, B. O. and Steyaert, L. T. (eds.) (1993): Environmental Modelling with GIS. Oxford University Press, Oxford.
7. Guptill, S.C., and Morrison, J.L. (1995): Elements of Spatial Data Quality. Elsevier/ Pergamon, Oxford.
8. Heywood, I. (2003): An Introduction to Geographical Information Systems. 2nd edition, Pearson Publishing Company, Singapore.
9. Korte, G. M. (2002): The GIS Book. On Word Press: Thomson Learning, New York and Singapore.
10. Lo, C.P. and Yeung, A. K. W. (2002): Concepts and Techniques of Geographic Information Systems. Prentice Hall of India, New Delhi.
11. Longley, P. and Batty, M. (eds.) (1996): Spatial Analysis: Modelling in a GIS Environment. GeoInformation International, Cambridge.
12. Longley, P., Goodchild, M.F., Maguire, D. and Rhind, D. (1999): Geographic Information Systems. Principles, Techniques, Management, Applications. John Wiley and Sons, New York.
13. Maguirre, D. J.; Michael F. G. and David W. R. (1999): Geographical Information Systems: Principles and Application. Geo Information International, Vol.2, Longman Publication., New York.
14. Martin, D. (1996): Geographic Information Systems: Socioeconomic Implications. Routledge, London.
15. Michael F. G. and Karan K. K. (ed.) (1990): Introduction to GIS. NCGIA, Santa Barbara, California.
16. Ralston, B. A. (2002): Developing GIS Solutions with Map Objects and Visual Basic. OnWord Press: Thompson Learning, New York and Singapore.
17. Reddy, M. A. (2001): Textbook of Remote Sensing and Geographic Information Systems. B. S. Publications., Hyderabad.
18. Ripple, W. J. (ed.) (1989): Fundamentals of Geographic Information Systems: A Compendium. ASPRS/ ACSM, Falls Church.
19. Siddiqui, M.A. (2005): Introduction to Geographical Information Systems, Sharda Pustak Bhawan, Allahabad.
20. Star, J. and Estes, J. (1990): Geographic Information Systems – An Introduction. Prentice-Hall, Englewood Cliffs, New Jersey.
21. Worboys, M. F. (1995): GIS: A Computing Perspective. Taylor and Francis, London.

Course Title Fundamentals of GIS -Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.606

Course Description:
The course provides a firm understanding of the conceptual and technical issues that affects the use of GIS and GPS. Through hands on exercise students will know about beauty of geographic/spatial data management.

Unit I

Practical Excercise: GIS Software: Introduction to Arc GIS 2. Georeferencing Maps/Images 3. Digitization of Raster Map: Point, Line and Polygon Features 4. Preparation of Attribute Tables, Editing and Joining Tables 5. Analyzing Attribute Data: Calculating Area, Perimeter, and Length.

Unit II:

Spatial Representation: Mapping Techniques 7. Spatial Representation: Symbolizing and Map Layouts 8. Basic Analysis in GIS: Buffering, Overlay and Query Building.

GPS Applications. User interface with global positioning receivers; Collection of ground control points using hand held GPS receiver; DGPS, wide area augmentation system (WAAS); transferring data from GPS receiver to PC.

GEO.700	Dissertation/Project work/Academic activities and Viva voce	-	-	-	10	300

Optional courses: Select any one special group based on specialisation from the followings:

Group A

Course Title: Gender, Health and Development

Course Code: GEO.635

L	T	P	Cr	Marks
4	1	-	4	**100**

Unit I

The Concept of gender, Evolution of gender in historical perspective; Patriarchy, Kinship Structure and gender roles, Feminist theories, Gender stratification in traditional and modern societies, Gender Analysis Tools, Gender Sensitive Indicators;

Concept of health, Evolution of the concept of Reproductive Health, life cycle approach to RH and recommendations from ICPD; Changing concept of development, Indicators of development, gender adjusted HDI.

Unit II:

Major morbidity and mortality burden in the developing world with major focus on India- sex ratio of births, major health problems experienced by women and men, reproductive health of women and men in developing world, differentials in use of male and female methods of contraception;

Health infra-structure and health care providers; Nutritional status, susceptibility to infections;

Major risk factors of men's health: masculinity, alcoholism, tobacco and drug consumption, accident;

Gender and Sexuality: Sexual health of men and women, gender dimension of HIV /AIDS; Gender and Infertility.

Unit III:

Gender and Development: Understanding social structures- role of caste, class, ethnicity and religion and gender in health inequalities and health outcomes; Gender dimension of social development, status and role of men and women in household and community, culture, marriage customs, dowry and bride price practices, age at marriage; Gender differentials in household headship and role in decision making; Gender differences in access to knowledge-, education, exposure to media and freedom of movements; Gender based violence- Domestic and community violence and gender, Legal aspects of domestic violence and rape.

Unit IV:

The concept of Gender Mainstreaming: Historic overview of Gender Mainstreaming- Women in development (WID)-concept and criticism by feminist; shift to Gender and Development (GAD), Gender Mainstreaming and the Millennium Development Goals (MDGs); The rights approach to Health, sexual and reproductive rights, violence, human rights and health.

Unit V:

Case of India: Characteristics of population: age-sex structure, rural-urban, literacy, work force and occupational structure; National population policy.

Suggested readings:

1. Basu, Alaka M., (1992): Culture, The Status of Women and Demographic Behaviour, Oxford University, New York.
2. Bhasin K. (1993). What is patriarchy?, Kali for Women Publishers, New Delhi.
3. Bhasin K. (2000). Understanding Gender, Kali for Women Publishers, New Delhi.
4. Dyson, Tim and Mick Moore, (1983). "On Kinship structure, female autonomy, and demographic behaviour in India", Population and Development Review vol. 9(1), pp. 35-60.
5. Ellsberg Mary and Heise Lori L. (2005). Researching violence against women: A practical guide for researchers and activists. WHO and Path, Washington D.C.

Additional readings:

1. Folbre, Nancy. (1992). Improper arts: Sex in classical political economy. Population and Development Review. 18(1): 105-112.
2. Gita Sen, Adreinne Germain and Lincoln C. Chen, (Eds.), (1994): Population Policies
3. Reconsidered: Health and Empowerment and Rights, Harvard University Press, Harvard.
4. Jeffery Patricia and R. Jeffery. 1997. Population Gender and Politics: Demographic change in rural north India. Cambridge University, Cambridge.
5. Miller, Barbara, D. (ed) (1993). Sex and Gender Hierarchies, Cambridge University Press, New York.
6. Hess, B.B. and M.M. Ferree. (1987). Analyzing Gender: A Handbook of Social Science Research. Sage Publication, London.
7. United Nation. (2001). Population, Gender and Development: A Concise Report. UN, Economic and Social Affairs (Dept. of), New York
8. World Health Organization. (1998). Gender and Health. Technical paper WHO/FRH/WHD/98. (Website: www.who.int)
9. World Bank. (1991). Gender and Poverty in India. World Bank, Washington.
10. World Health Organization (2003): Comparative Evaluation of Indicators for Gender Equity and Health, Women and Health Programme, Centre for Health Development, Kobe, Japan.
11. William Joan. (1989). Deconstructing Gender, 87 Michigan L Rev. 797. Law Journal Article

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Course Title Gender, Health and Development - Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.636

Unit I

Introduction to SPSS- facilities, creating database structure, data entry, specifying scales, validation of data entry, importing and exporting data. Data Manipulation–recoding creating new variable, sorting, filtering and selection of specific data, generating simple frequencies, use of syntax editor. Correlation and regression analysis– interpretation and regression diagnostic test.

Unit II:

Introduction to STATA, generating, variables, commands and do file editor. Survey analysis – estimation of mean, proportion, design. Multivariate analysis–concepts and interpretation of results of multiple regressions, logistic regression, ANOVA, with and without interaction. Survival analysis – Kaplan Meier, Cox regression -test of proportionality and heterogeneity. Introduction to GIS and illustration.

Group B

Course Title: Digital Image Processing & Information Extraction

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.637

Course Description:
This course will introduce fundamental technologies for digital image processing, information extraction, information analysis, and processing. Students will gain understanding of analytical tools, and implementations of various digital image applications.

Unit I

Introduction to Digital Image Processing & Information Extraction

Unit II:

Digital Data Formats; Image Rectification–I
(Radiometric and Atmospheric Correction Techniques)
Image Rectification–I
(Geometric Correction Techniques)

Unit III:

Image enhancement techniques–I
(Linear and non-liner contrast stretching)
Image enhancement techniques - II
(Image filtering–Low pass, high pass, edge enhancement & detection filters)

Unit IV:

Image Transformation
(Spectral rationing, density slicing, Principal Component analysis etc.)

Unit V:

Information Extraction–I
(Unsupervised/Supervised and Hybrid classification techniques)
Information Extraction–I
(Accuracy Assessment and integration with GIS)

Suggested readings:

1. Campell, J. B. (2003): Introduction to Remote Sensing. 4th ed. Taylor and Francis, London.
2. Cracknell, A. and Ladson, H (1990): Remote Sensing Year Book. Taylor and Francis, London.
3. Curran, P.J. (1985): Principles of Remote Sensing. Longman, London.
4. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science,

Bangalore.
5. Floyd, F. and Sabins, Jr. (1986): Remote Sensing: Principles and Interpretation. W.H. Freeman, New York.

Additional readings:

1. Gautam, N.C. and Raghavswamy, V. (2004): Land Use/ Land Cover and Management Practices in India. B.S. Publications., Hyderabad.
2. Harry, C.A. (ed.) (1987): Digital Image Processing. IEEE Computer Society, California.
3. Hord, R.M. (1982): Digital Image Processing of Remotely Sensed Data. Academic Press, New York.
4. Jensen, J.R. (1986): Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice-Hall, Englewood Cliffs, New Jersey.
5. Jensen, J.R. (2004): Remote Sensing of the Environment: An Earth Resource Perspective. Prentice-Hall, Englewood Cliffs, New Jersey. Indian reprint available.
6. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
7. Nag, P. (ed.) (2000): Thematic Cartography and Remote Sensing. Concept Publishing. Company, New Delhi.
8. Nag, P. and Kudrat, M (1998): Digital Image Processing, Concept Publishing Company, New Delhi.
9. Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation. Concept Publishing. Company, New Delhi.
10. Reeves, R.G. (ed.) (1983): Manual of Remote Sensing, Vols. 1 and 2. American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia.
11. Renz, A.N. (ed.) (1999): Remote Sensing for the Earth Sciences: Manual of Remote Sensing. American Society of Photogrammetry and Remote Sensing, and John Wiley and Sons, New York.
12. Siegel, B.S. and Gillespie, R. (1985): Remote Sensing in Geology. John Wiley and Sons, New York.
13. Swain, P.H. and Davis, S.M. (ed.) (1978): Remote Sensing: The Quantitative Approach. McGraw Hill, New York.

Course Title: Digital Image Processing and Spatial analysis - Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.638

Course description:
Through this course students will gain knowledge and practical experience in digital image processing.

Unit I

Image Rectification, Image enhancement and Image transformation

Unit II:

Information Extraction–I
(Unsupervised/Supervised and Hybrid classification techniques) Information Extraction–I
(Accuracy Assessment and integration with GIS)

Group C

Course Title: Geography of Urban System and Planning

Course Code: GEO.639

L	T	P	Cr	Marks
4	1	-	4	**100**

Unit I

Characteristics of cities in different historical periods (both industrial and pre-industrial); Functions and functional classification of towns; Contributions of Banaras School.

Unit II:

Urban land use and functional morphology: functional areas and Peri-urban areas; Theories of urban structure (Burgess, Hoyt, Harris and Ullman, Mann, White). Remote Sensing and GIS in Urban planning.

Unit III:

Issues and Planning. Urban problems: environmental, poverty, slums, transportation, housing, crime; Planned cities: Chandigarh and Jaipur; National Urban Policy and Urban land use planning, Master Plans: A case study of Chandigarh; Smart cities.

Unit IV:

Urban transportation: Evaluation of Urban Structure Transportation systems; Management of Transportation system; Regional Transport system; Transport policies.

Suggested readings:

1. Bridge, B. and Watson, S. (eds.) (2000): A Companion to the City. Blackwell, Oxford.
2. Carter, H. (1995): The Study of Urban Geography. 4th ed. Reprinted in 2002 by Rawat Publications, Jaipur and New Delhi.
3. Dubey, K.K. (1976): Use and Misuse of Land in KAVAL Towns. National Geographical Society of India, Varanasi.
4. Dubey, K.K. and Singh, A.K. (1983): Urban Environment in India. Deep and Deep, New Delhi.
5. Dutt, A. Allen, K, Noble, G., Venugopal G. and Subbiah S. (eds.) (2003): Challenges to Asian Urbanisation in the 21st Century. Kluwer Academic Publishers, Dordrecht and London.

Additional readings:

1. Hall, P. (1992): Urban and Regional Planning. Routledge, London.
2. Hall, T. (2001): Urban Geography. 2nd edition. Routledge, London.
3. Haughton, G and Hunter, C. (1994): Sustainable Cities. Jessica Kingsley, London.
4. Jacquemin, A. (1999): Urban Development and New Towns in the Third World – A Lesson from the New Bombay Experience. Ashgate, Aldershot, UK.
5. Johnson, J.H. (1981): Urban Geography, Pergaman Press, Oxford.
6. Mayer, H. and Cohn, C. F. (1959): Readings in Urban Geography, University of Chicago Press, Chicago.
7. Paddison, R. (ed.) (2001): Handbook of Urban Studies. Sage, London.
8. Pacione, M. (2005): Urban Geography: A Global Perspective, Routledge, London and New York.

9. Ramachandran, R., (1991): Urbanisation and Urban Systems in India. Oxford University Press, Delhi.
10. Rao, B. P. and Sharma, N. (2007): Nagariya Bhoogol, Vasundhara Prakashan, Gorakhpur.
11. Singh. H. H. (1972): Kanpur: A Study in Urban Geography, Indrasini Publications, Varanasi
12. Singh, K. and Stainberg, F. (eds.) (1998): Urban India in Crisis. New Age International, New Delhi.
13. Singh, O. P. (1987): Nagariya Bhoogol, Tara Book Agency, Varanasi
14. Singh, R.L. (1955): Banaras. A Study in Urban Geography. Nand Kishore and Brothers, Banaras.
15. Singh, R.L. and Singh, Rana P.B., (eds.) (1979): Place of Small Towns in India. National Geographical Society of India, Varanasi,
16. Singh, Rana P.B. and Rana, P.S. (2002): Banaras Region. Indica Books, Varanasi.
17. Singh, S. B. (ed.) (1996): New Perspectives in Urban Geography. M.D. Publications, New Delhi.

Course Title: Geography of Urban System and Planning -Practical

L	T	P	Cr	Marks
-	-	4	2	**100**

Course Code: GEO.640

Unit I

Understanding and documenting Urban component such market place, organic and planned, residential districts, station areas, mill lands, urban villages, transport hubs etc.

Baseline surveys for a small/ medium town; Data collection and analysis, comparing with benchmark/standards. Graphic representation of the same.

Unit II:

Urban land use classification system; Remote Sensing and urban land use mapping, GIS and Urban Planning.

The structure and components of urban landscapes – documenting components such as parks, plazas, grounds, road dividers, traffic signals, dumping grounds, green belts etc.

Group D

Course Title: Disaster Preparedness and Management

L	T	P	Cr	Marks
4	1	-	4	**100**

Course Code: GEO.641

Course Description:

This course examines the various phases of disaster management: prevention, preparedness, and management. It also explores disaster profiles of India, disaster management mechanism in India, process of disaster management and use of GIS and Remote Sensing in mitigation and preparedness.

Unit I

Disaster Profiles of India: ii. Regionalization of Disasters in India: Earthquake and Landslide iii. Regionalization of Disasters in India: Flood, Drought and Cyclone. Case study: Earthquakes in Western Himalayas, North-east India and Gujarat, Landslides in Himalayas and Western Ghats, Avalanches in Western Himalayas, Floods in Ganga Basin and Floods in Punjab, Cyclones in Bay of Bengal and Arabian Sea.

Unit II:

Disaster Management Mechanisms In India: Institutional Framework of Disaster Management in India, Stakeholders in Disaster Management, National/Central Level Management: Nodal Agencies iv. National Disaster Management Authority.

Unit III:

Disaster management: Disaster cycle Preparedness & Mitigation; **Phases of disaster cycle: i**. Factors of Disaster Management. ii. First Aid. iii. Role of Civilians and NGO'S in Natural & man- made Calamities. iv. Home guard. v. Role of Armed forces in Natural man- made Calamities. vi. Role of Para-Military forces in Natural man- made Calamities. vii. Role of Police forces in Natural man- made Calamities.

Unit IV:

Technologies for Disaster Management: Role of IT in Disaster Preparedness; Application of Modern Technologies for the Emergency communication. Application and use of ICST for different disasters.

Unit V:

RS & GIS in Disaster Mitigation and Preparedness: xii. Geoinformatics Perspective in Disaster Management xiii. Satellite Data Requirements for Disaster Management xiv. RS & GIS in Disaster Mitigation: Hazard Analysis and Mapping; Risk and Vulnerability Assessment xv. RS & GIS in Disaster Preparedness: Monitoring and Forecasting; Warning and Evacuation

Suggested readings:

1. Heywood, I. (2010). Conrnelius, S. and Carver, S., An Introduction to Geographical Information Systems, Pearson Education Limited, United Kingdom.
2. Lillesand, T.M.; & Kiefer, R.W. (1994). Remote Sensing and Image Interpretation, Third
3. Edition, John Wiley and Sons
4. Roy, P.S.; Van Westen, C.J.; Jha, V.K.; Lakhera, R.C. and Champati Ray, P.K. (2000). Natural Disaster and their Mitigation: Remote Sensing and Geographical Information System Perspectives, IIRS, Dehra Dun, Govt. of India.
5. Smith, K. and D. N. Petley (2009). Environmental Hazards: Assessing Risk and Reducing Disaster, 5th Edition, New York: Routledge.

Additional readings:

1. Chandel, Vishwa. B. S. and Brar, K. K. (2011). Multi-Disaster Risk and Vulnerability in Western Himalayan State of Himachal Pradesh. Punjab Geographer, 7, 9-19.
2. Chandel, Vishwa. B. S. and Brar, K. K. (2010). Climatic Extremes and Changing Climate in Western Himalayas: A Study of Cloudburst Incidences in Himachal Pradesh. Punjab Geographer, 6, 29-40.
3. Chandel, Vishwa. B. S.; Brar, K. K. and Chauhan, Y. (2011). RS & GIS Based Landslide Hazard Zonation of Mountainous Terrains: A Study from Middle Himalayan Kullu District, Himachal Pradesh, India. International Journal of Geomatics and Geosciences, 2(1), 121-132. 2011. Available online at: http://ipublishing.co.in/jggsvol1no12010/voltwo/EIJGGS3011.pdf
4. Chandel, Vishwa. B. S. and Brar, K. K. (2010). Seismicity and Vulnerability in Himalayas: the case of Himachal Pradesh, India. Geomatics, Natural Hazards and Risk, 1(1), 69–84. Available online at: http://www.springerlink.com/content/2860664656505556/fulltext.pdf Smith, K. (2001). Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge.

	L	T	P	Cr	Marks
Course Title Disaster Preparedness and	-	-	4	2	**100**

Management -Practical

Course Code: GEO.642

Course Description:
The course will give understanding of the satellite images and use of RS and GIS techniques for hazard zonation.

Unit I

RS & GIS in Disaster Mitigation and Preparedness: Geoinformatics Perspective in Disaster Management, Satellite Data Requirements for Disaster Management, RS & GIS in Disaster Mitigation: Hazard Analysis and Mapping; Risk and Vulnerability Assessment, RS & GIS in Disaster Preparedness: Monitoring and Forecasting; Warning and Evacuation.

Unit II:

Understanding Maps; Understanding Satellite Imageries; Knowing GIS Software (ARC GIS): Some Basic Operations; Hazard Zonation Using RS & GIS; RS & GIS Applications: xvi. Landslide Hazard Assessment and Monitoring xvii. Seismic Hazard Assessment and Monitoring xviii. Flood Hazard Assessment and Monitoring xix. Drought Hazard Assessment and Monitoring xx. Forest Fire Hazard Assessment and Monitoring.