Chaudhary Bansi Lal University, Bhiwani

(A State University established under Haryana Act No. 25 of 2014)

Examination Scheme
for
M.Sc. - Geography
(SEMESTER- I to IV)
(w.e.f. 2020-21)

Chaudhary Bansi Lal University, Bhiwani

(A State University established under Haryana Act No. 25 of 2014)

Study & Evaluation Scheme
of
M.Sc. Geography
Summary

Programme : M.Sc. Geography
Duration : Two year full time (Four Semesters)
Medium : English
Minimum Required Attendance : 75%
Total Credits : 122

Assessment/Evaluation

Internal Marks	Major Test (End Semester Exam) Marks	Total Marks
20	80	100

Internal Evaluation

Minor Test	Attendance	Assignment	Total Marks
10	5	5	20

Duration of Examination

Major Test (End Semester Exam)	Internal (Minor Test)
3 hrs.	1 ½ hrs.

To qualify the course, a student is required to secure a minimum of 40% marks in aggregate including the Major Test (End Semester Examination) and internal evaluation. A candidate who secures less than 40% of marks in a course shall be deemed to have failed in that course. The student should have obtained at least 40% marks in aggregate to qualify the semester.

Note: ***From session 2019-20 students should be involved in extracurricular activities through Hobbies Club (Non-credit) such as Poetry, Science Club, and Drama etc. and will be awarded a letter grade at the completion of M. Sc.***

Question Paper Structure

There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Semester	Core course		DSE			OEC (Open Elective Course)	Hobbies	AE		Non CGPA	Total
								Compulsory		Elective	
	Theory	Practical	Theory	Case Study/Supervised Field Training	Supervised Field Project			AEC	SEC	Extra CC/Passion/Hobby	
1	**4x5=20**	**4x2=8**	**-**	**-**	**-**	**-**	**N.C.**	**4**	**-**	**-**	**32**
2	**4x5=20**	**4x2=8**	**-**	**-**	**-**	**2**	**-**	**-**	**4**	**-**	**34**
3	**4x3=12**	**4x2=8**	**4x2=8**	**-**	**-**	**2**	**N.C.**	**-**	**-**	**-**	**30**
4	**4x3=12**	**4x2=8**	**4x2=8**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**30**
Total	**64**	**32**	**16**	**-**	**-**	**6**		**4**	**4**	**-**	**126**

1. **CC** = Core Course.
2. **DSE**= Discipline Specific Elective Course.
3. **OEC**= Open Elective Course.
4. **AECC**= Ability Enhancement Compulsory Course.
5. **SEC**= Skill Enhancement Course.
6. **Hobbies:** N.C.: Non-Credit

Chaudhary Bansi Lal University, Bhiwani
Scheme of Examination for M.Sc.-Geography

Semester-I (w.e.f. 2020-21) **Credits= 30** **Marks=800**

Sr. No.	Course/ Paper Code	Courses	Type of Course	Contact Hours Per Week			Credit			Examination Scheme		
				Theory	Practical	Total	Theory	Practical	Total	End Semester Exam	Internal Assessment Marks	Max Marks
1	19GEO-101	Geomorphology	C.C.	4	--	4	4	--	4	80	20	100
2	19GEO-102	Economic Geography	C.C.	4	--	4	4	--	4	80	20	100
3	19GEO-103	Geography of India	C.C.	4	--	4	4	--	4	80	20	100
4	19GEO-104	Statistical Methods in Geography	C.C.	4	--	4	4	--	4	80	20	100
5	19GEO-105	Cartography and Morphometric Analysis (Theory)	C.C.	4	--	4	4	--	4	80	20	100
6	19GEO-106	Cartography (Practical)	C.C.	--	8	8	--	4	4	80	20	100
7	19GEO-107	Morphometric Analysis (Practical)	C.C.	--	8	8	--	4	4	80	20	100
8	20 GEO-108	Academic and Research Communicative	A.E.C.C.	4	--	4	4	--	4	80	20	100
09		Hobbies	H.C.		1	1						
Total				24	17	41	24	8	32	640	160	800

C.C. = Core Course **A.E.C.C.= Ability Enhancement Compulsory Course** **H.C. = Hobbies Club**

Chaudhary Bansi Lal University, Bhiwani
Scheme of Examination for M.Sc.-Geography

Semester-II (w.e.f. 2020-21) **Credits= 32** **Marks=900**

Sr. No.	Course/ Paper Code	Courses	Type of Course	Contact Hours Per Week			Credit			Examination Scheme		
				Theory	Practical	Total	Theory	Practical	Total	End Semester Exam	Internal Assessment Marks	Max Marks
1	19GEO-201	Geographical Thought	C.C.	4	--	4	4	--	4	80	20	100
2	19GEO-202	Climatology	C.C.	4	--	4	4	--	4	80	20	100
3	19GEO-203	Agricultural Geography	C.C.	4	--	4	4	--	4	80	20	100
4	19GEO-204	Population & Settlement Geography	C.C.	4	--	4	4	--	4	80	20	100
5	19GEO-205	Physical & Socio Economic Landscapes (Theory)	C.C.	4	--	4	4	--	4	80	20	100
6	19GEO-206	Project report based on Physical Landscapes (Practical)	C.C.	--	8	8	--	4	4	80	20	100
7	19GEO-207	Field Work Socio Economic (Practical)	C.C.	--	8	8	--	4	4	80	20	100
8	20 GEO-208	IT for Spatial Sciences	S.E.C.	4	--	4	4	--	4	80	20	100
9.	19GEO-209	General Geography of India	O.E.C	2		2	2	--	2	80	20	100
10.		Hobbies	H.C.		1	1						
Total				26	17	43	26	8	34	720	180	900

C.C. = Core Course **S.E.C. = Skill Enhancement Course** **O.E.C.= Open Elective Course** **H.C. = Hobbies Club**

Chaudhary Bansi Lal University, Bhiwani
Scheme of Examination for M.Sc.-Geography

Semester-III (w.e.f. 2020-21) **Credits= 30** **Marks=800**

Sr. No.	Course/Paper Code	Courses	Type of Course	Contact Hours Per Week			Credit			Total Marks		
				Theory	Practical	Total	Theory	Practical	Total	End Semester Exam	Internal Assessment	Max Marks
1	19GEO301	Oceanography	C.C.	4	--	4	4	--	4	80	20	100
2	19GEO302	Urban Geography	C.C.	4	--	4	4	--	4	80	20	100
Any one of the following subject electives/specializations Discipline Specific Elective I												
3.	19GEO303	Fluvial Geomorphology	D.S.E.	4	--	4	4	--	4	80	20	100
4.	19GEO304	Political Geography										
5.	19GEO305	Environmental Geography										
Any one of the following subject electives/specializations Discipline Specific Elective II												
6	19GEO306	Aeolian Geomorphology	D.S.E.	4	--	4	4	--	4	80	20	100
7	19GEO307	Social Geography										
8	19GEO308	Geography & Disaster Management										
9.	19GEO309	Fundamentals of Remote Sensing (Theory)	C.C.	4	--	4	4	--	4	80	20	100
10.	19GEO310	Lab Work on Aerial Photographs & Satellite Images (Practical)	C.C.	--	8	8	--	4	4	80	20	100
11.	19GEO311	Remote Sensing Project Report (Practical)	C.C.	--	8	8	--	4	4	80	20	100
12.	19GEO312	Basic of Climatology	O.E.C.	2	--	2	2	--	2	80	20	100
13.		Hobbies	H.C		1	1						
Total				22	17	39	22	8	30	640	160	800

C.C. = Core Course **D.S.E. = Discipline Specific Elective** **O.E.C. = Open Elective Course.** **H.C. = Hobbies Club**

Chaudhary Bansi Lal University, Bhiwani
Scheme of Examination for M.Sc.-Geography

Semester-IV (w.e.f. 2020-21) **Credits= 30** **Marks=800**

Sr. No.	Course/Paper Code	Courses	Type of Course	Contact Hours Per Week			Credit			Total Marks		
				Theory	Practical	Total	Theory	Practical	Total	End Semester Exam	Internal Assessment	Max Marks
1	19GEO401	Regional Development & Planning	C.C.	4	--	4	4	--	4	80	20	100
2	19GEO402	Geography of Haryana	C.C.	4	--	4	4	--	4	80	20	100
Any one of the following subject electives/specializations Discipline Specific Elective I												
3.	19GEO403	Cultural Geography	D.S.E.	4	--	4	4	--	4	80	20	100
4.	19GEO404	Biogeography										
5.	19GEO405	Geography of Health										
Any one of the following subject electives/specializations Discipline Specific Elective II												
6	19GEO406	Glacial & Periglacial Geomorphology	D.S.E.	4	--	4	4	--	4	80	20	100
7	19GEO407	Settlement Geography										
8	19GEO408	Transport Geography										
9.	19GEO409	Principles of GIS & Navigation System (Theory)	C.C.	4	--	4	4	--	4	80	20	100
10.	19GEO410	Principles of GIS & Navigation System (Practical)	C.C.	--	8	8	--	4	4	80	20	100
11.	19GEO411	GIS Project Report (Practical)	C.C.	--	8	8	--	4	4	80	20	100
12.	19GEO412	General Geography of World	O.E.C.	2	--	2	2	--	2	80	20	100
13.		Hobbies	H.C.		1	1						
Total				22	17	39	22	8	30	640	160	800

C.C. = Core Course **D.S.E. = Discipline Specific Elective** **O.E.C. = Open Elective Course** **H.C. = Hobbies Club**

Ch. Bansi Lal University, Bhiwani

(A State University established under Haryana Act No. 25 of 2014)

Syllabi
for
M.Sc. Geography
(SEMESTER I to IV)
(2020-2021)

Semester-I

M.Sc. Geography
Semester I
19 GEO 101 Geomorphology

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The course aims to familiarize the students with the need for understanding of geomorphology with reference to certain fundamental concepts, focusing on the unity of geomorphology in the earth materials and the processes with or without an element of time. A few selected applications of geomorphology to societal requirements and quality of environment are also dealt with in the course.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Fundamental Concepts in Geomorphology
Geomorphology: Nature, Scope & Concept. Basic Principal of Geomorphology, Climatogenetic Geomorphology, Concepts of Threshold & Magnitude. Recent trends in geomorphology.

Unit II: Earth interior & Dynamic Forces
Continental drift theory and its basic considerations; Plate tectonics – Plate margins and boundaries, movement and distribution of plates, tectonic activities along the boundaries. Earthquake – causes, classification, intensity and magnitude, geographical distribution. Volcanism – mechanism and causes, classification and geographical distribution. Classification of geomorphic Processes: Exogenetic Processes, Endogenetic processes – Faulting, folding and their geomorphic expressions.

Unit III: Exogenetic Processes
Exogenetic Processes –Weathering: Causes, type of weathering: mechanical, chemical and biological; rock weathering and soil formation. Mass wasting: causes, classifications and types of mass movement- slow and rapid mass movements, Hillslope analysis: techniques and theories, mode and rate of slope retreat.

Unit IV: Applied Geomorphology
Applied geomorphology: meaning and concept; role of geomorphology in environmental management, Geomorphic processes and resulting landforms: Fluvial, Glacial, Aeolian and Karst.

Suggested Readings:
1. Ritter, D. F., Kochel, R. C. and Miller, J. R. (1995) Process Geomorphology. Dubuque, Win C. Brown Publishers (3rdEdn).
2. Sharma, V. K. (2010) Introduction to Process Geomorphology. Taylor and Francis, London.
3. Kale, V. S. and Gupta, A. (2001) Introduction to Geomorphology. Orient - Longman, Hyderabad.
4. Bloom, A. L. (2002) Geomorphology: A systematic Analysis of late Canozic landforms. Prentice –Hall Private Limited, New Delhi.

5. Thornbury, W. D. (2004) (rep.). Principles of Geomorphology. John Wiley & Sons, NewYork.
6. Sparks, B. W. (1960) Geomorphology. Longman, London.
7. Singh, S. (2014) Geomorphology. Prayag Publication, Allahabad.
8. Singh, S. (2008) Physical Geography. Prayag Pustak Bhawan, Allahabad.
9. Sharma, H. S. and Kale, V. S. (2009) Geomorphology in India. Prayag Pustak Bhawan, Allahabad.
10. Strahler, A. H. (2013) Introducing Physical Geography. Wiley, 6th Edition.
11. Kale, V. S. (2014) Landscapes and Landforms of India. Springer.
12. H.S. Sharma, Perspectives in Geomorphology 4 volumes, Concept Publishing Company, New Delhi.

M.Sc. Geography
Semester I
19 GEO 102 Economic Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: The basic aim of this course is to provide the basic understanding of nature & scope of economic geography with reference to the economic development, structure and role of world trade blocks in globalizing world.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature & Scope in Economic Geography
Economic Geography: Definition, nature, scope and approaches; Relationship of economic geography with economics and other branches of social sciences; World Economies: bases of classification, patterns and characteristics of developed and developing economies of the world.

Unit II: Functional Classification of Economic Activities
Functional Classification of Economic Activities: Primary, Secondary, Tertiary activities, Knowledge & Quaternary. World production and distribution of energy resources: coal and petroleum. World production and distribution of mineral resources: iron ore and bauxite.

Unit III: Network Structure and Economic Activities
Network structure and economic activities, impact of transport on economic activities, Classification of industries: Resource based and footloose industries. Theories of industrial location - Ullman, Weber, Isard and Losch.

Unit IV: Concept of Economic Growth and Development
Concept of economic growth and development, globalization and pattern of economic development,Emergence of a new global economy – transnational integration and its spatial outcomes. Major regional trade blocks of the world, free trade initiatives (GATT, UNCTAD, WTO).

Suggested Readings:
1. Hartshorne, T. A. and Alexander, J. W. (2001) Economic Geography (fourth Edition). New Delhi,Prentice Hall of India.
2. Jones, C. F. and Darkenwarld, G. G. (1955) Economic Geography. The Macmillan and Company, New York.
3. Wheeler, J.O. and Muller, P.O. (1985) Economic Geography. John Wiley and Sons. New York.
4. Knox, P. (2003) The Geography of World Economy. Arnold, London.
5. Hudson, R. (2005) Economic Geography. Sage Publication, New Delhi.
6. Gautam, A.(2010) Advanced Economic Geography. Sharda Pustak Bhawan, Allahabad.
7. Saxena, H.M. (2013) Economic Geography. Rawat Publications, Jaipur.
8. Horder & Lee. Economic Geography.

9. Lloyd,P. E. and Dicken, P. (1977) Location in Space a Theoretical approach to Economic geography. Harper and Row, London, New York.

M.Sc. Geography
Semester I
19 GEO 103 Geography of India

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: The basic aim of this course is to provide understanding about the location and geographical dimensions of India with detailed elaborations of physiography, climatic conditions, social composition, economic development and regionalization of India.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Physical Structure
India: size, shape and location. Unity in Diversity; Geological structure and relief, drainage system, climatic conditions, Soil and natural vegetation - Distribution, characteristics and conservation.

Unit II: Population Characteristics & Social Composition
Population distribution and growth, age and sex composition; literacy rate and differentials; Ethnic groups; linguistic and religious groups in context of unity in diversity in India. Features of Urbanization.

Unit III: Distribution of Resources and Economy
Economy: main features and problems of Indian agriculture, Green, white, blue and yellow revolutions; Regional distribution of major minerals and power resources – iron ore, mica, bauxite, copper, coal, petroleum and natural gas. Industrial Regions; New Industrial Policy; Problems and prospect of transportation with reference to railways, roadways, waterways, airways and pipelines.

Unit IV: Regionalisation of India
Region of India: D. Stamp, Desh Pandey; Geographic region of India by R.L. Singh, Prakasha Rao & Ashok Mitra; Economic & Planning Region of India: P. Sengupta, Economic region of India, Resources region of India, Development & Planning region of India.

Suggested Readings:

1. Dubey, R. N. (1974) Economic Geography of India. Kitab Mahal, Allahabad.
2. Joshi, H. L. (1990) Industrial Geography of India. Rawat Publications, Jaipur.
3. Nag, P. and Sengupta, S. (1992) Geography of India. Concept publications, New Delhi.
4. Rautray, J. K. (1993) Geography of Regional Disparity. Asian Institute of Technology, Bangkok.
5. Singh, R. L. (2007) India: A Regional Geography. NGSI, Varanasi.
6. Sharma, T. C. and Coutinho, O. (1988) Economic and Commercial Geography of India. Vikas Publishing House Pvt. Ltd, New Delhi.
7. Hussain, M. (2015) Geography of India. Mc Graw Hill Education.
8. Dixit K R, Ramprit K and Dixit J K (2014) North-East India: Land, People and Economy, Springer.

9. Spate O H K (1979) India and Pakistan – A General and Regional Geography, Methuen and Co., London.

M.Sc. Geography
Semester I
19 GEO 104 Statistical Methods in Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objectives: The course aims to provide understanding to the students about the nature and types of data; and to provide the basic understanding of application of statistical tools & technique for analyzing the Spatial Data.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Descriptive Statistics : Tools & Techniques
Geography and statistics, significance of statistics in geographical studies. Descriptive statistics: tabulation and graphical representation of data. Measures of central tendency: mean, median and mode. Partitioned values: Quartiles and deciles. Comparing the mean, median and mode.

Unit II: Measure of Dispersion
Measure of dispersion: absolute measure; Range, quartile deviation, mean deviation and standard deviation. Relative measure of dispersion: coefficient of variation. Measures of inequality: location quotient and Lorenz curve.

Unit III: Bivariate Analysis
Bivariate analysis: scatter diagram, correlation analysis, Spearman's rank correlation and Karl Pearson's correlation coefficient. Test of significance: Chi-square test, student's T-test, F-test.

Unit IV: Regression Analysis
Simple linear regression model: regression equations, construction of regression line, computation of residuals and mapping. Basis of multivariate analysis: correlation matrix, partial and multiple correlations. Measure of composite Indices (Scale Biasness weightage, Z Score and Principal Component Analysis).

Suggested Readings:

1. Mahmood, A. (2008) Statistical Methods in Geographical Studies. Rajesh Publications, New Delhi.
2. Paul, S. K. (1998) Statistics for Geoscientists: Techniques and Applications. Concept Publishing Company, New Delhi.
3. Gupta, C. B. and Gupta, V. (2009) An Introduction to Statistical Methods. Vikas Publishing House, Delhi.
4. Gregory, S. (1978) Statistical Methods and the Geographers. Longman, London.
5. Hoshmand, A.R. (1998) Statistical Methods for Environmental and Agricultural Sciences.CRC Press, New York, 2nd Edition.
6. Johnston, R. J. (1989) Multivariate Statistical Analysis in Geography. John Wiley & Sons, 4thedition.

M.Sc. Geography
Semester I
19 GEO 105 Cartography and Morphometric Analysis (Theory)

Maximum Marks - 100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The basic aim of this course is to provide basic understanding of Cartography, Thematic mapping & to provide the training for spatial Data Analysis.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature and Scope of Cartography
Nature and scope of Cartography, Historical evolution, Development and Recent advancements in cartography, Types and characteristics of distribution maps:
(i) Chorochromatic (ii) Choroschematic (iii) Isopleth (iv) Choropleth (v) Dot and (vi) Diagrammatic.

Unit II: Statistical Diagrams & Their Classification
Types and characteristics of statistical diagrams: (i) One dimensional (bar, line), (ii) Two dimensional (circular, rectangular, square), (iii) Three dimensional (block, sphere, cube) and (iv) Other diagrams (Snail, pyramid, flow diagram/cartogram). Characteristics of graph/diagrams/maps representing climatic data: (i) Rainfall deviation, (ii) Climograph (Taylor and Foster), (iii) Hythergraph, (iv) Star/Wind rose diagram (v) Isopleths (vi) Line and bar (vii) polygraph.

Unit III: Interpretation of Topographical Sheets
Arrangement, identification and interpretation of topographical sheets of India; Delineation of drainage basin and its geographical significance; Profile: Transverse and longitudinal; Drainage network analysis: Linear and areal properties; Relationship between stream order, number and length.

Unit IV: Analysis of Drainage Basin
Relief aspect of drainage basin: (i) area-height curve, (ii) Altimetric frequency curve, (iii) Hypsographic curve, (iv) Hypsometric integral curve and (v) Clinographic curve. Development of slope and various methods of its analysis (Wentworth and Smith's method).

Suggested Readings:
1. Misra, R.P. and Ramesh, A. (1999) Fundamentals of Cartography. Concept Publishing Company, New Delhi
2. Monkhouse, F.J. and Wilkinson, H. R. (1980) Maps and Diagrams. B. I. Publications, New Delhi.
3. Singh, R. L. (1986) Elements of Practical Geography. Kalyani Publishers, New Delhi.
4. Dury, G.H. (1966) Essays in Geomorphology. Heinmann, London.

M.Sc. Geography
Semester I
19 GEO 106 Cartography (Practical)

Maximum Marks - 100
Lab. Exercises - 45 marks (15x3)
Practical Record book - 20 marks
Viva Voce -15 marks
Internal Assessment – 20 marks
Maximum Time – 4 hrs

Objective: The aim of the course is to apprise the students with latest trends in the development of cartography as a tool in mapping thematic and quantitative data to facilitate spatial analysis and synthesis, and to provide training in application of modern tools and techniques to data in a variety of regional studies at local, regional and national levels.

Note: The examiner shall set six questions, two from each unit. The candidate shall attempt three questions/exercises in all, selecting at least one question/exercise from each unit.

Unit I: Representation of Climatic Data
Climate data representation by diagrams and maps:
- Line and bar graph (1)
- Poly graph (1)
- Rainfall deviation diagram (1)
- Climograph (Taylor and Foster's) (2)
- Hythergraph (1)
- Isopleth (1)
- Wind rose diagram (1)

Unit II: Graphical Representation of Socio-Economic Data
Diagrams: Types and properties of diagrams representing socio-economic data:
One dimensional diagram
Bar diagram: Simple bar (1),
Multiple bar (1),
Comparative bar (1)
Two dimensional diagrams – Pie diagram, Proportional circle (1).
Three dimensional diagrams – Sphere (1)

Unit III: Spatial Representation of Socio-Economic Data
Distribution maps
- Dot method (1)
- Choropleth – monovariate (1) and bivariate (1)

Miscellaneous diagrams and graphs
- Trend graph (1)
- Age and Sex pyramid (1), Snail Diagram (1).
- Flow diagram, cartogram and accessibility maps (2).

M.Sc. Geography
Semester I
19 GEO 107 Morphometric Analysis (Practical)

Maximum Marks - 100
Lab. Exercises - 45 marks (15x3)
Practical Record book - 20 marks
Viva Voce -15 marks
Internal Assessment – 20 marks
Maximum Time – 4 hrs

Objective: The aim of the course is to apprise the students with latest trends in the development of cartography as a tool in mapping thematic and quantitative data to facilitate spatial analysis and synthesis, and to provide training in application of modern tools and techniques to data in a variety of regional studies at local, regional and national levels.

Note: The examiner shall set six questions, two from each unit. The candidate shall attempt three questions/exercises in all, selecting at least one question/exercise from each unit.

Unit I: Interpretation of Toposheets
Interpretation of toposheets: (a) Physical features and (b) Cultural features (2)
Delineation of Watershed (All the exercises of morphometry shall be based on delineated watershed) (1)
Profile Analysis: Transverse and Longitudinal

a. Serial Profiles (1)
b. Superimposed Profiles (1)
c. Composite Profiles (1)
d. Projected Profiles (1)
e. Longitudinal or valley Thalweg Profile (1)

Unit II: Linear Aspects of Streams
Linear Aspects of streams:

a. Relationship between stream order and stream Number (1)
b. Relationship between stream order and Average stream length (1)
c. Bifurcation ration (1)

Areal Aspects of streams:

a. Drainage Frequency (1)
b. Drainage Density (1)

Unit III: Relief & Slope Aspect
Relief & Slope Aspect

a) Area Height Curve (1)
b) Altimetric frequency curve (1)
c) Hypsographic Curve (1)
d) Hypsometric Integral Curve (1)
e) Clinographic or clinometric curve (1)

Slope Analysis

a) Wentworth's Method of Average Slope (1)
b) G. H. Smith's Method of Relative Relief (1)

M.Sc. Geography
Semester I
20 GEO 108 Academic and Research Communicative

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs.

Objectives: Main objective of this course is to provide a brief understanding to the students about academic and research writing especially in the field of Geography, Research Ethics, Research Database and Application of ICT in the academic and research communicative.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Introduction
Academic and Research Communicative: Concept, Definition & Importance**;** Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process Current Trends in Research: Inter disciplinary research; Criteria of good research, Preparing for interviews, CV/ Biodata, Group Discussion, Public Speaking, Mass Communication.

Unit II: Research Communication and Ethics
Effective Research Communication and its Importance; Type of Academic Events: Workshop, Seminar, Conference & Symposium, Webinar etc.; Research Presentation: Planning, Structure Presentation (Understanding of the topic and the audience etc.); Methods of Effective Communication and Presentation; Research ethics: definition and importance; Conflicts of Interest; Moral and social values; Ethical Principles and Codes.

Unit III: Academic and Research Writing and Database
Research Paper: structure, format and layouts; Project Report/Dissertation and Thesis: Structure and Components and Layout; Literature Review & its importance in Research, Citation, Reference & Bibliography, Proof Readings: meaning and importance; Interpretation of Data and Paper Writing - Layout of a Research Paper, Journals in Geography, Impact factor of Journals, Cross-referencing, H-index, i10 Index, G-Index; Publication Identifiers: ISBN, ISSN & DOI, UGC CARE List.

Unit IV: Application of ICT in Research
Use of ICT tools/techniques for Research: Research Database: Scopus, Web of Science, PubMed, IEEE Xplore, ScienceDirect, ResearchGate, GoogleScholar etc; Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism: Turnitin.

Suggested Readings:
1. Babbie, E. R. (2007). *The Basics of Social Research* (4th ed.). Australia: Thomson/Wadsworth.

2. Becker, H. S., & Richards, P. (1986). *Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article.* University of Chicago Press
3. Chaddah, P. (2018). *Ethics in Competitive Research: Do not get scooped, do not get plagiarized*. Self-Published.
4. Craswell, G. (2004). *Writing for Academic Success*. Sage Publications.
5. Dutta, S. K. (2018). *Academic and Research Writing: Essential Skills and Styles*. New Delhi: New Century Publications
6. Fowler, F. J., Jr. (1993). *Survey Research Methods* (2nd ed.). Applied Social Science Research Methods Series, Vol. 1, Newbury Park, Calif.: SAGE Publications.
7. Kish, L. (1965). *Survey Sampling*, New York: John Wiley and Sons.
8. Savage, A & Patricia Mayer. (2012). *Effective Academic Writing*. Oxford University Press.
9. Shamoo, A. E., & Resnik, D. B. (2015). *Responsible Conduct of Research.* New York: Oxford University Press.

Semester-II

M.Sc. Geography
Semester II
19 GEO 201 Geographical Thought

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: The course aims to enlighten the students to the philosophical and methodological foundations of the subject and its place in the world of knowledge and to familiarize them with the major landmark development in geographical thoughts at different time periods and dualism in geography.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Geography in the Realm of Knowledge
Place of Geography in the realm of knowledge, Geography as a science and its relationship with other science, Significance of space, place and location in geography. Explanations in Geography: Methodological and philosophical settings.

Unit II: Evolution & Development of Geographical knowledge
Development of Geographical knowledge during ancient (Greek and Roman) and medieval (Arab) periods, Foundation of Modern Geography- Varenius, Kant, Humboldt and Ritter.

Unit III: Dualism in Geography
Concepts of Modern Geography- chorology, landscapes, areal differentiation, environmental determinism and possibilism. Dualism in Geography: Physical vs Human Geography and Systematic v/s Regional Geography.

Unit IV: Recent Trends & Post-Modernism Geography
Quantitative Revolution and Emergence of theoretical geography, Positivist Explanations in Geography - Laws, theories, models, Inductive & deductive logic. Behavioural and Humanistic Perspectives in Geography, Social Relevance in Geography – Welfare, Radical and Feminist Perspectives, Postmodernism and Geography.

Suggested Readings:

1. Dickinson, R. E. (1959) The Makers of Modern Geography. London.
2. Dikshit, R. D. (1997) Geographical Thought- A Contextual History of Ideas. PrenticeHall of India, New Delhi.
3. Harvey, D. (1989) Explanation in Geography. Edward Arnold, London.
4. Hartshorne, R. (1959) Perspectives on the Nature of Geography. Rand MacNelly, Chicago.
5. James, P. E. and Martin, J. G. (1972) All possible Worlds. John Wiley and Sons,New York.
6. Johnston, R. J. (1983) Geography and Geographers. Edward Heinemann, London.
7. Peet, R. (1998) Modern Geographical Thought. Oxford, Blackwell Publishers.
8. Hebert and Matthew. (2012) Re-unifying geography: Common Heritage and shared future. Routledge.

9. Husain, M. (2004) Evolution of Geographical Thought. Rawat Publication.
10. Adhikari, S. (2015) Fundamentals of Geographical Thought. Orient Blackswan, New Delhi.

M.Sc. Geography
Semester II
19 GEO 202 Climatology

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: The basic aim of this course is to foster comprehensive understanding of atmosphere, its evolution, characteristics, circulation and associated climatic phenomena, dynamics of global climates, recent climate change.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature & Scope of Climatology
Climatology: Definition, nature and scope; Climatology and Meteorology. Atmosphere: composition and structure. Insolation: Solar radiation and terrestrial radiation, latitudinal and seasonal variations; Effects of atmosphere: green house effect, heat budget and latitudinal heat balance. Temperature: Processes of heat energy transfer, heating and cooling of atmosphere, horizontal and vertical distribution, inversion of temperature.

Unit II: Atmospheric Circulation
Atmospheric pressure: measurement and its distribution pattern – vertical, horizontal and seasonal variations. General circulation: planetary, geostrophic, subtropical, westerlies and polar winds, tricellular meridional circulation, walker circulation-ENSO and La Nina; Circulation pattern in vertical and horizontal planes. Origin of monsoon and jet streams.

Unit III: Atmospheric Dynamic Process
Atmospheric moisture: sources of atmospheric moisture; types and distribution of humidity and evaporation. Condensation: conditions, forms and types. Precipitation: process, form, types and distribution. Atmospheric equilibrium: stability and instability. Adiabatic process of temperature change, lapse rate: dry and wet adiabatic rate.

Unit IV: Climate Change & its Classification
Air masses: definition, characteristics, modification and classification. Fronts: frontogenesis, frontlysis and classification. Atmospheric disturbances: extra tropical and tropical cyclones, their origin and associated weather, thunderstorms, tornadoes and waterspouts. Climatic classification: Bases of climatic classification by Koppen and Thornthwaite. Climatic changes – Evidences; Theories of Climate Change: - Milankovitch Cycle, Atmospheric Dust Hypothesis, Carbon Dioxide Theory and Astronomic Theory of Climate Change.

Suggested Readings:
1. Trewartha, G. T. (1980) An Introduction to Climate. McGraw Hill Company, New York.
2. Critchfield, H. J. (2010) General Climatology. Prentice Hall of India, New Delhi.
3. Barry, R. G. and Chorley, R. J. (1968) Atmosphere, Weather and Climate. Marthren.
4. Lal, D. S. (2012) Climatology. Chetanya Publishing House, Allahabad.
5. Singh, S. (2014) Climatology. Pravalika Publications, Allahabad.
6. Das, P. K. (1984) The Monsoons. National Book Trust, New Delhi.

M.Sc. Geography
Semester II
19 GEO 203 Agricultural Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: The basic aim of this course is to provide fundamental understanding about concept, origin and development of agriculture; along with recent dynamics, contemporary issues and challenges faced by the agrigarian system and communities.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Agricultural Geography: Definition, Nature & Scope
Agricultural Geography: Definition, nature, scope and significance; Approaches: commodity, systematic, and regional; Origin and dispersal of agriculture; gene-centres of agriculture; Determinants of agricultural patterns: physical, technological and cultural factors.

Unit II: Concepts Classification of Land Capability
Concepts of land capability classification (India), Land use survey and Classification (British and Indian), land use and cropping pattern; Agricultural concept and their measurement- (a) intensity of cropping, (b) degree of commercialization, (c) diversification and specialization, (d) agricultural efficiency and productivity, (e) crop combination and concentration; Von Thunen Model of agricultural land use.

Unit III: Concept of Agricultural Regionalisation
Agricultural Regionalisation: Concept and criteria, Whittlesey's agricultural systems; and agricultural typology by Kostrowiki; Agro-climatic zonation: Concept and agro-climatic regions of India. Agricultural regions of India, Regional imbalances in agricultural productivity in India. Green revolution: Its impact and consequences in India.

Unit IV: Contemporary Agriculture Issues & its Impacts
Neo-liberalization and Indian agriculture; Food Security: Concept and components, Food Security in India; Contemporary Issues: Food, nutrition and hunger, food security, drought and food security, food aid programmes; environmental degradation, New Perspectives in Agriculture: Urban agriculture, Contract Farming, Agri-business, Sustainable Agricultural Development; Agriculture and climate change: Impacts and adaptation, role of irrigation.

Suggested Readings:

1. Geoffrey, H.F. (1970) Geography of Agriculture: Themes in Research. Prentice Hall, N.J.
2. Morgon, W.B. and Munton, R.J. C. (1971) Agricultural Geography. Methuen, London.
3. Singh, J. and Dhillon, S.S. (1994) Agricultural Geography. Tata Mc Graw Hill, New Delhi.
4. Husain, M. (1996) Systematic Agricultural Geography. Rawat Publications, Jaipur.
5. Tarrant, J.R. (1974) Agricultural Geography. Willey, New York.
6. Shafi, M. (2006) Agricultural Geography. Pearson Education, New Delhi.

7. Bowler, T. R. (1992) The Geography of Agriculture in Developed Market Economics.Longman.
8. Grigg, D. (1995) Introduction to Agricultural Geography.Routledge, London.

M.Sc. Geography
Semester II
19 GEO 204 Population and Settlement Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: The basic aim of this course is to provide fundamental understanding about population, its distribution, structure and composition. Along with this course also provide an idea for settlement, evolution, types and its association with population geography.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Scope of Population Studies
Evolution of Population Geography, Scope and content of population geography, Sources of data and Nature of data. World population distribution and growth with respect to stages of demographic transition. Population growth, distribution and trend with respect to India at sub-national level.

Unit II: Population Structure
Age-sex structure, Overall sex ratio, child sex ratio, sex ratio at birth, elderly sex ratio and their temporal trend and spatial pattern in India, Phenomenon of ageing population.
Population Dynamics: Fertility, mortality and migration- Basic measures, spatial and temporal trends. Socio-cultural (Literacy and education, religious composition; rural-urban residence).

Unit III: Settlement Geography
Definition and Scope of settlement geography. Locational Aspects- Site, Situation, Characteristics (Size, Pattern, Shape, Functions), Distribution – Density, Spatial Distribution Pattern and Methods of Analysis of Distribution.

Unit IV: Settlement Types and Functions
Settlements Types based on Site, Situation, Population size and functions. Spatial and Temporal trends in size and growth of settlements with special reference to India, Functions of Settlements- Rural/ Urban Distribution. Empirical and theoretical models explaining the functional classification of towns & villages; functional classification of urban centres, functional typology of villages, functional landscape, functional structure of towns in India.

Suggested Reading:
1. Ambrose, Peter,(1970) Concepts in Geography Vol.-I Settlement Pattern, Longman.
2. Baskin, C.,(1966) (Translator), Central Places in Southern Germany, Prentice-Hall Inc.Englewood Cliffs New Jersey. (1933) Originally written by C.W. Christaller in German with title Die Zentralen Orte Suddeutsch land.
3. Census of India. (1961) House types and Settlement Patterns of Villages in India, GOI, New Delhi.
4. Haggett, Peter, Andrew D. Cliff and Allen Frey (1979), Locational Models Arnold Heinemann.
5. King, Leslie, J., (1986) Central Place Theory, Saga Publications, New Delhi.
6.. Mayer, M. Harold and Clyde F. Kohn(1967) (editors), Readings in Urban Geography, Central Book Depot, Allahabad.

7. Mitra, Asok, Mukherjee S and Bose R. (1980) Indian Cities Abhinav Publications, New Delhi.
8. Nangia, Sudesh,(1976) Delhi Metropolitan Region, K.B. Publications, New Delhi.
9. Prakasa, Rao, V.L.S., (1983) Urbanisation in India; Spatial Dimensions, Concept Publishing Co., New Delhi.
10. Ramachandran, R., (1992) Urbanisation and Urban Systems in India, Oxford University Press,New Delhi.
11. Singh R.L. and Kashi Nath Singh (1975) (editors), Readings in Rural Settlement Geography,National Geographical Society of India, Varanasi.
12. Srinivasan, K. and M. Vlassoff,(2001) (editors), Population-Development Nexus in India:Challenges for the New Millennium, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
13. Ucko, M.J., Ruth Tringham and G.W. Dimbleby (1972) (editors), Man, Settlement and Urbanism, Duckworth.
14. United Nations Centre for Human Settlements (HABITAT), (1996) An Urbanising World, Global Report on Human Settlements, Oxford University Press for HABITAT.
15. Bilasborrow, Richard E and Daniel Hogan,(1999) Population and Deforestation in the HumidTropics, International Union for the Scientific Study of Population, Belgium.
16. Bogue, D.J.(1969) Principles in Demography, John Wiley, New York.
17. Bose, Ashish et. al.:(1974) Population in India's Development (1947-2000); Vikas Publishing House, New Delhi.
18. Census of India,(1991) India: A State Profile,.
19. Chandna, R.C.(2000) Geography of Population; concept, Determinants and Patterns. Kalyani Publishers, New York.
20. Clarke, John I.,(1973) Population Geography, Pergamon Press, Oxford.
21. Crook, Nigel (1997) Principles of Population and Development. Pergmon Press, New York.
22. Daugherty, Helen Gin, Kenneth C.W. Kammeyir, (1998) An Introduction to Population (Second Edition), The Guilford Press, New York, London.
23. Garnier, B.J. (1970) Geography of Population Longman, London.
24. Kochhar, Rajesh,(2000) The Vedic People: Their History and Geography Orient Longman Ltd., New Delhi.
25. Mamoria, C.B. (1981) India's Population Problem, Kitab Mahal New Delhi.
26. Mitra, Asok,(1978) India's Population: Aspects of Quality and Control. Vol. I & II, Abhinar Publications, New Delhi.
27. Premi, M.K.,(1991) India's Population: Heading Towards a Billion, B.R. Publishing Corporation,.
28. Srinivasan, K. and M. Vlassoff. (2001) Population Development Nexus in India: Challenges for the New Millennium. Tata McGraw -Hill, New Delhi.
29. Srinivasan, K. (1998)Basic Demographic Techniques and Applications Sage Publications,New Delhi.
30. Sundaram, K.V. and Sudesh Nangia,(1986) (ed.) Population Geography, Heritage, Publications, Delhi.
31. UNDP (2000- 2009) Human Development Report. Oxford University Press, Oxford.

M.Sc. Geography
Semester II
19 GEO 205 Physical & Socio Economic Landscapes (Theory)

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The basic aim of the course is to provide theoretical background for conducting field Survey, its preparation & conduct field work for the understanding Physical & socio-economic landforms .

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Basic of Landscape Evolution
Earth surface processes and associated landforms. Geomorphic structure, processes and landscape evolutions, dynamic equilibrium, and topographic response to tectonic activities and climatic forcing, morphogenetic region, Topographical and Terrain analysis with field mapping , analysis of remotely sensed data and numerical models.

Unit II: Landscape Mapping Analysis
Landscape Analysis with Maps & Aerial Photos, Geomorphological mapping, Field mapping, Field surveying techniques. Identification of facies and genies of landforms, Stratigraphy, Sediment texture, structure, Particle morphology, Fabric analysis: General considerations; Clast macrofabrics and microstructural description, Clast mesofabrics and Laboratory analysis.

Unit III: Formation of Research Design
Significance of Field work in Geography; Identification of Research Problem and Formulation of Research Design in geography; Types and Sources of Data: Characteristics of primary and secondary data; Types of Questionnaires and their formulation.

Unit IV: Research Design & Report Writing
Selection of sample household; Preparation of field Questionnaire, Field sample survey design & preparation of Locational maps. Collection of demographic and socio-economic data from the field; Retrieval and analysis of data collected from field; Format of field project report writing; Data entry: coding and Tabulation, Planned report writing and Ethics of report writing.

Suggested Readings:

1. Ahuja, R. (2003) Social Survey and Research (Hindi version). Rawat Publications, Jaipur.
2. Basotia, G. R. and Sharma, K. K. (2002) Research Methodology. Mangal Deep Publications, Jaipur.
3. Creswell, J. (1994) Research Design: Qualitative and Quantitative Approaches. Sage Publications.
4. Dikshit, R. D. (2003) The Art and Science of Geography: Integrated Readings. Prentice- Hall of India, New Delhi.
5. Evans, M. (1988) Participant Observation: The Researcher as Research Tool, in Qualitative Methods in Human Geography. eds. J. Eyles and D. Smith,Polity.

6. Gideon, S. and Roger, N. (1992) A Methodology for Social Research. Rawat Publications, Jaipur.
7. Mukherjee, N. (1993) Participatory Rural Appraisal: Methodology and Application. Concept Publs. Co., New Delhi.
8. Mukherjee, N.(2002) Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi.
9. Robinson, A. (1998) Thinking Straight and Writing That Way, in Writing Empirical Research Reports: A Basic Guide for Students of the Social and Behavioural Sciences, eds. by F. Pryczak and R. Bruce Pryczak. Publishing: Los Angeles.
10. Stoddard, R. H. (1982) Field Techniques and Research Methods in Geography. Kendall/Hunt.
11. Wolcott, H. (1995) The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA.

M.Sc. Geography
Semester II
19 GEO 206 Project Report based on Physical Landscape (Practical)

Maximum Marks-100
Field Report – 50
Presentation – 15
Viva voce – 15
Internal Assessment – 20

Objectives: The main objective of this course is to provide basic understanding about structure, landforms, their evolution & genesis and their association with the flora, fauna & human activities in the selected area.

Note: The report need to be supplemented with maps, sketches, photographs etc.

Course Contents:

1. Trace the prominent features of selected area. Identify salient landform and features of the selected area with the help of topographical sheet of survey of India.
2. Identify the earth surface processes actively operating in the study area. Trace the erosional and depositional landforms, their facies and genesis, stratiography, particle size analysis, morphology and clast fabric.
3. Identify and classify the biodiversity in the area (Flora & Fauna).
4. Observe the relationship of various landforms, flora and fauna with land use, settlement structure and life style of people.
5. Based on the results obtained from Geomorphological analysis based on various techniques. Prepare a field report with field photographs, sketches, maps and diagrams. Along with students have to submit their field diary.

M.Sc. Geography
Semester II
19 GEO 207 Field Work Socio Economic (Practical)

Maximum Marks – 100
Field Report – 50
Presentation – 15
Viva voce – 15
Internal Assessment – 20

Objective: Main objective of this course is to provide the students with the understanding of ground reality of a chosen village/town by observation; mapping of land quality, land use and cropping pattern and conducting Socio-economic survey of the households with the help of a specially prepared questionnaire.

Course Contents:

1. Procure a topographic map of 1:50,000 or 1: 25,000 scale to study the settlements selected in its regional setting.
2. Collect demographic, social & economic data of the village/town from Census Reports to study the temporal changes in the profile of such characteristics.
3. Procure a cadastral map of the village/town for field mapping of the features of landuse and land quality. Procure/prepare the settlement-site map through rapid survey to map the residential, commercial, recreational (parks, playgrounds), educational, religious and other prominent features.
4. Conduct a socio-economic survey of the households with a structured questionnaire. Supplement the information by personal observations and perceptions.
5. Based on results of the land-use and socio-economic enquiry of the households, prepare a critical field-survey report. Photographs and sketches, in addition to maps and diagrams, may supplement the report.

M.Sc. Geography
Semester II
20 GEO 208 IT for Spatial Sciences

Maximum Marks – 100
Theory Examination – 80
Internal Assessment – 20
Max. Time – 3 hrs.

Objectives: Main objective of this course is to introduce the IT tools and its applications in Geography. It also aims to provide an understanding to the students about basic computing skills and its usefulness in GIS and other modern geographical technologies.

Note: There shall be nine questions in all. Question no. I shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Mapping and Spatial Sciences
Cartography: Geodesy, Photogrammetry, Remote Sensing, Geographical Information System (GIS); Information & Communication Technologies- Global Positioning System(GPS) Digital Image Processing; Map as Decision Tool; Conventional Symbols & Sign Survey Instruments, Traversing, Trilateration and Triangulation; Electronic (total station); Aerial and Satellite based survey techniques (Photogrammetry, RADAR, LiDAR).

Unit II: Mapping Techniques
Map as a communication system - Theory of Perception, Symbolization: Conventional signs and symbols: Quantitative, Qualitative Symbols, Use of colour; Qualitative mapping technique: Choroschematic and Chorochromatic; Quantitative mapping techniques: Choropleth, Isopleth; Physical surveying: GPS and Total Station, DGPS and GPR.

Unit III: Open Source Data, Software and WebGIS
Software: Definition and Types; Operating systems, Application programmes; Information Technology: Introduction, Applications of IT in Cartography, GIS, Remote Sensing and GPS; Open source software for GIS: QGIS, GoogleEarth, Google Earth Engine etc.; Geodata visualization and analysis: two, three, fourth dimension viewing, visualization by hyper map, Virtual images & WebGIS.

Unit IV: Spatial Database
Spatial database: Survey of India, NRSC, BHUVAN, NATMO, Geological Survey of India, Census of India, National Informatics Centre, Cadastral maps, Openstreet map; Foreign sources of data: USGS EarthExplorer, Earth Data Search; Physical surveying: GPS and Total Station; Attribute database: Census of India, Statistical Abstracts, National Informatics Centre etc.

Suggested Readings:

1. Anson, R.W., & Ormeling, F.J. (2008). *Basic Cartography* (Vol. I&II ed.). London: Elsevier Applied Science Publishers.
2. Cartwright.W., & Gartner G. A. L. (2009). *Cartography and Art*. Heidelberg: Springer – Verlag Berlin.

3. Clark, I. (1979). *Practical Geostatistics*. London: Applied Science Publishers
4. Davis, J.C. (1973). *Statistics and Data Analysis in Geology*. New York: Wiley
5. Keates, J. S. (2008). *Cartographic Design and Production*. London: Longman
6. Misra, R.P., & Ramesh, A. (2002). *Fundamentals of Cartography*. New Delhi: Concept Publishing Company.
7. Peterson, M. P. (1995). *Interactive and Animated Cartography*. Upper Sadde River, NJ: Prentice Hall.
8. Ramesh, P. A. (2000). *Fundamentals of Cartography*. New Delhi: Concept Publishing Co.
9. Rampal, K. K. (2004). *Mapping and Compilation*. New Delhi: Concept Publishing Co.
10. Robinson A.H., & Morrison J. L (1995) *Elements of Cartography*. John Wiley & Sons
11. Singh, R.L & Dutt. P.K. (2008). *Elements of Practical geography*. Allahabad: Students Friends.

M.Sc. Geography
Semester II
19 GEO 209 General Geography of India (Open Elective)

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The course aims to provide understanding to the students about the geographic dimensions of India in terms of its political and administrative characteristics. It also familiarize the students with the physical, climatic, human and economic dimensions of India in a spatial perspective.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

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Unit I:
India: Locational Setting and Geographical Expansion.
Relief and Drainage Systems.
Climate, Soil and Natural Vegetation.
Geographical Regions of India.

Unit II:
Peoples of India.
Population; Distribution, Density and Growth.
Population Composition: Ethnic and Socio-cultural attributes (caste and tribes).
Unity in Diversity in India.

Unit III:
Agriculture: Production, Productivity and Yield of major crops.
Major Crop Regions of India.
Agro-climate Zones of India.

Unit IV:
Industrial Development since Independence.
Industrial Region and their characteristics.
Industrial Policy of India.

Suggested Readings:

1. Ahmed, A. India: A General Geography. NCERT, New Delhi.
2. Qaureshi, M. H. India: People and Economy. NCERT, New Delhi.
3. Qaureshi, M. H. India: Physical Environment. NCERT, New Delhi.
4. Hussain, M. (2017) Geography of India. McGraw Hill Education Series.
5. Tiwari, R. C. (2016) Geography of India. Prayag Pustak Bhawan, Allahabad.

Semester-III

M.Sc. Geography
Semester III
19 GEO 301 Oceanography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The course aims to introduce students to the many facets of Oceans, such as, evolution of the oceans, physical and chemical properties of sea water, atmospheric and oceanographic circulation, the fascinating world of marine life and the characteristic of marine environment and the impact of man on the marine environment.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature and Scope of Oceanography
Definition, Nature and Scope of Oceanography; Distribution of Land and Water; Thermohaline Circulation and its association with the global climate, Origin of Ocean Basins.

Unit II: Features of Ocean Basins
Features of Ocean Basins; Continental Margins and Deep Oceanic Basins; Oceanic Floor Profile: Continental self, Slope, Ridge and Deeps, Abyssal Plains; Submarine Canyons; Coral reefs: Types, Origin and Distribution; Configuration of Ocean Floor of Indian, Atlantic and Pacific Ocean.

Unit III: Ocean Currents and Dynamics
Ocean Currents: origin, types and dynamics; Currents of Pacific, Atlantic, and Indian ocean; Impact of ocean currents; Climate change and ocean circulation, Physiochemical properties of sea water: Temperature, Density, Salinity and Dissolved Gases; Ocean movement: Waves, Tides; (Theory of Tides)and currents.

Unit IV: Marine Resources and Environment
Life in the Ocean: Bio zones; Types of Organism- Plankton, Nekton and Benthos; Ocean and livelihood; Oceans as Source of Food, Mineral and Energy Sources; Oceans Deposits; Sea Level Change: Evidences and Impacts; Sustainable marine environment.

Suggested Readings:

1. Davis, Richard J. A. (1986) Oceanography – An Introduction to the Marine Environment. Wm. C. Brown, Lowa.
2. Denny, M. (2008) How the Ocean Works: An Introduction to Oceanography. Princeton University Press, New Jersey.
3. Duxbury, C. A. and Duxbury, B. (1996) An Introduction to the world‘s Oceans. 2nd Edition, C. Brown, Lowa.
4. Garrison, T. (1995) Essentials of Oceanography. Wards worth Pub. Co., London.
5. Garrison, T. (2001) Oceanography-An Introduction to Marine Science. Books/Cole, Pacific Grove, USA.
6. Gross, M. G. (1987) Oceanography: A View of the Earth. Prantice - Hall Inc. New Jersy.

7. Kennel, J. P. (1982) Marine Geology. Prentice Hall, Englewood Cliff, New Jersey.
8. Kerhsaw, S. (2004) Oceanography: An Earth Science Perspective. Routledge, UK.
9. Sharma, R. C. (1985) The Oceans. Rajesh Publications, New Delhi.
10. Shepart, F. (1969) The Earth Beneath the Sea (Rev. ed.).Athneum, New York.
11. Von Arx, W. S. (1962) An Introduction to Physical Oceanography. Addison, Wesley, New York.

M.Sc. Geography
Semester III
19 GEO 302 Urban Geography

Maximum Marks - 100
Theory Examination - 80
Internal Assessment - 20
Max. Time - 3 hrs

Objective: The objectives of the course are to understand the process of urbanization and origin, growth and classification of urban settlements with relevant theories and models. It also aims to relate urbanization process and the evolution of urban system and examine the contemporary urban issues.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Urban Geography: Nature, Scope & Concept
Defining Urban, Urbanization and Urbanism; Urban Geography: Definition, nature and scope origin growth & stages of urban systems; (Conurbation, Megalopolis, etc.) Lewis Mumford & Griffith Taylor. Urban population characteristics, Urban systems in Ancient Civilization, Medieval and Modern India. Trend of Urbanization in World & India.

Unit II: Interaction Between City & Surrounding Regions
City and region; Spatial linkages (rural urban linkages) and interactions; Rural Urban fringe, Suburbanization; Spatial network framework - Central Place Theory: Christaller, Losch, Walter Isard; Size and spacing of cities: Rank Size Rule, Primate City; Functional classification of cities: concepts and scheme of classification.

Unit III: Urban Land Use Models
Urban Morphology and land use; Models of city structure: Concentric Zone model by E.W. Burgess, Sector model by Homer Hoyet, Multiple nuclei model by Harris and Ullman; Contemporary urban morphology in the wake of globalization – global city.

Unit IV: Urban Environment & Planning
Urbanisation in India: Patterns and Trends; Urban problems: Environmental issues, overcrowding, transportation and mobility; Urban Inequality: Urban Poverty, Slums & squatter housing, access to housing and amenities; Urban basic services; Quality of Urban Life; Urban Planning in India: National urban policy, Study of master plans of Delhi and Chandigarh; The Smart & sustainable cities.

Suggested Readings:
1. Michael, P. (2013) Urban Geography: A Global Perspective. Routledge, USA.
2. Cater, H. (1972) The Study of Urban Geography. Edward Arnold, London.
3. Hall, P. (1992) Urban and Regional Planning. Routledge, London.
4. Kundu, A. (1992) Urban Development and Urban Research in India. Khanna Publication, New Delhi.
5. Castells, M. (1977) The Urban Question: A Marxist Approach. MIT Press, Cambridge.
6. Bhattacharya, B. (1979) Urban Development in India. Shree Publishing House, New Delhi.
7. Khan & Moyer. Reading in urban Geography.

8. Johnson, J.H.(1972). Urban Geography: An introductory Analysis. Pergamon.
9. Brian, R. K. (1996) Landscape of Settlement Prehistory to the Present. Routledge, London.
10. Northam, R. M. (1979) Urban Geography. John Wiley, Toronto.
11. Ramachandra, R. (1992) Urbanization and Urban System in India, Oxford, London.
12. Singh, K. and Steinberg, F. (eds). (1998) Urban India in Crisis. New Age Interns.

M.Sc. Geography
Semester III
19 GEO 303 Fluvial Geomorphology

MaximumMarks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The rivers being the major geomorphic agent of erosion, the course assumes significance as it mainly deals with an understanding of the fluvial forms and processes. The evolution of drainage pattern and alluvial channels are governed by the forces resisting and driving the flow of water. The students are introduced to the activities of these two forces and their resultant effects on the flow patterns, sediment load and channel patterns.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Basic Concepts of Fluvial Geomorphology
Basic concept of Fluvial Geomorphology and Geography; hydrological cycle and subcycle; drainage pattern evolution; limits of drainage development; channel changes with time.

Unit II: Fluvial Morphology and River Profile
Fundamentals of river mechanics: types of flow and flow discrimination; forces acting in channels; Low regimes; sediment load of streams. sediment transport; competent velocity; lift force; critical tractive force, Hydraulic geometry of streams at a station and down-stream; channel thalweg; causes of concavity; channel patterns, equilibrium profile - straight, meandering and braided.

Unit III: Process: Basin Morphology
Drainage basin as a fundamental geomorphic unit. Drainage basin - form and process; drainage basin morphometry; morphometric interrelations.

Unit IV: Applied Fluvial Geomorphology
Applied fluvial geomorphology; human adjustment to flood plain, alluvial fans and deltaic environments (case studies). Effects of reservoirs on fluvial systems. Remote sensing and GIS application to fluvial environments.

Suggested Readings

1. Chorley R.J. (ed). (1973) Introduction of Fluvial Processes. Methuen & Co., London.
2. Coates, D.R. and Vitek, J.I. (1980) Thresholds in Geomorphology. George Allen Unwin, London.
3. Gregory, K.J. (1977) River Channel Changes. John Wiley & Sons, New York.
4. Gregory, K.J. and Walling, D. E. (1985) Drainage Basin: Forms and Process- A Geomorphological Approach. John Wiley & Sons, New York.
5. Kingston, D. (1984) Fluvial Forms and Processes. Edward Arnold, London.
6. Leopold, C.B. et.al. (1964) Fluvial Processes in Geomorphology. Freeman, London.
7. Morisawa, M.(ed.). (1981) Fluvial Geomorphology. George Allen & Unwin.
8. Gleick, P. H. (ed.). (1993) Water in Crisis Oxford University Press, New York.

9. Morisawa, M. (1968) Streams - Their Dynamics and Morphology. McGraw Hill, New York.

M.Sc. Geography
Semester III
19 GEO 304 Political Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time - 3 hrs

Objective: This course aims to expose the students to the strategic importance of geographical parameters in the Political Science at global, regional and local level, to sensitize the students to geopolitical dimensions and the understanding of conflicts and regional cooperation and to make them familiar with the international geopolitics.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Concepts and Contribution in Political Geography
Ideas in Political Geography, Geography and its relationship with political economy and political sociology. Theoretical contributions to political geography: Ratzel, Hartshorne, Taylor and Harvey.

Unit II: Political Geography of Ocean
Political Geography of Ocean: Maritime Boundaries, delimitations: principles and problems, international law of the sea. UNCLOS III, Theories of international trade and economic zones and organizations, role of WTO in international geopolitics.

Unit III: Theories and Models of Geopolitics
Geo-strategic views: Mahan, Mackinder, Spikeman, conflict between states and conflict resolutions, supranational organisations and their geographical significance. Political Geography of the world order: Theories of international systems, evolution of contemporary world order, alternate models of development for the future.

Unit IV: Administrative Organization of Space
Administrative organisation of space: Methods of administrative organisation, territory: Electoral Geography: electoral systems, methods of studying electoral geography, geographical influence in voting; public administrations and landscape formation, polity as an agent of landscape change.

Suggested Readings

1. Agnew, J. (ed.) (1997) Political Geography. Arnold, London.
2. Bryant, R. L. and Bailey, S. (1997) Third World Political Ecology. Routledge, London.
3. Blake, G. (ed.) (1987) Maritime Boundaries and Ocean Resources. Croom Helm, London.
4. Dikshit, R. D. (1997) Developments in Political Geography: A Century of Progress. Sage Publications, New Delhi.
5. Dodds, K. (2000)Geopolitics in a Changing World. Prentice Hall, Essex.
6. Elliott, L. (1998) Global Politics of the Environment. Macmillan Press Ltd., London.
7. Gottman, J. (ed.) (1980) Centre and Periphery: Spatial Variations in Politics. Sage, London.

8. O'Tuathail, G. and Simon, D. (1998) Rethinking Geopolitics. Routledge, London.
9. Parker, G. (1998) Geopolitics: Past Present and Future. Printer, London.
10. Taylor, P. J. (2000) Political Geography: World Economy, Nation-State and Locality. Longman, London.
11. Taylor, P.J. and Johnston, R. J. (1979) Geography of Elections.Croom Helm, London.

M.Sc. Geography
Semester III
19 GEO 305 Environmental Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to provide the understanding about the importance of biodiversity to maintain ecological balance and various environmental issues at national and international level.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature and Scope
Scope of Environment Geography, Basic Principles of Environmental Geography: Composition and types of Environment, Ecological Principles, Man – Environment relationship, Restoration of Ecology.

Unit II: Ecosystem
Ecosystem: Concept and components, Trophic levels, Food chains and food webs, Energy flow in the ecosystem, Ecosystem stability, high land – low land interactive system, human ecological adaptation.

Unit III: Concepts of Ecosystem
Concept of ecosystem, Environmental Degradation, Environmental Pollution (Air, Water and Solid Waste), Ganga Pollution & Ganga action Plan, Environmental Problems – Global Warming, Ozone Depletion and Green house effects, transformation of nature by man, global ecological imbalances, wetland ecosystem with reference to Haryana.

Unit IV: Environmental Management and Planning
Environmental Management: Concept and approaches: Ecosystem Management Strategies, Environmental Dimension in Planning – Sustainable Development, Eco- Development, Limits to growth, Environmental Consciousness, National Environmental Policies and Programmes, Environmental Impact assessment, Rio Summit, Kyoto Protocol & Carbon Trading, Paris climate summit and environmental footprints.

Suggested Readings

1. Singh, L.R. et al. (1983) Environmental Management, Allahabad Geographical Society, Allahabad.
2. Arvil, R. (1983) Man and the Environment. Penguin Books.
3. Singh, S. (2015) Environmental Geography.Pravalika Publications, Allahabad.
4. Detwler, T.R.(1971) Man's impact on the Environment. McGraw Hill, New York
5. Adans, W.M. (2001) Green Development: Environment and Sustainability in the Third World. Routledge, London.

M.Sc. Geography
Semester III
19 GEO 306 Aeolian Geomorphology

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: Aeolian environments are particularly sensitive to aridity, bio-mass and human interferences. All these activities affect wind shear in different degrees, set time in motion the processes of erosion and deposition. These processes and their resulting forms are highlighted in the course content. A direction is set for the application of aeolian geomorphic principles for the efficient management of land-based human economic activities through advanced monitoring technique with special reference to India.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Aeolian Processes
Wind environment: introduction; desert wind systems; directional variability and resultant, Drift potential; scope of aeolian geomorphology. Grain in motion: fluid flows –flow types; interaction of the wind and the bed-wind shear; entrainment-lift and drag: Thresholds of movement: static and dynamic; modes of transport saltation, creep, reputation and suspension; transport rates.

Unit II: Aeolian Landforms
Wind erosion and landforms: processes: abrasion, deflation and aerodynamic erosion; landforms; yardangs, ventifacts, pans, stone pavements, deflation hollows, desert varnish: processes and significance. Dusts-sources; -contemporary and proximal, mineral composition; dust-generating and dust yielding systems, gross spatial patterns of production and removal; deposition; loess, types, palaeo-environmental significance.

Unit III: Depositional Processes and Palaeo Environment
Forms of wind deposition: sand ripples, obstacle dunes; dune- classification schemes; morphodynamics of the crescentic, longitudinal and complex dunes. Palaeo—environments: Introduction; sediment movement in the past; relic and active dunes; dating aeolion deposits; pre-leistocene sand dunes; Pleistocene and Holocene dunes; Aeolinites - composition and distribution.

Unit IV: Applied Aeolian Geomorphology
Applied Aeolian Geomorphology: Introduction; wind erosion on agricultural fields; controls of dust; Management of coastal dunes and dunes in semi -arid areas; desertification and its controls with special reference to India. Remote sensing and GIS applications in aeolian settings.

Suggested Readings:
1. Abrahams, A.D. and Parsons, A. J. (eds.). 1994. Geomorphology of Desert Environments. Chapman & Hall, London.

2. Goudie,A. and Hegde. 1980. Palaeo-geography and Pre-history of Indian Desert. AcademicPress, London.
3. Baumont, P. 1993. Drylands-Environment, Management and Development. Routledge, New York.
4. Bagnold, R.A. 1941. The Physics of Blown Sand and Desert Dunes. Methuen, London.
5. Cook, R. U.,Waren, A. and Goudie, A. 1993. Desert Geomorphology. London, UCL Press, London.
6. Embleton, C. and Thornes, J. (eds.). 1980. Process in Geomorphology. Arnold - Heinemann, New Delhi.
7. Greeley, R. and Iversen, J. D. 1985. Wind as a Geological Process. Cambridge University Press, Cambridge.
8. Lancaster, N. 1995. Geomorphology of Desert Dunes. Routledge, New York.

M.Sc. Geography
Semester III
19 GEO 307 Social Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to familiarize the students with the understanding of the society through concepts and social theories, philosophical approaches and spatial processes, social distortion and various components of social well- being in India.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature and Scope of Social Geography
Nature and Scope of Social Geography; Developments in the field of social geography; Concepts in social geography: social differentiation, region formation, social evolution, social change & transformation, social space, social and spatial justice, ethnicity, social wellbeing.

Unit II: Elements of Socio-cultural Regionalism
Socio-cultural formation of society in India; Geography and caste: regional/spatial framework of dominant caste and land inequality, social and spatial segregation/exclusion, regional/cultural forms of untouchability in India- continuity and change; tribes and geographical isolation, tribe as a social formation: scheduled tribes and scheduled areas; regional studies of the major and minor tribes in India.

Unit III: Linguistic Dimensions
Language and dialect, language families, India as a linguistic area, linguistic diversity in India, Greenberg's linguistic diversity index, Mother tongue, Bi-lingualism, multi-lingualism, language shifts and retention, linguistic regionalism and minority languages; space and religion: religious diversity in India, religious minorities, communalism and space.

Unit IV: Social Transformation
Social Change and transformation in India: Modernization, role of rural urban interaction, problems of social transformation, social wellbeing- overview of concept; social and ethnic diversity of India and national integration: cultural pluralism and development.

Suggested Readings:

1. Ahmad, A. (1999) Social Geography. Rawat Publication, New Delhi.
2. Ahmad, A. (1993) (ed). Social Structure and Regional Development: A Social Geography Perspective.Rawat Publications, Jaipur.
3. Dreze, J. And Sen, A. (1996) Economic Development and Social Opportunity. Oxford University Press, New Delhi.
4. Dubey, S. C. (1991) Indian Society. National Book Trust, New Delhi.
5. Pain, R., Barke, M., Fuller, D., Gough, J., MacFarlane, R., and Mowl, G. (2001) Introducing SocialGeographies. Arnold Publishers, London.
6. Registrar General of India. (1972) Economic and Socio Cultural Dimensions ofRegionalization of India. Census Centenary Monograph No 7, New Delhi.

7. Schwartzberg, J. (1978) A Historical Atlas of South Asia. University of Chicago Press, Chicago.
8. Sen, A. And Dreze, J.(1996) Indian Development: Selected Regional Perspectives. Oxford University Press.
9. Smith, D. (1977) Geography: A Welfare Approach. Edward Arnold, London.
10. Sopher, D. (1980) An Exploration of India. Cornell University Press.

M.Sc. Geography
Semester III
19 GEO 308 Geography & Disaster Management

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This basic aim of this course is to provide the theoretical understanding of various disasters, their origin, management and mitigation. Along with this course will also provide understanding for vulnerability and developing community resilience.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Geographical Setup of India and Regional Hazard Risks
Regional physiography, geology, soils, drainage, climate, land use and land cover of India, and natural hazards risk prone areas. Hazard risk, vulnerability and disaster: concepts and relationships; measuring hazard risks, vulnerability and disasters.

Unit II: Disaster Extremes in India & Their Impact
Regional extreme events in India: earthquakes, floods, drought, cyclone, tsunami, landslides, avalanches, snow, rain, and wind storms. Disaster magnitude and impacts: case study/ examples from recent disasters.

Unit III: Regional Patterns of Disaster & Vulnerability in India
Earthquake disaster vulnerability assessment (case study of metropolitan and other major cities). Flood disaster zonation and vulnerability assessment (case study of Brahmaputra and Ganga river systems). Landslides and avalanches disaster zonation and mapping (case study of Himalayas and north east region). Drought disasters zonation and mapping. Multi hazard risk assessment.

Unit IV: Disaster Management and Response System
Understanding manmade disasters, fires and forest fires; nuclear, biological and chemical disaster, road accident and building collapses. Regional capacity, preparedness and response; governance and institutions for disaster management; awareness among people, capacity building, state disaster management plan.

Suggested Readings:

1. Contemporary natural and manmade disaster (2004) Master of disaster mitigation. World institution building programme centre.
2. Disaster management in India- a status report (2004) National disaster management division, ministry of home affairs, Govt of India.
3. Sharma, Vinod K. (1994) Disaster management, NCDM, IIPA, New Delhi.
4. National disaster response plan, (2001) NCDM, New Delhi.
5. Mathur, G C. (1986) Housing in disaster prone areas, national building organization and UN regional centre, ESCAP, New Delhi.
6. Dave, R K. (2018) Disaster management in India: Challenges and strategies.

7. Bell, F G. (1999) Geological hazards: their assessment, avoidance and mitigation. Routledge, London.

M.Sc. Geography
Semester III
19 GEO 309 Fundamentals of Remote Sensing (Theory)

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The aim of this course is to:

1. Disseminate basic concepts and applications of Electromagnetic Spectrum in Remote Sensing, Energy Balance and Data acquisition platforms, sensors and their characteristics.
2. Enhance student's knowledge about optical, thermal and microwaves based Remote Sensing and Applications for solving real life problems.
3. Introduce students to digital image processing tools and techniques.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Remote Sensing
Remote Sensing: History, Development, Definition, Concept & Principles, Electromagnetic Radiation (EMR) and Its Characteristics, Wavelength Regions and their Significance, Interaction of EMR with Atmosphere and Earth's Surface: Absorption, Reflectance and Scattering, Atmospheric Windows, Energy Balance Equation.

Unit II: Imaging and Non-Imaging
Imaging and Non-Imaging, Active and Passive, Multispectral, Superspectral and Hyperspectral Sensors, Electro-Optical Systems, Opto-Mechanical Scanners, Infrared Scanners, Scatterometer, Thermal Properties of Terrain, Thermal IR Environmental Considerations, Thermal Infrared and Thermal Scanners, Microwave Remote sensing concepts: Backscattering, Range Direction, Azimuth Direction, Incident Angle, Depression Angle, Polarization, Dielectric Properties, Surface Roughness and Interpretation, Speckle and Its Reduction, Applications of optical, thermal and microwave remote sensing.

Unit III: Concepts about Digital Image
Concepts about digital image and its characteristics, Sources of image degradation - Image restoration and Noise Abatement , Radiometric and Geometric correction technique, linear and non linear transformation for geometric corrections, Look-up Tables (LUT) and Types of image displays and FCC, Radiometric enhancement techniques, Spatial enhancement techniques, Contrast stretching: Linear and non-linear methods, Low Pass Filtering: Image smoothing, High Pass Filtering: Edge enhancement and Edge detection, Gradient filters, Directional and non-directional filtering.

Unit IV: Concept of Pattern Recognition
Concept of Pattern Recognition, Multi-spectral pattern recognition, Spectral discrimination, Signature bank, Parametric and Non-Parametric classifiers, Unsupervised classification methods, Supervised classification techniques, Limitations of standard classifiers.

Suggested Readings:

1. Avery, T.E. and Berlin, G. L.(1992) Fundamentals of Remote Sensing and Air Photo Interpretation. 514 Ed, Macmillan, New York, USA.
2. Aggarwal, C.S. And Garg, P. K. (2000) Remote Sensing. A.H. Wheeler & Co. Ltd, New Delhi.
3. Campbell, J. B. (2002) Introduction to Remote Sensing. 3rd ed., Taylor & Francis, New York, USA.
4. Jensen, J.R. (1996). Introductory Digital Image Processing A remote sensing perspective. Prentice Hall Seies in GIS , USA
5. Jensen, J.R. (2006). "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi.
6. Joseph, George and Jeganathan, C. (2017). "Fundamentals of Remote Sensing", 3rd Edition, Universities press (India) Pvt. Ltd., Hyderabad.
7. Kumar, M. (2000) Text book on Remote Sensing. NCERT, New Delhi.
8. Lillesand, Thomas M. and Kiefer, Ralph, W. (2007). "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York
9. Sabins, F. (1982) Remote Sensing Principles and Application. Freemass and Compare, New York, USA.
10. Vyas, P. R. (2015) RS and GIS Basic and Application. Rawat Publication.

M.Sc. Geography
Semester III
19 GEO 310 Lab work on Aerial Photographs & Satellite Images (Practical)

Maximum Marks - 100
Lab. Exercises - 45 marks (15x3)
Practical Record book - 20 marks
Viva Voce -15 marks
Internal Assessment - 20 marks
Maximum Time – 4 hrs

Objective: This course aims to make the student learn practical aspects related to:

1. Usage of diverse remote sensing data for extracting needed geo-spatial information.
2. Execution of various analogue and digital information extraction techniques, both manually and using computers.

Note: The examiner shall set four questions, two from each unit. The candidate shall attempt three questions in all, selecting at least one question/exercise from each unit.

LAB EXERCISES

- Understanding Remote Sensing Data and Visual Interpretation
- Import / Export of Satellite Data, Display, Analysis, and Digital interpretation of earth surface features in Standard FCC
- Radiometric and atmospheric corrections
- Geo-referencing and Geo-coding
- Field Spectra Collection: vegetation, bare soil, and concrete using Spectro Radiometer
- Analysis of satellite derived spectral response and field spectra
- Study of the various contrast enhancement techniques
- Spectral Enhancement (Ratio images and PCA) Techniques
- Spatial Enhancement: Low Pass Filtering & High Pass Filtering Techniques
- Unsupervised Classification
- Supervised Classification & Accuracy Evaluation
- Advance Classification

M.Sc. Geography
Semester III
19 GEO 311 Remote Sensing Project Report (Practical)

Maximum Marks: 100
Project Report: 50 marks
Viva-Voce: 30 marks
Internal Assessment: 20 marks

Objective: This course aims to familiarize and enhance the student's knowledge about the Remote Sensing and GIS techniques along with their application value in the Earth observation. And enable them to write the project report based on application of remote sensing.

Note: Student has to submit a Remote Sensing Project Report individually on the approved topic by the department from the following themes. Report should be of minimum 50 pages as per the Performa decided by the department.

Themes for the Remote Sensing Project Report:

- Land Use Land Cover (LULC)
- Agriculture, Crop Combination & Pattern
- Transport Network Analysis at micro-level
- Urban Land use, Land Cover and Planning
- Deforestation and Land degradation
- Land degradation and desertification
- Water Management
- Hotspot Analysis
- Planning for smart cities
- Micro climate of Urban areas
- Infrastructure development and planning
- Mining and environmental degradation
- Snow cover and glacial mapping
- Hydrological and Runoff Modelling

Outline for Project Report:

Student has to submit a report based on the analysis of remotely sensed data and field observations as mentioned:

- Statement of the problem
- Research Objectives
- Database
- Research Methodology
- Analysis of Data
- Discussion and Research Findings
- References
- Annexure and Additional Data

Semester III
19 GEO 312 Basic of Climatology (Open Elective Course)

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The overall objective of the course is to foster comprehensive understanding of atmospheric phenomena; dynamics and global climates.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I:
Definition of weather and climate; Climatology and Meteorology; Origin, composition and structure of atmosphere; Solar radiation, greenhouse effect, heat budget and temperature distribution.

Unit II:
Atmospheric pressure and its distribution pattern; Theories of general circulation and planetary winds; Walker circulation- ENSO and La Nina, origin of monsoons and jet streams.

Unit III:
Atmospheric Moisture: humidity, evaporation, condensation; precipitation formation theories and types of precipitation, acid rain; Stability and instability of atmosphere, air masses and fronts;

Unit IV:
Weather systems: Origin and characteristics of extra tropical and tropical cyclones; Climatic change: pattern, evidences and theories of climate change; Global warming and its impacts on earth systems.

Suggested Readings:

1. Trewartha, G. T. (1980) An Introduction to Climate. McGraw Hill Company, New York.
2. Chritehfield, H. J. (1987) General Climatology. Printice Hall of India, New Delhi.
3. Barry, R. G. and Chorley, R. J. (2010).Atmosphere, Weather and Climate. Marthren.
4. Lal, D. S. (1966) Climatology. Chetanya Publishing House, Allahabad.
5. Das, P. K. (1984) The Monsoons. National Book Trust, New Delhi.
6. Ramasastry, A. A. (2014) Weather and Weather Forecasting. Publication Division, New Delhi.
7. Athrens, C. D. (1994) Meteorology Today: An Introduction to Weather, Climate and Environment. West Publishing Co.

Semester-IV

M.Sc. Geography
Semester IV
19 GEO 401 Regional Developments and Planning

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The basic aim of this course is to provide the theoretical foundations and conceptual framework for the regional development process. It also sensitizes the students about the changes taking place in regional structure of Indian economy, about the concept of region in Geography and the regional development and planning process in India.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Concepts of Regional Development
Concept of regional development, concept of region, classification of region and method of region delineation, types of planning region; concept of regional planning and development.

Unit II: Developmental Models and Theories
Development Theories: Trickle-down Theory (Hirschman), Growth Pole Model (Parroux), Cumulative causation model (Myrdal), Core-Periphery Theory (Friedman); Recent Divergence and convergence theories: Kuznets curve, Dependency theory, bio-regionalism, Eco-feminism, Deep ecology, sustainable development.

Unit III: Planning Region
Planning Region: Characteristics and need; Planning Process- Sectoral, Temporal and Spatial dimensions; Short-term and Long-term Perspective of Planning; Planning for a Region's development and Multi-regional planning in National Context; sectoral-spatial development with special reference to agricultural and industrial development in India; decentralization and development; State, civil society and market in the Neo-liberal economic framework; Globalization.

Unit IV: Regional Planning: Policy and Strategies
Regional Planning in India: Regional Imbalances/Disparities- Causes and Consequences; Measurements of Regional Disparities; Planning Policies for Regional Development; National Capital Region, study of regional development planning and programmes: Backward area development, Tribal area development, Hilly area development, Arid/Desert area development, flood and drought prone areas development and coastal area development.

Suggested Readings:
1. Bhatt, L. S. (1972) Regional Planning in India. Statistical Publishing Society, Calcutta.
2. Bhatt, L. S. et al. (1982) Regional Inequalities in India. Society for the study Regional Disparities, New Delhi.
3. Blunder, J. et al. (1973) Regional Analysis and Development. Harper & Row, London.
4. Chand, M. and Puri, V. K. (1985) Regional Planning in India. Allied Pub. Pvt. Ltd., New Delhi.

5. Coates, B. R. and Johnston R. J. (1977) Geography and Inequality. Oxford University Press, Oxford.
6. Friedmann, J. and William, A. (1967) Regional Development and Planning: A Reader. MIT Press, Cambridge Massachesetts.
7. Kuklinski, A. R. (ed). (1972) Growth Poles and Growth Centres in Regional Planning. Monton, The Hague.
8. Misra, R. P. et al. (eds.). (1974) Regional Development Planning in India. Vikas Publication, New Delhi.
9. Raza, M. (1988) Regional Development. Heritage Publication, New Delhi.
10. Sundram, K. V. (1977) Urban and Regional Planning in India. Vikas Publishing House Pvt Ltd, New Delhi.

M.Sc. Geography
Semester IV
19 GEO 402 Geography of Haryana

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The basic aim of this course is to introduce the students with the glorious past of the state of Haryana, its Physiography, Climate, People, Society, resource base and Economic structure.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Haryana: An Introduction
Haryana: Physiography: Relief characteristics and physiographical divisions, Drainage systems and their significance, Chronology and Palaeo Channel of Sarasvati River and its association with Vedic Civilisation, Climatic regions of state, Soil and vegetation, forest regions , characteristics and conservation.

Unit II: People and Society
History of the State, Vedic Civilisation, Geography of Vedas & Puranas Growth of Population, distribution of Demographic attributes: sex-ratio, literacy rate and work force participation. Population problems and policies, Human Resources: Potential and Prospects, Contemporary issues related to gender Ratio and women empowerment.

Unit III: Agriculture
Agriculture: Agro-climatic Region, Traditional agriculture system, Cropping Pattern, Green Revolution and Agricultural development in Haryana and problems related to agriculture. Irrigation: Types of irrigation, Major irrigation projects: Bhakra Nangal, Agriculture Potential and Management, Prospects and Potential of Agro-processing Industries, Storage and Marketing of Agriculture Products, Contemporary issues related to agriculture and farmer sustainability.

Unit IV: Resource and Economy
Trend and Pattern of Urbanisation, Contemporary Issues and Challenges in Urban Areas, Distribution of Natural and Human Resources, Transport System and Growth, Manufacturing and Service hubs, knowledge economy Any Case Study of Automobile and Information and Technology Hub

Suggested Readings:
1. Buddha Prakash.,(1962). “Haryana through the Ages”, Kurukshetra University, Kurukshetra.
2. Das Gupta, K.K. “Tribal History of Ancient India”.
3. Goyal J.B..,(1966) etd. “Haryana- Puratattna, Itihas, Sanskriti, Sahitya evom Lokwarta , Delhi.

4. Phadke. H.A.(1990) " Haryana: Ancient and Medieval, Harman Publication House, New Delhi.
5. Phogat, S.R.(1978) "Inscriptions of Haryana, Kurukshetra University Kurukshetra".
6. Singh, Fauja (ed.) (1997-2000) "History of the Punjab, Vol. I-III, Publication Bureau, Punjab University, Patiala.
7. Yadav.K.C.(1994) (2nd Ed.) "Modern Haryana: History & Culture, Part 1&2 Manohar Publisher, New Delhi.
8. Valdiya. K.S. (2002) "Sarasvati the River that Disappeared" Universities Press (India) Limited, Hyderabad.
9. Kumar. Vinay "An Archaeological History of Haryana. Kaveri Books.
10. District Census Handbook of Haryana (2011).
11. Haryana Sarasvati Heritage Development Board (http://merisarasvati.com) (www.hshdb.in)
12. Economic &Statistical Handbook of Govt. of Haryana (http://esaharyana.gov.in)
13. Ali. S.M. (1983) (3rd Ed.) Geography of the Puranas, People's publishing house pvt. Ltd. New Delhi.

M.Sc. Geography
Semester IV
19 GEO 403 Cultural Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to understand diversity of cultures in the world as well as in India, to comprehend the diffusion of various ethnic traits and religions and to understand the relationship between cultures and pattern of living and economic development.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Nature and Scope of Cultural Geography
Introduction: Nature and scope of cultural geography; Definition, cultural element and components of culture; convergence and divergence processes; cultural changes: perception, behaviouralism and cultural relativism.

Unit II: Cultural Diversity
Cultural Diversity: Bases of cultural diversity-race, religion and language. Cultural diversity in the world, cultural diversity and regionalization in India. Geography of ethnic groups and tribal groups. Religion and its diffusion; diffusion of ethnic traits in world as well as in India; ethnic landscape and economy of the area; Diffusion in folk geography; cultural landscape and cultural ecology in folk Geography; Religion: origin, diffusion and spatial distribution.

Unit III: Patterns of Livelihood
Patterns of livelihood: various economic activities & cultural adaptations; agriculture, industrialization and modernization; technological changes and their geographical implications.

Unit IV: Human Settlements Pattern
Human settlements: Relation to ideology, social structure and technology, social structure and technology, pattern of rural & urban society, social processes in the city, the city in the developing countries.

Suggested Readings

1. Broek, J. C. and Webb, J. W. (1978) A Geography of Mankind. McGraw Hill, New York.
2. Crang, M. (1998) Cultural Geography. Routledge publications, London.
3. Hazra (ed.).(1997) Dimensions in Human Geography. Rawat Publication, Jaipur.
4. Hutchinson and Smith, D. (1996) Ethnicity. Oxford University press, Oxford.
5. Jordon and Lester, G. (1979) The Human Mosaic. Harpar & Row, New York.
6. Massey, D. and Jess, P. (1995) A Place in the World: Places, Cultures and Globalization. Oxford University, New York.
7. Massey et.al (ed). (1999) Human Geography Today. Polity Press, Cambridge.
8. Steve, P. And Michael, K. (ed) (1993) Places and the Politics of Identify. Routledge, London.

M.Sc. Geography
Semester IV
19 GEO 404 Biogeography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to introduce the students the concept of Biogeography and its, interpretation. Information and their application; interaction between living organisms with climate and physical environment, with special reference to India.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Students will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Significance of Biogeography
Nature, scope and significance of biogeography, Basic ecological principles: Bio-energy cycles in territorial ecosystem (Carbon and Nitrogen), energy flow, trophic levels and food web, Origin of fauna and flora.

Unit II: Biomes of the World
Major biomes of the world: forests, grasslands and deserts, Distribution of plant life on the earth and its relation to soil, climate and human activities, Geographical distribution of animals on the earth and its relation to vegetation types, climate and human activities.

Unit III: Communities and Ecosystems
Communities: Nature of communities and ecosystems: bio-diversities; human induced community change; habitat decay and conservation of biotic resources, Ecosystem services and its significance.

Unit IV: Environmental Hazards and Ecological Consequences
Environmental hazards, Ecological consequences, human perception and adjustment with respect to flood, drought and earthquake, Bio-Reserves of India, National forest and wild life policy of India.

Suggested Readings:

1. Agarwal, D. P. (1992) Man and Environment in India through Ages. Book & Books.
2. Bradshaw, M. J. (1979) Earth and Living Plant. ELBS, London.
3. Cox, C. D. and Moore, P. D. (2016) Biogeography: An Ecological and Evolutionary Approach. 5thedn. Blackwell.
4. Gaur, R. (1987) Environment and Ecology of Early Man in Northern India. R. B. Publication Corporation.
5. Hoyt, J. B. (1992) Man and the Earth. Prentice Hall, U.S.A.
6. Huggett, R. J. (1998) Fundamentals of Biogeography. Routeldge, U.S.A.
7. Lllies, J. (1974) Introduction of Zoogeography. McMillan, London.
8. Khushoo, T. N. and Sharma, M. (eds.). (1991) Indian Geosphere – Biosphere. Har-Anand Publication, Delhi.
9. Lapedes, D. N. (ed.). (1974) Encyclopaedia of Environmental Science. McGraw Hill.
10. Mathur, H. S. (1998) Essentials of Biogeography. Anuj Printers, Jaipur.

M.Sc. Geography
Semester IV
19 GEO 405 Geography of Health

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to provide the understanding about the perspectives on health, its relation with development and global environmental change.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Perspectives on Health
Perspectives on Health: Definitions; linking environment, development and health; driving forces in health and environmental trends- population dynamics, urbanization, poverty and inequality, science and technology and life styles. Pressure on Environmental Quality and Health: Human activities and environmental pressure- land use and agricultural development; industrialization; transport and energy.

Unit II: Exposure and Health Risks
Exposure and Health Risks: Air pollution; household wastes; water; housing; workplace; global environment change; multiple challenges for health protection. Health and Disease in Environmental Context with special reference to India: Estimating the burden of disease-acute respiratory infections, diarrhoeal diseases , tropical vector-born and newly emerging diseases, injuries and poisoning; mental health conditions, cardiovascular diseases and cancer.

Unit III: Climate Change and Human Health
Climate Change and Human Health: Changes in climate system - heat, cold and air pollution; extreme weather events; sea level fluctuation; ozone depletion; effects on biological disease agents; food production and nutrition.

Unit IV: Linkage Methods for Environment, Development and Health Analysis
Linkage Methods for Environment, Development and Health Analysis: Approaches to linkage analysis; health and environmental analysis for decision making; development of environmental health indicators; assessment of health effects. Promotion of environmentally sound healthy settings in India: Districts; cities, neighborhoods, institutions, markets.

Suggested Readings:
1. Akhtar Rais (Ed.), (1990) Environment and Health Themes in Medical Geography, Ashish Publishing House, New Delhi.
2. Avon Joan L. and Jonathan A Patzed.(2001) Ecosystem Changes and Public Health, Baltimin, John Hopling Unit Press(ed).
3. Bradley,D.,(1977) Water, Wastes and Health in Hot Climates, John Wiley Chichesten.
4. Christaler George and Hristopoles Dionissios, (1998) Spatio Temporal Environment Health Modelling , Boston Kluwer Academic Press.
5. Cliff, A.D. and Peter, H., (1988) Atlas of Disease Distributions, Blackwell Publishers, Oxford.

6. Gatrell, A., and Loytonen, (1998): GIS and Health, Taylor and Francis Ltd, London.
7. Ellliot P.J., et al (ed.), (1992): Geographical and Environmental Epidemeology Methods for Small Area Studies, Oxford University Press.
8. Hardham T. and Tannav M., (eds) Urban Health in Developing Countries; Progress, Projects, Earthgoan, London.
9. Herman Koreri and Michael Biseri: Environmental Health: Lewis Publishers, New York.
10. Kay, Brian H.,(ed), (1999) Water Resource Health , Environment and Development, E& FN Spon
11. Murray C. and A. Lopez, (1996): The Global Burden of Disease, Harvard University Press.
12. Moeller Dade wed., (1993) Environmental Health, Cambridge, Harward Univ. Press.
13. Phillips, D. and Verhasselt, Y., (1994) Health and Development, Routledge, London.
14. Price - Smith, Andrew T., (2000) The Health of Nations, The MIT Press, Cambridge.
15. Stephen T. Holgate (ed.) (1999) Air Pollution and Health, Academic Press, London.
16. Tromp, S., (1980) Biometeorology: The Impact of Weather and Climate on Humans and their Environment, Heydon and Son.

M.Sc. Geography
Semester IV
19 Geo 406 Glacial and Periglacial Geomorphology

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to provide in-depth understanding about glaciations and related morphological processes on the earth surface.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Ice Ages and World Glaciations
Ice Ages and World Glaciations: Causes of Ice Ages-Pleistocene Glaciation: onset and retreat, direct and indirect effects of Pleistocene Glaciation-glacier regimes: definition, mass balance and response to climatic changes-glacier ice: physical and thermal properties, glacier flow and internal deformation.

Unit II: Erosional Process
Erosional Process: glacial erosion: ice and melt water-mechanical and chemical processes of erosion; development of erosional landforms-morphodynamics of the features of erosion at or inside glacier margins-glacial thermofrost; superglacial, englacial, and basal.

Unit III: Depositional Process
Depositional Process: Processes-stratified and non-stratified; drifts-morphodynamics of moraines: forms of moraines-glaciofluvial and glacio-lacustrine environment; Pleistocene glaciation in South Asia-Hazards in glacial environment: glacial surges and glacier dam bursts.

Unit IV: Periglacial Processes: Frozen Ground Phenomenon
Periglacial Processes: frozen ground phenomenon: identification, depth variations, thermal properties, classification and distribution-ground ice: types and morphodynamics of periglacial processes: mechanism of frost action, mass wasting, nivation. Periglacial landforms; frost actions and landforms-mass wasting and landforms adaptation of human beings to periglacial environment.

Suggested Readings

1. Brown, R. J. E. (1970) Permafrost in Canada. University of Toronto Press, Toronto.
2. Carson, M. A. and M. J. Kirkby. (1972) Hillslope Form and Process. Cambridge University Press.
3. Coates, D. R. (ed.). (1974) Glacial Geomorphology. State University of New York, New York.
4. Dixon, J. C. and Abrahams, A. D. (eds.). (1992) Periglacial Geomorphology. John Wiley, New York.
5. Drewry, D. (1986) Glacial Geological Processes. Edward Arnold, London.
6. Embleton, C. and King, C. A. M. (1968) Glacial and Periglacial Geomorphology. Edward Arnold, London.

7. Embleton, C. and Thormes, J. (eds.). (1980) Process in Geomorphology. Arnold Hesnemann, New Delhi.
8. Hails, J. R. (ed.). (1977) Applied Geomorphology. Elsevier Sci. Amsterdam.
9. Pewe, T. L.(ed.). (1969) The Periglacial Environment. Mc. Gill- Queen's University Press, Montreal.
10. Peterson, W. S .B. (1969) The Physics of Glaciers. Pergamon Press, Oxford.
11. Price, L.W. (1972) The Periglacial Environment, Permafrost and Man. Commission on College Geography, Resource Paper No. 14, Washington, D.C.

M.Sc. Geography
Semester IV
19 GEO 407 Settlement Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to provide the understanding about historical development, patterns, types of settlement system in India and world.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Evolution, Size and Growth
Evolution, size and growth of human settlements: Theories of evolution of settlements; size, distribution, spatial and temporal trends in size and growth of settlements. Distribution Pattern: Spatial distribution pattern of settlements: Theoretical models and empirical findings.

Unit II: Settlement Structure
Settlement Structure: Physical (characteristics of internal structure and external form, theories explaining internal morphological structure of cities; empirical and theoretical models explaining the functional classification of towns & villages; functional classification of urban centres, functional typology of villages, functions and scope, functional structure of towns in India. Land use (principles and theories of land use in urban and rural setting: house types and building materials, environmental, socio-economic/cultural factors influencing the dynamics of settlement structure.

Unit III: Settlement Hierarchy
Settlement Hierarchy: theories of Christaller and Losch and their application to settlement hierarchy, factors contributing to hierarchy, Central Place theory: measurement of centrality and hierarchy. Hierarchy of settlements in India – an empirical exercise. Issues, perspectives and policies on Population and Human Settlements. Interface between human settlements and environment.

Unit IV: Issues, Perspectives & Policies on Population
Issues, perspectives and policies on Population and Human Settlements. Interface between human settlements and environment.

Suggested Readings

1. Ambrose, P. (1970) Concepts in Geography Vol.-I Settlement Pattern, Longman.
2. Baskin, C. (Translator). (1966) Central Places in Southern Germany. Prentice-Hall Inc. Englewood Cliffs New Jersey.(1933) Originally written by C.W. Christaller in German with title Die Zentralen Orte Suddeutsch land in.
3. Census of India, (1961) House types and Settlement Patterns of Villages in India, GOI, New Delhi.
4. Haggett, P., Andrew, D. C. and Frey, A. (ed.) (1979) Locational Models. Arnold Heinemann.
5. King, Leslie, J., (1986) Central Place Theory. Sage Publications, New Delhi.

6. Mayer, M. Harold and Clyde F. Kohn (eds.). (1967) Readings in Urban Geography. Central Book Depot, Allahabad.
7. Mitra, A., Mukherjee, S. and Bose, R. (1980) Indian Cities. Abhinav Publications, New Delhi.
8. Nangia, S. (1976) Delhi Metropolitan Region. K. B. Publications, New Delhi.
9. Rao, P. V.L.S. (1983) Urbanisation in India: Spatial Dimensions. Concept Publishing Co., New Delhi.
10. Ramachandran, R. (1992) Urbanisation and Urban Systems in India. Oxford University Press, New Delhi.
11. Singh R. L. and Singh, K. N. (eds.). (1975) Readings in Rural Settlement Geography. National Geographical Society of India, Varanasi.
12. Srinivasan, K. and M. Vlassoff, (eds.). (2001) Population Development Nexus in India: Challenges for the New Millennium. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
13. Ucko, M. J., Tringham, R. and Dimbleby, G. W. (eds.). (1972) Man, Settlement and Urbanism. Duckworth.

M.Sc. Geography
Semester IV
19 GEO 408 Transport Geography

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: The basic aim of this course is to provide basic understanding about the development of Transport Network and its spatial linkages and Network Analysis.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: Spatial Interaction & Transport

Transport for spatial interaction: Spatial interaction and time-space convergence, enlarging the catmint area of markets, dynamic relationship between transport and spatial readjustment--- Role of transport as a lead sector.

Unit II: Network Analysis

Problem of accessibility: The transport network; Network shape and location; Regional variations in its density; Methods of measurement, transport and spatial processes; Traffic flow and regional interaction.

Unit III: Network Efficiency

Graph theory and Network Geometry; Concept of topology, topological measurement of network efficiency. Urban Transport: Profile of urban transport facilities; Traffic in towns; Transport services and urban land use pattern, role of intermediary transport modes; modal split.

Unit IV: Transport Planning

Regional Transport Planning: The framework of regional transport Planning traffic generation; methods of forecasting; zonal interchange of traffic; mode and route assignment methods. Indian Transport: Transport development during colonial and plan periods; transport and regional structure of Indian Economy.

Suggested Readings

1. Ashton, W.D., (1966): The Theory of Traffic Flow, Methuen, London
2. Berry, B.J.L et al.(1966): Essays on Commodity Flow and Spatial Structure of Indian Economy, Department of Geography, Chicago.
3. Berry, B.L.J. and Marble, D.F. (eds.) (1971): Spatial Analysis: A Reader In Statistical Geography, Prentice Hall.
4. Brooks, P.W., (1994): The Development of Air Transport Hurst, M.E. (ed.) Transportation geography: Comments and Reading, Mc Graw Hill, 256-273
5. Cooley, C.H. (1994): The Theory of Transportation, in Hurst, M.E. (ed.) Transportation geography: Comments and Reading, Mc Graw Hill, 15-29.

6. Fleming, D.K. and Hayuth, Y. (1994): Spatial Characteristics of Transportation Hubs: Centrality and Intermediacy, Journal of Transport Geography, 2 (1), 3-18.
7. Gautam, P.S. (1992) Transport Geography of India: A Study of Chambal Division, M.P., Mittal Publications, New Delhi
8. Haggett, P. (1965) Locational Analysis in Human Geography, London.
9. Haggett, P. and Chorley, R.J. (1969) Networks in Geography, London.
10. Kansky, K.J., (1963): Structure of Transportation Networks: Relationships between Network Geometry and Regional Characteristics, University of Chicago, Department of Geography, Research Paper, Chicago, 84.
11. Nagar, V.D. and Gautam S. (1964): Principles and Problems of Indian Transport, Kailash Pustak Sadan, Gwalior.
12. Owen, W. (1968): Distance and Development: Transport and Communications in India, Washington.
13. Raza, M. and Aggarwal, Y., (1986) Transport Geography of India, Concept Publishing Company, New Delhi.
14. Taaffe, E.J.et al.(1963) Transport Expansion in Underdeveloped Countries: A Comparative Analysis, Geographical Review, 53:503-29.
15. White, H. P. and Senior, M.L. (1983) Transportation Geography, Longman Inc. New York.

M.Sc. Geography
Semester IV
19 GEO 409 Principles of GIS and Navigation System (Theory)

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Objective: This course aims to familiarize and enhance the student's knowledge about the Remote Sensing and GIS techniques along with their application value in the Earth observation.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I: GIS Basic
GIS: Definition and Applications; Components and Elements of GIS; Development of GIS technology; Geographic objects: point, line and area; analog and digital maps; theoretical models and framework for GIS, representation of geographic data-base; coordinate systems and map projections.

Unit II: Data Input
Data Input, Storage and Editing: Nature of geographic data: Spatial and Attribute Data, Concept of vector and raster based models; data input devices: Digitization; external data bases; storage and manipulation of GIS data bases.

Unit III: Spatial Analysis
GIS and Spatial Analysis: Neighbourhood analysis; Proximity analysis and buffers; Overlays Analysis – raster and vector based overlay and their applications; Presentation of GIS output.

Unit IV: GNSS
Different GNSS Systems in Operation; How a GNSS system works; Sources of error in a GNSS system, Introduction to GIS: Concepts of Projection, datum and spheroid, mean sea level, orthometric height, Geoid models; Formats of storing GIS Data, Geographical Mapping with hand-held GPS, data downloading and visualization, import GPS data in Google Earth.

Suggested Readings:

1. Gupta, R. P. (2003) Remote Sensing Geology. Springer-Verlag.
2. Curran, Paul J. (1985) Principles of Remote Sensing. Longman, London & New York.
3. Jensen, J. R. (2004) Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education.
4. Joseph, G. (2003) Fundamentals of Remote Sensing. University Press, Hyderabad.
5. Lillesand, T. and Kiefer, R. (1999) Remote Sensing and Image Interpretation. Wiley, London.
6. Singh, R. B. (ed.), (1991) Environmental Monitoring: Application of Remote Sensing and GIS. Geocarto Int. Centre, Hong Kong.
7. Singh, R. B. and Murai, S. (eds.). (1998) Space Informatics for Sustainable Development. Oxford & IBH Pub., New Delhi.

8. Burrough, P. A. and McDonnell, R. A. (1998) Principles of Geographic Information Systems. Oxford University Press, Oxford.
9. De Mers, Michael N. (1999) Fundamentals of Geographic Information Systems. John Wiley & Sons, New York.
10. Environmental Systems Research Institute (ESRI). (1997) Getting to know Arc View GIS, Cambridge: Geo-information International.
11. Heywood, I. et al. (2004) An Introduction to Geographic Information Systems. Pearson Education.
12. Longley, P. A., Goodchild, M. F., Maguire, D. J. and Rhind, D. W. (2001) Geographic Information Systems and Science. Wiley, Chichester.

M.Sc. Geography
Semester IV
19 GEO 410 Principles of GIS and Navigation System (Practical)

Maximum Marks - 100
Lab. Exercises - 45 marks (15x3)
Practical Record book - 20 marks
Viva Voce - 15 marks
Internal Assessment - 20 marks
Maximum Time – 4 hrs

Objective: This course aims to familiarize and enhance the student's knowledge about the Remote Sensing and GIS techniques along with their application value in the Earth observation.

Note: The examiner shall set six questions, two from each unit. The candidate shall attempt three questions selecting at least one question/exercise from each unit.

Unit- 1: Map Elements
Map elements: scale, projection, coordinate systems
Introduction to GIS software (open source)
Data inputs scanning/acquiring data
Georeferencing a raster layer with GPS Points and an existing georeferenced layer,
Defining projection, re-project from one projection to another

Unit II: Digitisation
Creating Vector layers through on-screen digitisation- Point, Line, Polygon, Creating Attribute Table: Add Fields for different data types, Joining and relating tables.
Simple query building
Topology: error detection and correction

Unit III: Data Visualization
Data visualization, map layout design and symbology
Raster data manipulation: Resampling, Mathematical operations using raster layers (Case Studies: Forest Planning for Sensitive Wildlife Species, Population mapping and modelling, Delineation of Watersheds etc.)

M.Sc. Geography
Semester-IV
19 GEO 411 GIS Project Report (Practical)

Maximum Marks - 100
Lab. Exercises - 45 marks (15x3)
Practical Record book - 20 marks
Viva Voce - 15 marks
Internal Assessment - 20 marks

Objective: This course aims to familiarize and enhance the student's knowledge about the Remote Sensing and GIS techniques along with their application value in the Earth observation and enable them to write the project report based on application of remote sensing.

Note: Student has to submit a GIS Project Report individually on the approved topic by the department from the following themes. Report should be of minimum 50 pages as per the Performa decided by the department.

Themes for the GIS Project Report:

- Land Use Land Cover (LULC)
- Agriculture, Crop Combination & Pattern
- Transport Network Analysis at micro-level
- Urban Land use, Land Cover and Planning
- Deforestation and Land degradation
- Land degradation and desertification
- Water Management
- Hotspot Analysis
- Planning for smart cities
- Micro climate of Urban areas
- Infrastructure development and planning
- Mining and environmental degradation
- Snow cover and glacial mapping
- Hydrological and Runoff Modelling

Outline for Project Report:

Student has to submit a report based on the analysis of remotely sensed data and field observations as mentioned:

- Statement of the problem
- Research Objectives
- Database
- Research Methodology
- Analysis of Data
- Discussion and Research Findings
- References
- Annexure and Additional Data

M.Sc. Geography
Semester IV
19 GEO 412 General Geography of World (Open Elective Course)

Maximum Marks-100
Theory Examination-80
Internal Assessment-20
Max. Time- 3 hrs

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit I:
Continents and Oceans: Their location, expansion and geographical characteristics.
World Major Physiographic Units: Mountain, Plains and Plateaus.

Unit II:
World Climates and Major Climatic Regions
Major Soil Types and Natural Regions.

Unit III:
Human Biological Diversity, Ethnicity and Distribution of Races
Major Religions of World and their Distribution.

Unit IV:
Population: Distribution, Density and Growth
World Economy: Characteristics of Developed and developing Economics.

Suggested Readings:

1. Hussain, M. (2006) World Geography. Rawat Publishers, New Delhi.
2. Pounds and Taylor. (1974) World Geography. South Western Publishing Co., Ohio.
3. Brown, 1. (ed). (1994) State of the World. WW Norton and Co. New Delhi.
4. Mcdougal, H. (2010) World Geography. HMH Publishing Co.