Syllabus
for
M.A. / M.Sc. Geography

PREPARED IN 2019: EFFECTIVE FROM THE ACADEMIC SESSION 2019-2020

Department of Geography
Raja N. L. Khan Women's College (Autonomous)
Gope Palace
Midnapore
Paschim Medinipur, West Bengal
PIN – 721 102

Division of Marks

Total marks: 1100 (Core) + 100 (Elective)

For Internal Students				Elective
Semesters	**Theoretical**	**Practical**	**Total**	**Total**
Semester- I	200	100	300	-
Semester- II	150	100	250	50
Semester- III	150	100	250	50
Semester- IV	200	100	300	-
Total	**700**	**400**	**1100**	**100**

Structure of Syllabus

Semester-I
(Duration: July – December)

Types	Paper	Units	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
Theoretical	Paper-101	Unit-1: Geotectonics	20	5	25		4	60 hours
		Unit-2: Geomorphology	20	5	25			
	Paper-102	Unit-3: Hydrology & Water shade Management	20	5	25	50	4	60 hours
		Unit-4: Oceanography	20	5	25			
	Paper-103	Unit-5: Soil Geography	20	5	25	50	4	60 hours
		Unit-6: Biogeography	20	5	25			
	Paper-104	Unit-7: Climatology	20	5	25	50	4	60 hours
		Unit-8: Natural Hazard &Disaster Management	20	5	25			
Practical	Paper-105	Unit-9: Basic Statistics in Geography	25	-	25	50	4	60 hours
		Unit-10: Remote sensing (Visual)	25	-	25			
	Paper-106	Unit-11: Hydrological Techniques	25	-	25	50	4	60 hours
		Unit-12: Term Paper (Issues from Physical or Human Geography – Library based assignment work)	25	-	25			

Semester-II
(Duration: January – June)

Types	Paper	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
Theoretical	Paper-201	Unit-13: Settlement Geography	20	5	25	50	4	60 hours
		Unit-14: Urban Geography	20	5	25			
	Paper-202	Unit-15: Economic Geography& Industrial Development	20	5	25	50	4	60 hours
		Unit-16: Trade& Transport Geography	20	5	25			
	Special Paper							
	Paper-203	Unit-17: Fluvial Geomorphology	20	5	25	50	4	60 hours
		Unit-18: Fluvial Landforms	20	5	25			
	Elective Paper (CBCS)							
	Paper-204	Unit-19: Basics of Environment	20	5	25	50	4	60 hours
		Unit-20: Environmental pollution: Issues & Policies	20	5	25			
Practical	Paper-205	Unit-21: Computer Application and Numerical Data Processing	25	-	25	50	4	60 hours
		Unit-22: Environmental Mapping	25	-	25			
	Paper-206	Unit-23: Digital image processing & GIS	25	-	25	50	4	60 hours
		Unit-24: Hydro-geomorphological Techniques	25	-	25			

Semester-III

(Duration: July – December)

Types	Paper	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
Theoretical	Paper-301	Unit-25: School of Geographical Though	20	5	25	50	4	60 hours
		Unit-26: Contemporary Discourses In Geography	20	5	25			
	Paper-302	Unit-27: Land Water Forest: Concepts, Conflict, Conservation	20	5	25	50	4	60 hours
		Unit-28: Food and Agricultural Geography	20	5	25			
	Special Paper							
	Paper-303	Unit-29: Special Paper: Fluvial Geomorphology	20	5	25	50	4	60 hours
		Unit-30: Special Paper: Fluvial Geomorphology	20	5	25			
	Elective Paper (CBCS)							
	Paper-304	Unit-31: Geography of West Bengal	20	5	25	50	4	60 hours
		Unit-32: Geography of Tourism	20	5	25			
Practical	Paper-305	Unit-33: Advance Quantitative Techniques	25	-	25	50	4	60 hours
		Unit-34: Physical Thematic Mapping	25	-	25			
	Paper-306	Unit-35: Field Report Preparation (special paper)	25	-	25	50	4	60 hours
		Unit-36: Viva on Field Report (Special paper)	25	-	25			

Semester-IV

(Duration: January – June)

Types	Paper	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
Theoretical	Paper-401	**Unit-37: Regional Development & Planning**	20	5	**25**	**50**	**4**	60 hours
		Unit-38: Landscape Ecology & Planning	20	5	**25**			
	Paper-402	**Unit-39: Social & Cultural Geography**	20	5	**25**	**50**	**4**	60 hours
		Unit-40: Contemporary Issues in Geography	20	5	**25**			
	Paper-403	**Unit-41: Population &Welfare Geography**	20	5	**25**	**50**	**4**	60 hours
		Unit-42: Political Geography & Globalisation	20	5	**25**			
	Paper-404	**Unit-43: Regional Geomorphology of India**	20	5	**25**	**50**	**4**	60 hours
		Unit-44: Physical, Human & Regional Development of Paschimanchal, W.B.	20	5	**25**			
Practical	Paper-405	**Unit-45: Research Methodology**	25	-	**25**	**50**	**4**	60 hours
		Unit-46: Research Exercise in Geography	25	-	**25**			
	Paper-406	**Unit-47: Spatial Analysis in Geography**	25	-	**25**	**50**	**4**	60 hours
		Unit-48: Socio-Cultural Thematic	25	-	**25**			

SPECIAL PAPERS: ***Fluvial Geomorphology***

Question Pattern

Group A (Long Answer Type)
Any one out of two options 1 x 8

1.
2.

Group B (Semi-long Answer Type)
Any two out of four options 2 x 4

3.
4.
5.
6.

Group C (Short Answer Type)
Any two out of four options 2 x 2

7.
8.
9.
10.

Outcome of the academic programme on M.Sc. in Geography

1. Fostering the ability of the students to encounter practical problems with theoretical knowledge in Geography and Environment.
2. Promotion of research aptitude and field work aptitude as well as laboratory based practical works for the students of Geography.
3. Capacity enhancement of the students in spatial mapping on digital platform for the Geographical research and studies.
4. Orientation of the students of Geography to develop competitive examinations aptitude among them including NET / SET/ and other professional jobs.
5. Preparing students for Higher Academic programmes for institutes of National and International repute.
6. On completion of the M. Sc. in Geography, students are able to get absorbed in various Govt Departments (like planning and developmental commissions, forestry, environmental, and disaster management departments) travel agencies, manufacturing firms, etc. They can be cartographer (NATMO), surveyor (Survey of India), GIS and Remote Sensing experts, environmental planner, Environment Reporter, urban and regional planner, transportation manager, Teacher/Professor etc.

Semester- I (300 Marks)

THEORETICAL COURSES (200 Marks)

PAPER GEO-101: Geotectonic and Geomorphology

Unit: 1- Geotectonic

Course objectives and expected outcome:

The focus of this course is to give an in-depth concept on the fundamental physical laws towards understanding the initial phases of the early universe with special reference to the Earth and the Moon. It also focuses on the basic understanding of the genesis of the Earth's magnetic field and palaeomagnetism that will enhance the understanding about the Earth's geological history and theories about the continental drift and sea floor spreading. The course is also designed to have some advanced level of understanding of the absolute dating techniques to find the ages of geological formation. It also includes the processes and mechanisms of mountain building. All these concepts and techniques will surely enhance the ability of the students for critical analysis and thereby synthesis of the Earth's system process. The completion of this course will give impetus to the research insights for the students who would like to pursue their future carrier in geosciences.

1. Origin of earth's magnetic field, paleomagnetism: evidences and impact.
2. Geological time scale: dating of rocks: principles and techniques.
3. Mechanism of plate dynamics. Application of plate tectonic theory in explaining orogenesis, volcanism, earthquake.
4. Neotectonics and its worldwide evidences: Post Pleistocene age.
5. Tsunami and its genesis.

Suggested References:

1. HOLMES, ARTHUR (1978): *HOLMES PRINCIPLES OF PHYSICAL GEOLOGY*, FRANCIS & TAYLOR.
2. BLOOM, ARTHER L. (2003). GEOMORPHOLOGY – A SYSTEMATIC ANALYSIS OF LATE CENOZOIC LANDFORMS, 3RD EDN.
3. CHORLEY, R., SCHUMM, S. AND SUGDEN, D.E. 1994. *GEOMORPHOLOGY*, METHUEN, LONDON: 605P.
4. COOK AND DOORNCAMP. 1988. *GEOMORPHOLOGY IN ENVIRONMENT MANAGEMENT*, LONDON
5. KALE, V.S. AND GUPTA, A. 2001. *INTRODUCTION TO GEOMORPHOLOGY*, ORIENT LONGMAN LTD., HYDERABAD: 274P.
6. KEARY, P. AND VINE, M. 1997. *GLOBAL TECTONICS*, 2ND EDITION, BLACKWELL SCIENTIFIC PUBLICATIONS, OXFORD: 302P.
7. LOWRIE, W. (2007): *FUNDAMENTALS OF GEOPHYSICS*, CAMBRIDGE UNIVERSITY PRESS.
8. OLLIER, C.D. 1981: *TECTONIC GEOMORPHOLOGY*, LONGMAN SCIENTIFIC & TECHNICAL, LONDON:
9. Summerfield, m.a. (editor) 1991. *Global geomorphology: an introduction to the study of landforms*, john wiley and sons ltd., new york: 560p.
10. VALDIYA, K.S. 1998. *DYNAMIC HIMALAYA*, UNIVERSITY PRESS (INDIA) LTD., HYDERABAD: 178P

Unit: 2 –Geomorphology

Course objectives and expected outcome:

Students will learn about the mechanism and working principle of processes that lead to shape present earth-surface. Field demonstration on process-form relationship help in concretizing ideas. This understanding may help in formulating hydrological, geologic and economic planning. Learners may take part in hazard management too.

1. Fundamental concepts in geomorphology.
2. Theory of Land Form Evolution: L. C. King, Chorley Schumme.
3. Slope Evolution: process-form relationship on slope elements, theories of Wood, King, and Savigear.
4. Morphogenetic regions, concepts, process& Peltiers model.
5. Interruption in fluvial cycle: causes & landforms.

Suggested References:

1. BLOOM, ARTHER L., (2003): *GEOMORPHOLOGY – A SYSTEMATIC ANALYSIS OF LATE CENOZOIC LANDFORMS*, 3RD EDN.
2. BRUTSAERT, W. (2005): *HYDROLOGY: AN INTRODUCTION*, CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE.
3. CHORLEY, R., SCHUMM, S. AND SUGDEN, D.E. (1994): *GEOMORPHOLOGY*, METHUEN, LONDON: 605P.
4. COCH,N.K, (1994): *GEOHAZARDS: NATURAL AND…* ,PRENTICE-HALL,ENGLEWOOD CLIFFS
5. COOK AND DOORNCAMP. (1988): *GEOMORPHOLOGY IN ENVIRONMENT MANAGEMENT*, LONDON
6. FANIRAN, A. AND JEJE, L.K. (1983): *HUMID TROPICAL GEOMORPHOLOGY*, LONGMAN, LONDON:
7. GOUDIE,A.(ED)(1990):GEOMORPHOLOGICAL TECHNIQUES,2ND EDITION,ALLEN UNWINCROWS NEST(AUSTRALIA).
8. HUGGETT,R(2006): FUNDAMENTALS OF GEOMORPHOLOGY,ROUTLEDGE,LONDON.
9. KALE, V.S. AND GUPTA, A. 2001. *INTRODUCTION TO GEOMORPHOLOGY*, ORIENT LONGMAN LTD., HYDERABAD: 274P.
10. KNIGHTON, D.1998 : *FLUVIAL FORMS AND PROCESSES: A NEW PERSPECTIVE*, ARNOLD, LONDON: 385P.
11. LAL, D. S., 2003. OCEANOGRAPHY, 3RD EDN. 288P.
12. MORISAWA, M. (EDITOR) 1994. *GEOMORPHOLOGY AND NATURAL HAZARDS*, ELSEVIER, AMSTERDAM: 355P.
13. MORISAWA, M. 1985. *RIVERS*, LONGMAN, LONDON: 222P
14. MURTHY, K.S. 1998. *WATERSHED MANAGEMENT IN INDIA*, 3RD EDITION, WIELY EASTERN LTD. / NEW AGE INTERNATIONAL LTD., NEW DELHI: 198P
15. NEWSON, M. 1992. *LAND WATER AND DEVELOPMENT, RIVER BASIN SYSTEMS AND THEIR SUSTAINABLE MANAGEMENT*, ROUTLEDGE, LONDON: 350P.
16. OLLIER, C.D. 1981: *TECTONIC GEOMORPHOLOGY*, LONGMAN SCIENTIFIC & TECHNICAL, LONDON:
17. PAUL, R.P. (2006): INVITATION TO OCEANOGRAPHY, 4TH EDITION, JONES AND BARTLETT PUB.
18. PETHICK, J. 1984. *AN INTRODUCTION TO COASTAL GEOMORPHOLOGY*, EDWARD ARNOLD, LONDON: 259 P.
19. PIRAZZOLIA, P.A. (1996): SEA LEVEL CHANGES: THE LAST 20000 YEARS, WILEY, NEW YORK
20. PUGH, D. (2004): CHANGING SEA LEVEL: EFFECT OF TIDES, WEATHER AND CLIMATES, CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE
21. RITTER,D.F.,KOCHEL,R.C.AND MILLER,J.R.(2006):PROCESS GEOMORPHOLOGY,4TH EDITION, WAVELAND PRESS,N.Y.
22. SELBY, M.J. 1985. *AN INTRODUCTION TO GEOMORPHOLOGY*, CLARENDON, OXFORD: 607P.
23. SHARMA, H.S. 1987. *TROPICAL GEOMORPHOLOGY : A MORPHOGENETIC STUDY OF RAJASHAN*, SOUTH ASIA BOOKS, JAIPUR: 124P.
24. SINGH, S. (2008): OCEANOGRAPHY, PRAYAG PUSTAKALAYA, ALLAHABAD
25. SMITH,K.(2004):ENVIRONMENTAL HAZARDS, ASSESSING RISK AND REDUCING DISASTER, 4TH EDITION, ROUTLEDGE, LONDON.
26. STARKEL, L. AND BASU, S. 2000 *RAINS, LANDSLIDES AND FLOODS IN THE DARJEELING HIMALAYA*, INDIAN NATIONAL SCIENCE ACADEMY, NEW DELHI: 168P.
27. SVERDRUP, K.A AND ET. ALL (2005): THE WORLD'S OCEANS, MCGAWHILL, NEW YORK.
28. THOMAS,D.S.G.(EDITOR)(2008):ARID ZONE GEOMORPHOLOGY: PROCESS, FORM AND CHANGE IN DRYLANDS, 2ND EDITION,WILEY, CHICHESTER.
29. THORNBURY, W.D. (1969): *PRINCIPLES OF GEOMORPHOLOGY*, WILEY EASTERN LIMITED, NEW DELHI: 594 P
30. TINKLER, 1985. *A SHORT HISTORY OF GEOMORPHOLOGY*, CROOM HELM LTD., BECKENHAM: 315P
31. TRUJILLO, A.P AND THURMNAN, H.V. (2007): ESSENTIAL OF OCEANOGRAPHY, 9TH EDITION, , PRENTICE HALL.

PAPER GEO-102: Hydrology and Water Management and Oceanography

Unit: 3 Hydrology and Water Management

Course objectives and expected outcome:

Students will learn about the working principle of earth system processes that lead to water availability and necessity for water management in the context of global climatic change. This understanding may help in water budgeting and formulating plan for water use and water management. Learners may take leading role in awareness generation among community for rain water harvesting and judicial water use.

1. Hydrological systems, estimating water potential, water budgeting at watershed level.
2. Hydrologic frequency analysis (Gumbel's equation and log probability law).
3. Precipitation estimates: point rainfall analysis, area-depth curve, Theisen network and isohyetal method for estimating rainfall volumes.
4. Infiltration and evapotranspiration: soil-vegetation complex and infiltration estimates. Methods of estimating evapotranspiration.
5. Basic concepts of water shade, introduction to watershed management,

Suggested References:

1. Bedinent, P.B.et.al. (2008*): Hydrology and Floodplain Management*, Prentice Hall,Upper Saddle River, NJ07458.
2. Biswas,A.K. (1972*): History of Hydrology*, North Holland Pub.Cc. Amsterdam.
3. Boca Raton, F.L Viessman and Lewis (1996): *Introduction to Hydrology*, Harper Collins, Newyork.
4. Chow V.T., Maidment ,D.R. and Mays, L.W. (1988*): Applied Hydrology*, Mc Graw Hill, Newyork.
5. Dingman, SL. (2002): *Physical Hydrology*, 2nd Edition, Prientice Hall, EnglewoodCliffs
6. Hyot, W.G. and W. Langbain (1955): *Floods*, Prentice Hall University Press, Princeton.
7. Keith, D. and Mays,L.W. (2004): *Ground water hydrology*, 3rd Edition, Wiley, Chichester.
8. Kintede-Levario, H. (2007): *Design for Water: Rain Water Harvesting, Storm Water Catchment and Alternate Water Reuse*, New society publishers, Gabriola Island.
9. Mays, L.W. (1996): *Water Resources Handbook*, Mc Graw Hill, Newyork.
10. Murthy, K.S. (1998): *Watershed Management in India*, 3rd edition, Wiely Eastern Ltd. / New Age International Ltd., New Delhi: 198p.
11. Pethick, J. (1984): *An Introduction to Coastal Geomorphology*, Edward Arnold, London: 259 p
12. Singh, V.P. and D.K. Frevest (2006): *Watershed Models*, CRC Press,
13. Todd, D.K. (2004): *Groundwater Hydrology*, 3re Edition, Wiley, Chichester

Unit: 4- Oceanography

Course objectives and expected outcome:

The students will be able to understand the marine environment and oceanographic processes that leads to earth system processes. They can extend their ideas in understanding environmental and climatic processes too. An aptitude on the distribution of marine resources as well as their utilization and possible impact are also developed among the students.

1. Wave and tide genetic classification & mode of formation.
2. Coastal Habitats: Estuaries, lagoons, salt marshes, mangrove swamps, coral reefs- origin, circulation, sedimentation and ecology.
3. Marine Environment and Processes: Major subdivisions of the marine environment, dynamics of shoreline: coastal water movement.
4. The Ocean's Resources: Law of the sea, law of the sea treaty, exclusive economic zones, mineral resource- oil and natural gas, gas hydrates, sand and gravel, mangrove nodules, cobalt-rich oceanic crusts, phosphate deposits, living resources
5. Sea level change: types, causes & implications.

Suggested References:

1. Garrison, T.S. (2007*): Oceanography: An Introduction to Marine Science*, 6th Edition, BrooksCole, Chicago
2. Levinton, J.S. (1982): *Marine Ecology*, PrenticeHall.
3. Pinet, P.R. (2006): *Invitation to Oceanography*, Jones & Bartlett.
4. Sverdrup, K.A.; Duxbury, A.C. and Duxbury, A.B. (2005): *The world Oceans*, McGrawhill.
5. Thorson, G. (1971*): Life in the Sea*, World University Library, New York.
6. Vatal, and Sharma (1972): *Oceanography for Geographers*, Chaitanya publising house, Allahabad.
7. Wirthmann, A. (2000): *Geomorphology of the Tropics*, Translated by Busche, D. Springer-Verlag, Berlin: 225p.
8. Woodroffe, C. D. (2003): *Coasts: Form Processes and Evolution*, Cambridge University Press, Cambridge.

PAPER GEO-103: Soil Geography and Biogeography

Unit: 5- Soil Geography

Course objectives and expected outcome:

Learners will understand about functional integration of various process that results in formation and distribution of different types of soil and their implication of agricultural systems. They will be able to achieve integrated knowledge on soil and landscape. They will develop special aptitude on soil survey techniques to analyse patio-temporal distribution of agricultural systems.

1. Soil profile: characteristics of different soil profile.
2. Bio-functions of Soil; Soil organic matter, Soil organisms and Micro-organisms and their relation with soil fertility.
3. Soil mineralogy and Soil nutrients; Role of physico-chemical properties in soil fertility and productivity.
4. Soil degradation and pollution: causes, processes and consequences; Preventive, ameliorative and conservation measures.
5. Soil taxonomic classification: USDA.

Suggested References:

1. Bhattacharjee, J.C. (1997): *Introduction to Pedology*, Oxford & IBH.
2. Biswas, T.D. and Mukherjee, S.K. (1987): *Textbook of Soil Science*, Tata-McGraw-Hill, 314p.
3. Boul, S.W. (2003): *Soil Genesis & Classification*, Wiley-Blackwell.
4. Brady, N.C & Well, R.R., (2005): *Nature and Properties of Soils*, (3rd. Indian Reprint); Pearson PHI.
5. Daji, Kadam, Patil: (Revised edn.) (1996*): A Text Book of Soil Science;* Media Promoters & Pub. Pvt. Ltd.
6. Das, P.C. (2002): *Soils of India*, Kalyani Pub.
7. Davies, D.B.; Eagle, D.J. and Finney, J.B. (1993): *Soil Management*, Farming Press.
8. De, N.K. & Ghosh, P. (1993): *A Study In Soil Geography*, Shribhumi.
9. Fitzpatrick,E.A. (1983): *Soils-Their Formation, Classification and Distribution*, Longman Group Ltd.
10. Foth, H.D. (1990): *Fundamentals of Soil Science*, 8th edition, John Wiley and Sons, New York: 360p.
11. Gerrard, J. (2000): *Fundamentals of Soils*, Routledge.
12. Joffe, J.S. (1953): *The ABC of Soils*, (2nd.Edn) Oxford Book Co.
13. Miller, R.W. & Donahue, R.L. (1997): *Soils in Our Environment*, (7th. Edn); PHI.
14. Mitchell, C. W. (1991): *Terrain Evaluation: An Introductory Handbook to the History, Principles and Methods of practical terrain assessment*; Longman Scientific & Technical.
15. Morgan, R.P.C. (1995): *Soil Erosion and Conservation*, 2nd edition, Longman, London: 198p.
16. Piegorsch, W.W & Bailer, A.Z. (2005): *Analyzing Environmental Data*; John Wiley and Sons.
17. Sarkar, Dipak. (2003*): Fundamentals and Applications of Pedology*, Kalyani Pub.
18. Sehgal, J. (1996): *Pedology- Concepts & Applications*, Kalyani Pub.
19. Singer, M.J. and MuMs, D.N. (1996): *Soils: An Introduction*, Prentice Hall, London: 480p.
20. Wild, A. (1993): *Soils and the Environment: An Introduction*, Cambridge University Press, Cambridge: 287p.

Unit: 6 Biogeography

Course objectives and expected outcome:

Students will get a comprehensive understanding about the plant species, process of degradation and regeneration of plants, animal dispersal. It also provides practical knowledge about the wildlife management strategies of India.

1. Phytogeographical regions, concept of plant species, family and genera, taxonomy.
2. Concept of degradation and regeneration of plants.
3. Dispersal of animals in different geological periods
4. Wildlife management practiced in India with special reference to sanctuaries.
5. Principal of physical and human ecology; ecosystem model

Suggested References:

1. Allaby, M. (1996): *Basics of Environmental Science*, Routledge, London: 297p.
2. Chapman J.L. and Reiss, M.J. (1993): *Ecology: Principles and Applications*, Cambridge University Press.
3. Marsh, W.M. and Grossa, J.M. (1996): *Environmental Geography: Science, Landuse and Earth Systems*, John Wiley & Sons.

4. Park, C. (1998): *The Environment: Principles and Applications*, Routledge, London:
5. Pickering, K. and Owen, L.A.(1997) : *An Introduction to Global Environmental Issues*, 2nd edition, Routledge, London.
6. Prabhakar, V.R. (1998): *Social and Community Forestry*, Indian Pub. Distrb., New Delhi: 224p.
7. Nick Middleton: The Global *casino:an introduction to environmental issues, Arnold* ,A member of the Hodder Headline Group LONDON Distribuced in rhe Uniced Scaces ofAmerim by Oxford University Press Inc., New York.
8. Robert M. May And Angela R. Mclean(2007): Theoretical Ecology:Principles And Applications,Oxford Universitypress
9. Barry Cox; Peter Dale Moore(2010): Biogeography An Ecological And Evolutionary Approach ,Hoboken, NJ : Wiley

PAPER GEO-104: Climatology and Natural Hazard &Disaster Management

Unit: 7 Climatology

Course objectives and expected outcome:

The course deals with the basic understanding of the climate system. The fundamental physics of surface pressure distribution, the general circulation model and sea surface temperature (SST) variation will allow students to get insights to the space-time scale variation of weather and climate. Students will understand the weather and climatic processes working on earth and this understanding will help them to assess and predict the weather phenomena and its related hazards. Through this understanding, they can take part in hazard and disaster management programmes.

1. Classification Sources, origin, modification of air mass
2. The General Circulation: GCM, Tropical circulation- mechanism of Indian monsoon, Walker circulation and ENSO phenomena, Temperate Circulation.
3. Climatic changes through geological periods- evidences and possible causes; Global Warming-Natural and anthropogenic causes and probable consequences.
4. Meteorological and climatic hazards and disasters: Cyclones, Thunderstorms, Tornadoes, Cloud Burst.
5. Approaches and techniques of weather forecasting with reference to the tropics: short, medium, and long range

Suggested References:

1. Barry, R.G. and Chorley, R.T. (1992): *Atmosphere, Weather and Climate*, 6th edition, Routledge, London: 392p.
2. Critchfield, H.J. (1983): *General Climatology*, 4th edition, Prentice Hall India Ltd., New Delhi: 453p.
3. Das, P.K. (1995) : *Monsoons*, 2nd edition, National Book Trust, New Delhi: 347p.
4. Lal, D.S. (1993) : *Climatology*, 3rd edition, Chaitanya Pub. House, New Delhi: 412p.
5. Linacre, E. and Geerts, B. (1997): *Climates and Weather Explained*, Routledge, London: 464p.
6. Lutgens, F.K.. and Tarbuck, E.J. (1998): *The Atmosphere: An Introduction to Meteorology*, 7th edition, Prentice-Hall
7. Moran, J.M. and Morgan, M.D. (1997) : *Meteorology: The Atmosphere and the Science of Weather*, 5th edition, Prentice-Hall Inc., Upper Saddle River: 530p.

Unit: 8 Natural Hazard &Disaster Management

Course objectives and expected outcome:

Students will foster their skill in managing various types of natural hazards by analysing their risk and vulnerability. They will be trained in the procedures of hazard management through proactive approach by increasing the resilience of the community in tune with national policy of hazard management and international laws.

1. Hazard, Risk, Disaster, Vulnerability and Resilience Capacity: concept and Paradigm shift.
2. Hydro-Metrological Hazard, cyclone and Storm surges, Drought and Desertification: impact and management.
3. Earthquake Hazard and Tsunami Disasters: Consequences and Management.
4. Natural Hazard and Disaster Management in India.
5. A Social Perspective on Natural Disaster Management and Planning; Other Disaster (Disease as Disasters)

Suggested References:

1. Alexander, D. (1993): *Natural Disasters*, Research Press, New Delhi: 619p.
2. Allaby, M. (1996): *Basics of Environmental Science*, Routledge, London: 297p.
3. Chapman J.L. and Reiss, M.J. (1993): *Ecology: Principles and Applications*, Cambridge University Press.
4. Chapman, D. (1994): *Natural Hazards*, Oxford University Press, Melbourne: 174p.
5. Choudhuri, A.B. (2007): *Endangered Wetland*.
6. Elsom, D.M. (1992): *Atmospheric Pollution: A Global Problem*, 2nd edn, Blackwell Pub. Co., London: 422p.
7. Farmer, A. (1997): *Managing Environmental Pollution*, Routledge, London: 246p.
8. Marsh, W.M. and Grossa, J.M. (1996): *Environmental Geography: Science, Landuse and Earth Systems*, John Wiley & Sons.
9. Park, C. (1998): *The Environment: Principles and Applications*, Routledge, London:
10. Pickering, K. and Owen, L.A.(1997) : *An Introduction to Global Environmental Issues*, 2nd edition, Routledge, London.

PRACTICAL COURSES (100 marks)

PAPER GEO-105: Basic Statics in Geography and Remote Sensing (Visual)

Unit: 9 Basic Statics in Geography

Course objectives and expected outcome:

The course, split into two units, corresponds to the basic and advance statistics, is a starting point of escalating the statistical analytical skills. It includes the founding concepts of probability distribution including the advanced linear modelling with matrix solution to the multivariate linear and non-linear model. These concepts are essential for augmenting the analytical skills of any beginner in Geography that includes both physical and social aspects of academic discipline. Upon completion of this course, the students get the benefit of having a strong mathematical and statistical analytical skills.

1. Measurement in Geography: Nominal, ordinal, interval and ratio measurement. Scaling Techniques: Rank Score, Weighted Score, Likert's Opinionnaire
2. Concept of covariance, correlation and regression: Bi-variate analysis - linear, exponential, Product moment correlation, Spearman's Rank correlation, correlation matrix, partial correlation, residuals - mapping of residuals.
3. Probability distribution: addition and Law of multiplication, concept of probability distributions (binomial distributions, normal probability distribution), properties of normal curve.
4. Hypothesis testing: Formulation, Rejection rule, one and two tailed tests, significance level, degrees of freedom type I and type II errors, Standard Error. Different types of significance test for various purposes. Chi- square test, shortest path analysis, student's t- test, Z test
5. Sampling techniques for geographical analysis.

Suggested References:

1. Alvi. Z. (1995*): Statistical Geography: Methods and Applications*, Rawat Publication, New Delhi
2. John, C. D. (2002): *Statistics and Data Analysis in Geology*; John Wiley & Sons.
3. Mehmood, A (1977): Statistical methods in Geographical studies, Rajesh Pub. New Delhi
4. Pal, S.K. (1999): *Statistics for Geoscientists*, Concept publishing Company, New Delhi: 423p.
5. Sarkar, A. (2006): *Practical Geography; A systematic approach*, Orient Longman Ltd, Hydrabad,
6. Silk, J. (1979): *Statistical techniques in Geography*, George Allen and Unwin, London: 276p.
7. Swan, A.R.H.; Sandilands, M. and McCabe, P. (1995): *Introduction to Geological Data Analysis*, Blackwell. 446p.
8. Walford, P. (1995): *Geographical Data Analysis*, John Wiley and Sons Inc., New York: 446p.

Unit: 10 Remote Sensing (Visual)

Course goal and expected outcome:

The course content is focused on basic understanding of satellite remote sensing. Basic principles of satellite motion and sensor parameters help the students to formalize with the modern space based analytical techniques. Upon completion of this course, the students will get benefit from rigorous practice and comprehensive theories.

1. Physics of Remote Sensing: Electro Magnetic Radiation (EMR), Radiation laws (wavelength-frequency-energy relationship of EMR numerical problems)
2. Satellite Sensors: Concept of IFOV, resolution and determination of pixel size
3. Referencing scheme of satellite system (path/row calculation)
4. Basics of Aerial Photograph: Basics geometry of aerial photograph, determination of scale and height, Distortions, Image parallax, Relief displacement.
5. Visual interpretation of satellite images

Suggested References:

1. Allison, L.J., Schnapf, A.(1983): Meteorological satellites: In Colwell, R.N.(ed.) *Manual of Remote Sensing*.
2. Campbell, J .B. (1996): *Introduction to Remote Sensing*, 2nd edition, Taylor & Francis, London: 622p.
3. Chaisman, N. (1992): *Exploring Geographical Information Systems*, John Wiley and Sons Inc., New York: 198p.
4. Colwell, R.N. (ed.) *Manual of Remote Sensing* (2nd edn). American Society of Photogrammetry, Falls Church,
5. Curran, P.J. (1988): *Principles of Remote Sensing*, ELBS Edn. Longman Group UK Ltd.
6. Guha, P.K. (2003): *Remote Sensing for the Beginner*, Affiliated East-West Press Pvt. Ltd., New Delhi
7. George, J. (2003): *Fundamental Remote Sensing*, Universities Press, New Delhi.
8. John R Jensen (2006): *Remote Sensing of the Environment: An Earth Resource Perspective*, Pearson Education Delhi
9. Lillesand, T.M. and Kiefer, R. W. (2003): *Remote Sensing and Image Interpretation*, 5th edition, John Wiley and Sons, New York.
10. Narayan L R A (2000): *Remote sensing and its applications*, Universities Press Hyderabad
11. Rajan, M.S. (1995): *Space today*, 2nd edition, National Book Trust, New Delhi, 344p.
12. Slater, P.N. (1983*): Photographic systems for remote sensing*, Singapore Science Center.
13. Slater, P.N. (1983): *Photographic systems for remote sensing*, Virginia,

PAPER GEO-106: Hydrological Techniques and Term Paper

Unit:11 Hydrological Techniques

Course objectives and expected outcome:

Students will develop skills in application of theoretical knowledge of hydrology. They will learn on field as well as laboratory techniques for estimating different hydrological attributes as for example rainfall, run off, infiltration etc. in order to construct water budget. Students are enabled to analyse magnitude frequency of different hydrological hazards like fold and droughts and their social and economic applications. This knowledge will help them in formulating various hydrological projects and their successful management.

1. Point rainfall analysis, area-depth curves, Thiessen network and Isohyetal methods to determine rainfall volumes.
2. Estimating infiltration using infiltrometre and other field techniques. Drawing infiltration curve.
3. Evaporation estimation: Use of evaporation pan and empirical equations using climatic data.
4. Runoff and discharge estimation: Curve Number methods for estimating runoff: area-velocity method for discharge estimate & Estimation of Evapotranspiration
5. Construction of unit-hydrograph and rating curves.

Suggested References

1. Bedinent, P.B.Et.Al. (2008*): Hydrology And Floodplain Management*, Prentice Hall,Upper Saddle River, NJ07458.
2. Biswas,A.K. (1972*): History Of Hydrology*, North Holland Pub.Cc. Amsterdam.
3. Boca Raton, F.L Viessman And Lewis (1996): *Introduction To Hydrology*, Harper Collins, Newyork.
4. Chow V.T., Maidment ,D.R. And Mays, L.W. (1988*): Applied Hydrology*, Mc Graw Hill, Newyork.
5. Dingman, SL. (2002): *Physical Hydrology*, 2nd Edition, Prientice Hall, Englewoodcliffs
6. Hyot, W.G. And W. Langbain (1955): *Floods*, Prentice Hall University Press, Princeton.
7. Keith, D. And Mays,L.W. (2004): *Ground Water Hydrology*, 3rd Edition, Wiley, Chichester.
8. Kintede-Levario, H. (2007): *Design For Water: Rain Water Harvesting, Storm Water Catchment And Alternate Water Reuse*, New Society Publishers, Gabriola Island.
9. Mays, L.W. (1996): *Water Resources Handbook*, Mc Graw Hill, Newyork.
10. Murthy, K.S. (1998): *Watershed Management In India*, 3rd Edition, Wiely Eastern Ltd. / New Age International Ltd., New Delhi: 198p.
11. Pethick, J. (1984): *An Introduction To Coastal Geomorphology*, Edward Arnold, London: 259 P
12. Singh, V.P. And D.K. Frevest (2006): *Watershed Models*, CRC Press,
13. Todd, D.K. (2004): *Groundwater Hydrology*, 3re Edition, Wiley, Chichester

Unit-12: Term Paper

Course objectives and expected outcome:

The aim of the course is to develop the ability to discuss, describe and explain an issue related to different geographical topics and also build up their writing skill.

Issues from Physical or Human Geography: Library Based Assignment Work

Semester- II (300 Marks)

THEORETICAL COURSES (200 Marks)

PAPER 201: Settlement & Urban

Geography Unit – 13: Settlement

Geography

Course objectives and expected outcome:

The primary aim of studying settlement geography is to acquaint with the spatial and structural characteristics of human settlements under varied environmental conditions. The paper deals with multi-disciplinary perspectives on the formation, evolution of human settlement. The paper will help the students to make an understanding on the reasons people settle in certain locations and the geographical features lead to the development of civilizations. The Nature and Scope of Settlement Geography, Characteristics of Rural and Urban Settlements according to Indian Census and nature, scope, evolution and several study methods. The settlement types, pattern and nature and process of urban settlement, different cultural landscapes

1. Evolution of the concept of shelter; Settlement types: on the basis of census category, shape and locations.
2. Traditional rural house types: Origin, evolution & characteristics, roof and building materials
3. Architectural design of houses and dependence on climate and its recent trends
4. Site, situation and spacing of settlements – dependence on terrain characteristics and water availability
5. Transformation and planning of Indian villages: models and plans

Suggested References

1. Brian,K.R(1996):*Landscapes of Settlements:Prehistory to the Present,* Routledge,London
2. De Blij H.J. (1995): *The Earth: An Introduction to its Physical and Human Geography*, John Wiley and Sons Inc., New
3. De Blij H.J. (1996): *Human Geography: Culture, Society and Space*, John Wiley and Sons Inc., New York: 531 p.
4. Ghosh, S. (1998): *Introduction to Settlement Geography*, Orient Longman Ltd., Calcutta: 158p.
5. Hudson, F.S. (1970): *Geography of Settlements*, Macdonald and Evans Ltd., Plymouth
6. Hussain, M. (1994): *Human Geography*, Rawat Pub. Co., New Delhi: 485p.
7. Misra. H.N. (ed) (1987): *Contributions to Indian Geography*, Volume 9: *Rural Geography*, Heritage Pub., New Delhi.
8. Racine, J. (ed) : *Calcutta 1981*, Concept Pub. Co., New Delhi.
9. Rodwin (2006): *Shelter, Settlement and Development*, Rawat Pub.
10. Singh, R. Y. (1994) : *Geography of Settlements*, Rawat Pub. Co., New Delhi: 335p.
11. Singh, R.L. et. al. (ed) (1976): *Geographic Dimensions of Rural Settlements*, National Geographical Society of India, Varanasi.
12. Ramachandram, R. (1999): Urbanization and urban systems in India, Oxford University Press, New Delhi
13. Verma, L (2009): Urban Geography, Rawat publication, Jaipur
14. Roy Chaudhuri, J. (2001): An Introduction to Development and Regional Planning-with special reference to India, Orient Blackshawn, Hyderaband

Unit – 14: Urban Geography

Course objectives and expected outcome:

This paper will provide knowledge on spatial analysis of functions of urban areas. Social and economic characteristics of cities and suburbs will be discussed under this paper. Urban land use and its impact on environment and ecology will be addressed. This paper will introduce students to the basics of urban geography, such as definition of cities, central place theory, National urban systems, and traditional models of urban spatial structure. More importantly, students will be exposed to contemporary urban topics such as global cities, urban sprawling, urban green space, urban ecology and footprints

etc. Emphasis will be placed on the urban experience of developing countries, especially India.The students will be able to assemble knowledge of urbanism and urbanization as historic, geographic, social, and cultural processes, historical development, contemporary condition, and environmental impact of cities and urban related issues growing from exposure to the disciplines of Geography and Planning

1. Recent trends in urban geography; concepts of urban place, urbanisation, urbanism and urban ecology
2. Characteristics of Pre industrial, industrial and modern cities; Functions and functional classification of towns
3. Urban landuse and functional morphology: Burges, Hoyt, Harris & Ullman
4. Size and spacing of cities: Rank-size rule; Law of the primate city; urban hierarchies; Central Place Theory (Christallar & Losch)
5. Challenges and issues of Indian urbanisation: urban sprawling, slum, pollution; India's Urban Policy (1986).

Suggested References

1. Carter, H. (2002): *Urban Geography*, 4th edition Arnold-Heinemann, New Delhi: 434p.
2. De Blij, H.J. and Muller, P.O. (1997): *Geography: Realms Regions and Concepts*, 8th edition, John Wiley and Sons Ltd., New York: 569p.
3. Dickinson, J., Gould, B., Clarke, C., Mather, S., Prothero, M., Siddle, D., Smith, C. and Thomas-Hope, E. (1996): *A Geography of the Third World*, 2nd edition, Routledge, London: 334p.
4. Dickinson, R.E. (1968): *City and Region: A Geographical Interpretation*, Routledge and Kegam Paul Ltd. London.
5. Ghosh, S. (1998): *Introduction to Settlement Geography*, Orient Longman Ltd., Calcutta: 158p.
6. Gore, Charles (1984): *Region in question*, Routledge Publisher.
7. Hudson, F.S. (1970): *Geography of Settlements*, Macdonald and Evans Ltd., Plymouth.
8. Knox, P. (1982): *Urban Social Geography*, Longman Scientific and Technical, Harlow.
9. Pacione, M. (2007): *Urban Geography*, Routledge,
10. Ramachandran R. (1989): *Urbanisation and Urban Systems in India*, Oxford University Press, New Delhi.
11. Singh, R.L. (editor) (1971): *India: A Regional Geography*, National Geographical Society of India / UBS Pub. Distributors Ltd., New Delhi: 992p.
12. Singh, R.L. et. al. (ed) (1976): *Geographic Dimensions of Rural Settlements*, National Geographical Society of India, Varanasi.
13. Spate, O.H.K. and Learmonth, A. T.A. (1967): *India and Pakistan*, 3rd edition, Munshiram Monoharlal Pub. Pvt. Ltd., New Delhi: 877p.
14. Tewari, V. Weinston, J. and Prakash Rao, V.L.S. (1986): *Indian Cities: Ecological Perspectives*, Concept Pub. Co., New Delhi.

PAPER 202: Economic Geography & Industrial Development and Trade & Transport Geography

Unit – 15: Economic Geography & Industrial Development Course objectives and expected outcome:

Students will be aware about the different global economic policies, scenario etc. They will also learn about the industrial policies of India and different economic zones of India.

1. Scope and content of economic geography; Economic geography in the era of globalisation: changes and recent trends
2. World economic order: Economic boom and crisis (Kuznetz's model)
3. Classification of industries, Theories of industrial location (A. Losch, D.M. Smith & A. Pred)
4. Industrial policy of India; Role of liberalisation, privatisation and globalisation
5. Industrial regions of India: Special Economic Zone (SEZ), Exclusive Economic Zone (EEZ), Industrial complex and Industrial hubs, MSME and craft development.

Suggested References

1. Churchel, R. R. and Lowe, A.D (1999): The Law of the Sea, Manchester University Press
2. Doshi, K (2007): Treaties on Special Economic Zone, Snow White Publication
3. Dutt, R. and Sundaram.K.P.M . (2007): Indian Ecocomy, S. Chand and Com Ltd, Ramnagar, New Delhi
4. Gupta, K.R (2008): Special Economic Zones: Issues, Law and Procedure, Atlantic Publisher
5. Nilekani, Nandan (2009): Imagining India- The Idea of a Renewed Nation, Penguin Press
6. India, 2009: Publication Division,Ministry of Information Broadcasting, Govt. of India
7. Singh, B D.(1992): Planning for Rural Development and Poverty Alleviation, Mittal Pub.
8. Menon, N and Nigom, A (2007): Power and the Contestation: India since 1989, Zed Books
9. Smith, R.W (1986): Exclusive Economic Claims: An Analysis and Primary Documents, Martinus Nijhoff Publisher

Unit – 16: Trade & Transport Geography

Course objectives and expected outcome:

Students will learn about the role of transport in entire economic and social processes. This course aims to make students understand the locational advantage of different economic and social institutes based on transport principle. They are made aware of the role of public transport in addressing the problems of congestion and air pollution. This understanding may help them in formulating plan for regional development and economic regeneration by proper transport planning.

1. Concept of distance, Transportation and space, space-time relation through transportation, Models of Transportation: Railways, Roads, Airways and waterways.
2. Transport network analysis: Centrality, Accessibility, Connectivity; Traffic congestion Model
3. Transport cost, Principles of transport cost fixation, comparative cost advantage by different modes.
4. National transport policy and development in India: National Highways and Golden Quadrilateral, State and District Roads, Pradhan Mantri Gram Sadak Yojana, National Freight corridor, Green corridor.
5. Regional blocks in international trade: SAARC, OPEC, EU

Suggested References

1. Adler, H.A (1987): *Economic Appraisal of Transport Project*, John Hapkins Press. Washington.
2. Dasgupta, A.K. and Pearee, D.W. (1972); *Cost Benefit analysis, theory and practice*; Mac Millan, London.
3. Flahesly CAO (2006): *Transport Planning and Traffic Engineering*, Butterworth- Heinemann
4. Gwillian, K.M. (Ed.) (1993): *Transport Policy and Global Warming*, European Conference of Ministers of Transport, Paris.
5. Lays M.G. (1993*): Wags of the World*, Primarera Press, Sydwen
6. Pearce D.W. and Markyanda, A. (1989*): Environmental policy Benefits*, Manetany valuation OECD, Paris.
7. While, P. (1986): *Public Transport Planning*, Management and operation, Hatechinson, London.

PAPER 203: Fluvial Geomorphology (Special Paper)

Unit -17: Fluvial Geomorphology

Course objectives and expected outcome:

Students will learn about the mechanism and working principle of geomorphic processes in details that lead to shape present earth-surface. This understanding may help in formulating engineering plan for management of land, water and soil, three basic resources on earth surface.

1. Fluvial Geomorphology: Concept and evolution of fluvial geomorphology, Contribution of

Indian geomorphology

2. Open channel flow: mechanism, hydraulic relations, types and factors
3. Concept of channel equilibrium, Graded stream, Re-graded stream; Base level of erosion – types, change and consequences
4. Channel migration: evidences, causes and consequence; Concept of palaeo channel
5. Empirical and genetic model of drainage pattern

Suggested References

1. Anderson Robert S. and Anderson Suzanne P., 2010 Geomorphology (1st Edition, Kindle Edition) by , Cambridge University Press.
2. Anderson, M.G. (1988) Modelling Geomorphological Systems, John Wiley & Sons, New York
3. Chorley R.J. (Ed.) (1972) Spatial Analysis in Geomorphology., Methuen & Co., London.
4. Chorley, R.J. Schumm,S.A. & Sugden, D.E. (1985): Geomorphology, Methuen & Co. Ltd., London, New York.
5. Christopherson, R.W. (1995): Elemental Geosystems: A Foundation in Physical Geography, Prentice Hall Englewood Cliffs, New Jersey.
6. Coates, D.R. and Vitek, J.D. (1980) (eds), Thresholds in Geomorphology, George Allen & Unwin, London.
7. Crozier, M. J. (1986), Landslides: Causes, Consequences and Environment, Croom Helm, London.
8. Greeley, Ronald (2013) Introduction to Planetary Geomorphology, Cambridge University Press
9. Gupta, A. (2011) Tropical Geomorphology, Cambridge University Press
10. Knighton, D. (1990) Fluvial Forms and Processes, Hodder Education, UK.
11. Leopold, L.B. Wolman, M.G. & Miller, J.P. (1964): Fluvial Processes in Geomorphology, W.H.Freeman
12. Maiti, R.K. (2016) Modern Approaches to Fluvial Geomorphology, Primus Books.
13. Mondal S. and Maiti, R.K. (2015) Semi-quantitative Approaches in Landslide Assessment and Prdiction, Springer.
14. Morisawa, M. (1985) Rivers, Longman, London.
15. Ollier, C. D. (1969) **Weathering**. Elsevier, New York.
16. Pity A.F., 1971, Introduction to Geomorphology, Methuen, London.
17. Ritter, D.F. (1986) Process Geomorphology, Wm. C. Brown Publisher, Dubuque, Iowa.
18. Ritter, Kochel and Miller Process Geomorphology, 4th edition, Waveland Press 2006 (ISBN 13: 978-1-57766-461-1).
19. Robinson, Harry (1969): Morphology and Landscape, University Tutorial Press Ltd. London.
20. Selby, M.J. (2005) Hill slope materials and processes, Oxford University Press, Oxford.
21. Selby, R.C. (1976), An Introduction to Sedimentology, Academic Press, London.
22. Sparks, B.W (1972) Geomorphology, Longman, London.
23. Thomas Michael F. 2014 Geomorphology in the Tropics, , Wiley.
24. Worcester, P. G. (1948): Textbook of Geomorphology, Princeton, D.Van, Nortrand.
25. Zaruba, Q. et al (1969) Landslides and their control. Elsevier, Amsterdam.

Unit – 18: Fluvial Landforms

Course objectives and expected outcome:

Students will learn about origin and process of formation of different geomorphological landforms of India and they also come to know their importance.

1. Morphological characteristics of Alluvial terraces with special reference to Tista River Basin.
2. Morphological characteristics of Alluvial Fan with special reference to Kosi River basin.
3. Morphological characteristics of Flood plain with special reference to Brahmaputra River Basin.
4. Morphological characteristics of Delta Plain with special reference to Lower Ganga Basin.
5. Badland Morphogenesis: Components, factors, processes and evolution.

Suggested References

1. Chorley R.J. (Ed.) (1972) Spatial Analysis in Geomorphology., Methuen & Co., London.
2. Gamen,H.F. (1974) The Origin of Landscapes-A Synthesis in Geomorphology, Oxford University Press.
3. Kale, V.S. (2018) (ed) Geomorphosites in India. IGI
4. Lobeck, A.K. (1939) Geomorphology, McGraw Hill, New York.
5. Ritter, D.F. (1986) Process Geomorphology, Wm. C. Brown Publisher, Dubuque, Iowa.
6. Spark, B. W. (1986) Geomorphology, Longman, London.

7. Sparks, B.W (1972) Geomorphology, Longman, London.
8. Wadia, D.N. (1993) Geology of India, Tata McGraw Hill Edition, New Delhi.
9. Valdia, K.S. (2010) The Making of India: Geodynamic Evolution
10. Selby Michael John (1985) Earth's Changing Surface: An Introduction to Geomorphology, Clarendon Press.

PAPER- 204 Basic of Environment and Environmental pollution: Issues and Policies

Unit- 19: Basic of Environment

Course objectives and expected utcome:

The living things interact with each other in various ways and with the non-living components that make up the environment in which we live. These non-living components include rocks, soils and water, as well as the atmosphere. All these interactions produce a complicated set of interrelationships and these interrelationships can take many forms. Thus, this paper on basics of environment and ecology prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective. Ecology is a scientific way of thinking about the world. This means that it involves a certain way of investigating, studying and writing about the systems. Student can learn the core concepts and methods from ecological and environmental perspectives and their application in environmental problem solving.

1. Approaches to study of environment and its recent trends, Type of environment.
2. Concept of ecosystem and its classification.
3. Function of Ecosystem: Trophic level, Energy flow, Bio-chemical cycle (Carbon, Nitrogen, and Geochemical), Food chain, Food web and Ecological pyramid.
4. Concepts of biome and biomass, Classification of biomes, Geographical distribution and characteristics of equatorial rainforest and temperate grass land.
5. Environmental ethics and its significance.

Suggested References:

1. Anjuneyulu, Y. (2002): Environmental Impact Assessment Methodologies. B. S. Publications, Hyderabad.
2. Anjuneyulu, Y. (2004): Introduction to Environmental Science. B. S. Publications, Hyderabad.
3. Athavale, R. N. (2003): Water Harvesting and Sustainable Supply in India. Rawat Publications., Jaipur.
4. Bilas, R. (1988): Rural Water Resource Utilization and Planning. Concept Publishing Company, New Delhi.
5. Blaikie, P., Cannon, T. and Davis, I. (eds.) (2004): At Risk: Natural Hazards, Peoples Vulnerability and Disasters. Routledge, London.
6. Clarke, J. I., Curson, P., Kayastha, S. L. and Nag, P. (eds.) (1991): Population and Disaster. Basil Blackwell, USA.
7. Gautam, A. (2007): Environmental Geography, Sharda Pustak Bhawan, Allahabad.
8. Huggett, R. J. (1998): Fundamental of Biogeography. Routledge, London.
9. Kayastha, S.L. and Kumra, V.K. (1986): Environmental Studies. Tara Book Agency, Varanasi.
10. Khoshoo, T. N. (1981): Environmental Concerns and Strategies. Ashish Publishing House, New Delhi.
11. Kumra, V.K. (1982): Kanpur City. A Study in Environmental Pollution. Tara Book Agency, Varanasi.
12. Mathur, H. S. (2003): Essentials of Biogeography. Pointer Publication, Jaipur.
13. Nag, P., Kumra, V.K. and Singh, J. (1990): Geography and Environmental Issues at Local, Regional and National Levels. (in 3 vols.), Concept Publishing Company, New Delhi.
14. Odum, E.P. (1975): Ecology. Rowman and Littlefield, Lanham USA.
15. Rajagopalan, R. (2005): Environmental Studies: From Crisis to Cure, Oxford University Press, New Delhi.
16. Reddy, M. A. (2004): Geoinformatics for Environmental Management. B. S. Publishers.,

Hyderabad

Unit- 20: Environmental pollution: Issues and Policies

Course objectives and expected outcome:

Students will learn about the necessity and mechanism of waste water treatment and understand the procedures to manage land, air and noise pollution. This course aims to enable the learners to participate in making of pollution free environment. This fundamental understanding and knowledge help them to get engaged in various non-government and government initiatives in this regard.

1. Fundamental concepts: Pollution, pollutants, Pollution sink, Ecological foot print.
2. Environmental pollution, causes and consequence: Air, Water and Land.
3. Measurement of environmental contaminants based on WHO, BIS: Drinking water, Ground water, Air.
4. Biodiversity: Issues, vulnerability and conservation (IUCN)
5. National policies on environmental conservation.

` **Suggested References**:

1. William J. Sutherland (2006): Ecological Census Techniques Edited by Cambridge 2nd edition
2. Lagacherie Philippe, McBratney Alex and Voltz Marc(2006) : Digital Soil Mapping :An Introductory Perspective, Elsevier
3. Scull, P.; J. Franklin, O.A. Chadwick & D. McArthur (June 2003). Predictive soil mapping - a review. Progress in Physical Geography, Sage Publications.
4. Monkhouse, F.J. 1971: Maps and Diagrams, Methuen, London
5. Singh, R.L. and Singh, R.P.B. 1992: Elements of practical Geography.
6. Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. and Guptill, S.C. 1995: Elements of Cartography, John Wiley and Sons, New York.
7. Basu, R. and Bhaduri, S. ed, 2007: Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.
8. Gupta, K. K. and Tyagi, V. C. (1992): Working with maps, Survey of India Publication, Dehradun

PAPER- 205 Computer application and Numerical data processing and Environmental mapping

Unit- 21: Computer application and Numerical data processing

Course objectives and expected outcome:

The course is designed to get a comprehensive knowledge of fundamentals of computer application. It also includes the exercise from Microsoft excel and SPSS regarding the basic statistical computation. The course, therefore, lay the foundation for software-based computing skills. Upon completion, the students get adequate level of skills to do statistical analysis.

1. Computer components: Hardware and software: CPU, Input and Output devices; Common computer languages, System Software, Application Software and Operating Systems.
2. Representation of data; Numbering Systems; Binary Arithmetic; Basic Logic Gates; Boolean Logic.
3. Computation, Storing and Formatting Spreadsheets: Computation of Rank, Mean, Median, Mode, Standard Deviation, Sample Variation, Correlation, Covariance, Selection of technique and interpretation using MS-Excel.
4. Fitting the trend line: Bivariate regression (Scatter diagram), Time series analysis (Moving average).
5. Preparation of power point presentation through data mining from internet.

Suggested References:

1. Bailey, T. and Gatrell, A. C. (1995): Interactive Spatial Data Analysis. Longman , Harlow.
2. Dorling, D. and Fairborn, D. (1997): Mapping. Ways of Representing the World. Longman, Harlow.
3. Fraser Taylor, D.R. (1980): The Computer in Contemporary Cartography. John Wiley and Sons, New York.

4. Fraser Taylor, D.R. (ed.) (1983): Graphic Communication and Design in Contemporary Cartography. John Wiley and Sons, New York.
5. Griffith, D. A. and Amehein (1997): Multivariate Statistical Analysis for Geographers. Prentice Hall, Englewood Cliffs, New Jersey.
6. Griffith, D. A. and Amehein (1997): Statistical Analysis for Geographers. Prentice Hall, Englewood Cliffs, New Jersey.
7. Kanetkar, T.P. and Kulkarni, S.V. (1967): Surveying and Levelling, Part II, A.V.G. Prakashan, Poona.
8. Keates, J.S. (1973): Cartographic Design and Production, Longman Group Ltd.
9. Mailing, D.H. (1973): Co-ordinate Systems and Map Projections. George Philip and Sons Ltd.
10. Monkhouse, F.J. and Wilkinson, H. R. (1962): Maps and Diagrams, Methuen and Company Ltd., London.
11. Nag, P. (ed.) (1984): Census Mapping Survey, Concept Publishing Company, New Delhi.
12. Nair, N. B. (1996): Encyclopaedia of Surveying, Mapping and Remote Sensing. Rawat Publications., Jaipur and New Delhi.
13. Raisz, E. (1962): Principles of Cartography. McGraw Hill Books Company, Inc., New York.
14. Misra, R.P. and Ramesh, A. (1999): Fundamentals of Cartography. Concept Publishing Company, New Delhi.
15. Rhind, B. and Adams, T. (ed.) (1983): Computers in Cartography. British Cartographic Society, London.

Unit-22: Environmental mapping

Course objectives and expected outcome:

Students will develop cartographic skills for constructing various thematic maps and foster their abilities in showing the spatial distribution of various environmental elements and their proper interpretation. This ability will help them to formulate environmental plans and to manage and conserve vegetation, soil, water etc.

1. Concept of environmental mapping and its significance.
2. Sampling technique, data preparation, and mapping technique of environmental parameters.
3. Surface and ground water quality mapping and interpretation.
4. Air quality mapping and interpretation.
5. Soil mapping and interpretation.

Suggested References:

1. Bailey, T. and Gatrell, A. C. (1995): Interactive Spatial Data Analysis. Longman , Harlow.
2. Dorling, D. and Fairborn, D. (1997): Mapping. Ways of Representing the World. Longman, Harlow.
3. Fraser Taylor, D.R. (1980): The Computer in Contemporary Cartography. John Wiley and Sons, New York.
4. Fraser Taylor, D.R. (ed.) (1983): Graphic Communication and Design in Contemporary Cartography. John Wiley and Sons, New York.
5. Griffith, D. A. and Amehein (1997): Multivariate Statistical Analysis for Geographers. Prentice Hall, Englewood Cliffs, New Jersey.
6. Griffith, D. A. and Amehein (1997): Statistical Analysis for Geographers. Prentice Hall, Englewood Cliffs, New Jersey.
7. Kanetkar, T.P. and Kulkarni, S.V. (1967): Surveying and Levelling, Part II, A.V.G. Prakashan, Poona.
8. Keates, J.S. (1973): Cartographic Design and Production, Longman Group Ltd.
9. Mailing, D.H. (1973): Co-ordinate Systems and Map Projections. George Philip and Sons Ltd.
10. Monkhouse, F.J. and Wilkinson, H. R. (1962): Maps and Diagrams, Methuen and Company Ltd., London.
11. Nag, P. (ed.) (1984): Census Mapping Survey, Concept Publishing Company, New Delhi.

12. Nair, N. B. (1996): Encyclopaedia of Surveying, Mapping and Remote Sensing. Rawat Publications., Jaipur and New Delhi.

PAPER- 206 Digital image processing and GIS and Hydro-morphological techniques

Unit-23: Digital image processing and GIS

Course objectives and expected outcome:

The course is designed for the general ideas of GIS and image-based information. Upon completion of this course, students get benefit from these baseline concepts to further increase their knowledge.

1. Digital Image Processing: Pre-processing, Image Registration, Image geometric operations, Enhancement, Spatial filtering, Transformation, classification, data compression, spectral pattern recognition, output generation.
2. Digital image classification technique-supervised, unsupervised and interpretation.
3. Basic Concepts and components in GIS: An overview of the development of the GIS fields, Data Sources; Data acquisition methods.
4. Data structure: Vector and Raster data structures, data storage.
5. Creation of Vector layer: Point, Line and Polygon features.

Suggested References:

1. Campell, J. B. (2003): Introduction to Remote Sensing. 4th ed. Taylor and Francis, London.
2. Cracknell, A. and Ladson, H (1990): Remote Sensing Year Book. Taylor and Francis, London.
3. Curran, P.J. (1985): Principles of Remote Sensing. Longman, London.
4. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science, Bangalore.
5. Floyd, F. and Sabins, Jr. (1986): Remote Sensing: Principles and Interpretation. W.H. Freeman, New York.
6. Gautam, N.C. and Raghavswamy, V. (2004): Land Use/ Land Cover and Management Practices in India. B.S. Publications., Hyderabad.
7. Harry, C.A. (ed.) (1987): Digital Image Processing. IEEE Computer Society, California.
8. Hord, R.M. (1982): Digital Image Processing of Remotely Sensed Data. Academic Press, New York.
9. Jensen, J.R. (1986): Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice-Hall, Englewood Cliffs, New Jersey.
10. Jensen, J.R. (2004): Remote Sensing of the Environment: An Earth Resource Perspective. Prentice-Hall, Englewood Cliffs, New Jersey. Indian reprint available.
11. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
12. Nag, P. (ed.) (2000): Thematic Cartography and Remote Sensing. Concept Publishing. Company, New Delhi.
13. Nag, P. and Kudrat, M. (1998): Digital Image Processing, Concept Publishing Company, New Delhi.

Unit -24: Hydro-Morphological Technique

Students will be skilled to identify basin morphological characters in the field and come to know about the importance of drainage network analysis and its practical applications. They will also become skill- full in determining of pebble and sediment analysis and handling of different field instruments.

1. Basin morphometry: Form factor, Circularity ratio, Compactness co-efficient, Elongation ratio, Relief ratio.
2. Drainage network analysis: Stream ordering (after Horton 1945, A.N. Strahler,1964, R.L. Shreve

1967), Bifurcation ratio, Law of stream length, sinuosity Index (Schumm's model, Muller's Model), drainage texture analysis, Length of overlay flow, Constant of channel maintenance.

3. Analysis of pebble and Sediment: Shape Indices and textural analysis by Seiving.
4. Determination of discharge by using equipments: Total Station, Fish-finder, Flow meter, Calculation of velocity and discharge using Manning equation.
5. Preparation of River bank erosion map and vulnerable zone with the aid of GPS and GIS techniques.

Suggested reading:

1. Bedinent, P.B.et.al. (2008*): Hydrology and Floodplain Management*, Prentice Hall,Upper Saddle River, NJ07458.
2. Biswas,A.K. (1972*): History of Hydrology*, North Holland Pub.Cc. Amsterdam.
3. Boca Raton, F.L Viessman and Lewis (1996): *Introduction to Hydrology*, Harper Collins, Newyork.
4. Chow V.T., Maidment, D.R. and Mays, L.W. (1988*): Applied Hydrology*, Mc Graw Hill, Newyork.
5. Dingman, SL. (2002): *Physical Hydrology*, 2nd Edition, Prientice Hall, EnglewoodCliffs
6. Hyot, W.G. and W. Langbain (1955): *Floods*, Prentice Hall University Press, Princeton.
7. Keith, D. and Mays,L.W. (2004): *Ground water hydrology*, 3rd Edition, Wiley, Chichester.
8. Kintede-Levario, H. (2007): *Design for Water: Rain Water Harvesting, Storm Water Catchment and Alternate Water Reuse*, New society publishers, Gabriola Island.
9. Mays, L.W. (1996): *Water Resources Handbook*, Mc Graw Hill, Newyork.
10. Murthy, K.S. (1998): *Watershed Management in India*, 3rd edition, Wiely Eastern Ltd. / New Age International Ltd., New Delhi: 198p.
11. Pethick, J. (1984): *An Introduction to Coastal Geomorphology*, Edward Arnold, London: 259 p
12. Singh, V.P. and D.K. Frevest (2006): *Watershed Models*, CRC Press,
13. Todd, D.K. (2004): *Groundwater Hydrology*, 3re Edition, Wiley, Chichester

Semester- III
THEORETICAL COURSES (300 Marks)

PAPER GEO-301:
Geographical Thought & Contemporary Discourses in Geography

Unit: 25 - Geographical Thought

Course objectives and expected outcome:

The course incorporated the fundamental concepts of geographical thought. It includes the premier concepts of geography at the time of its emergence to the past century (20th century). Upon completion of this course, the students would have a comprehensive idea of the fundamental nature of Geography and how it evolves with time.

1. The Field of Geography, Place of Geography in classification of knowledge and other disciplines, Geography as a social science.
2. Physical and Human Geography. Linkages among the sub-disciplines of physical and human geography.
3. Contributions of Varenius, Kant, A .V.Humboldt, Ritter, Heartshorne & Scheifer
4. Development of Geography: Contribution of German, French, British, American and soviet schools of thought.
5. Concepts Of Hypothesis, Law, Theory & Model; Typology o-f Model &Uses, Structure and Components.

Suggested References:

1. Arentsen M., Stam R. and Thuijis R., 2000: Post-modern Approaches to Space, e book.
2. Bhat, L.S. (2009) Geography in India (Selected Themes). Pearson
3. Bonnett A., 2008: What is Geography? Sage.
4. Dikshit R. D., 1997: Geographical Thought: A Contextual History of Ideas, Prentice– Hall India.
5. Hartshorne R., 1959: Perspectives of Nature of Geography, Rand MacNally and Co.
6. Holt-Jensen A., 2011: Geography: History and Its Concepts: A Students Guide, SAGE.
7. Johnston R. J., (Ed.): Dictionary of Human Geography, Routledge. Johnston R. J., 1997:
8. Geography and Geographers, Anglo-American Human Geography since 1945, Arnold, London.
9. Kanpur A., 2001: Indian Geography Voice of Concern, Concept Publications.
10. Maiti, R and Moitra Maiti, M, 2018: Modern Approaches to Geographical Thought, Nabadaya Publications, Kolkata.
11. Martin Geoffrey J., 2005: All Possible Worlds: A History of Geographical Ideas, Oxford.
12. Soja, Edward 1989. Post-modern Geographies, Verso, London. Reprinted 1997: Rawat Publ., Jaipur and New Delhi.

Unit: 26 - Contemporary Discourses in Geography

Course objectives and expected outcome:

Students will learn about the philosophical background that guides the approaches and ways of thinking to design teaching-learning and research under different discourses of Geography. It aims to achieve a clear insight into theoretical foundation of the subject that is articulated among different courses and guides to design objectives and methodological framework of geographical enquiry. This understanding helps the learners to locate themselves in the wide and dynamic philosophical domain of the discipline and help them to concentrate towards developing geography as a science of holistic synthesis.

1. Conceptual & methodological evolution in geography; paradigm shift
2. Pragmatism, positivism & quantitative revolution in geography.
3. Development of critical social theories: Humanistic geography, Radicalism, Welfare geography,

Geography of gender.
4. Structuralism and Post-structuralism, Modernism and Postmodernism.
5. Concepts of space: types: time geography, space time quantinuum

Suggested References:

1. Arentsen M., Stam R. and Thuijis R., 2000: Post-modern Approaches to Space, e book.
2. Bhat, L.S. (2009) Geography in India (Selected Themes). Pearson
3. Bonnett A., 2008: What is Geography? Sage.
4. Dikshit R. D., 1997: Geographical Thought: A Contextual History of Ideas, Prentice– Hall India.
5. Hartshorne R., 1959: Perspectives of Nature of Geography, Rand MacNally and Co.
6. Holt-Jensen A., 2011: Geography: History and Its Concepts: A Students Guide, SAGE.
7. Johnston R. J., (Ed.): Dictionary of Human Geography, Routledge. Johnston R. J., 1997:
8. Geography and Geographers, Anglo-American Human Geography since 1945, Arnold, London.
9. Kanpur A., 2001: Indian Geography Voice of Concern, Concept Publications.
10. Maiti, R and Moitra Maiti, M, 2018: Modern Approaches to Geographical Thought, Nabadaya Publications, Kolkata.
11. Martin Geoffrey J., 2005: All Possible Worlds: A History of Geographical Ideas, Oxford.
12. Soja, Edward 1989. Post-modern Geographies, Verso, London. Reprinted 1997: Rawat Publ., Jaipur and New Delhi.

PAPER GEO-302: Land Water Forest: Concepts, and Conservation & Food and Agricultural geography

Unit-27: Land Water Forest: Concepts, and Conservation

Course objectives and expected outcome:

Students will acquire knowledge about primary resources, their conflicts in uses, availability and need for conservations. They will understand the environmental and economic services of land, water and forests. It will enhance their ability of being a resource planner

1. Concept of Land, Land class systems, land ~~use~~ capability classification, Land degradation, land conservation and land improvement.
2. Water assessment: water quality, water availability and scarcity of water, freshwater- saline water interface in coastal areas, classification and functions of wetlands, wide use of wetlands.
3. Characterization and diversity of rainforests and mangrove forests; Degradation and management of forest, social forestry and Agro-forestry,
4. Application of RS-GIS-GPS for land, water, forest resources assessment, monitoring, and modeling
5. Land, water, and forest resources: management, policies and planning

Suggested References:

1. De, N.K and Jana, N.C (1997): The Land: A Multifaceted Appraisal and Management, Sribhumi Publishing Co.
2. FAO (1974): A Framework for Land classification; Soil Bulletin No. 32, FAO, Rome.
3. FAO (1976): Approach to Land classification; Soil Bulletin No. 22, FAO, Rome.
4. Human Resource Development (2008): Issues on Ecosystem and Environment, UNDP.
5. Desai Mamata (2008): Environmental conservation : management and development : the sustainable approach, acb publications Kolkata.
6. Yasmi Yurdi (2010): Conflict over forests and land in Asia Impacts, causes, and management, The Centre for People and Forest, RECOFTC: Website: www.recoftc.org.
7. Pravat Kumar Shit, Hamid Reza Pourghasemi Pulakesh Das, and Gouri Sankar Bhunia (eds.) (2020): Spatial Modeling in Forest Resources Management, Springer Nature (ISBN 978-3-030-56541-1).
8. James MacGregor, Charles Palmer, Jon I. Barnes (IIED, 2007).Forest Resources and Rural Livelihoods in the North-central Regions of Namibia

Unit-28 Food & Agricultural geography

Course objectives and expected outcome:

Learners will understand about functional integration of various process that results in formation and distribution of different types of soil and their implication of agricultural systems. They will develop special aptitude on soil survey techniques to analyse patio-temporal distribution of agricultural systems. Students will also get a wider concepts about food security and its regional pattern. They will be able to compare the scenario of food security of developed and developing countries. The syllabus also help to acquire the knowledge the problem of global climatic change and its impact on food security.

1. Origin and Evolution of Agriculture, Determinants of agricultural practices -physical, Socio-economic, Cultural, Institutional, Technological and Political
2. Theory of Agricultural Location-Hoover, Sinclair's model of Peri-urban agriculture; Farming systems of the world with emphasis on recent trends in Dissemination of technologies, Organic Farming, Commercialisation and Globalisation of Agricultural practices.
3. Agricultural Regionalisation, Agro-climatic and Agro-ecological regions(India). Phases of Green Revolution, White Revolution, Blue Revolution, Yellow Revolution;
4. Concept and Indicators of Food Security, Regional Pattern of Food Security, Comparison between developed & developing countries on food security, FAO and Distribution justice over the countries of the world.
5. Food Security through Sustainable Agriculture, Problem of Global Climate change and Food Security, Mitigation Strategies.

Suggested References

1. Barun, J,et al. (1992): Improving Food Security of the Poor: Concept, Policy and Programme, International Food Policy Research Institute, Washington
2. Bryant, C.R., Johnston, T.R. (1992): Agriculture in the City Countryside, Belhaven Press, London.
3. Gautam, Alka (2012): agricultural Geography, Sharda Pustak Bhawan, Allahabad.
4. George, P.S., (1994): Food Security in South Asia: Performance and Prospects, Economic and Political
5. Grig, B, David (1995): An Introduction to Agricultural Geography, Routledge.
6. Hussain, Majid(2003): Agricultural Geography, Anmol Publications Pvt. Ltd., India.
7. Hussain, Majid(2007): Systematic Agricultural geography, Rawat Publications, new Delhi
8. Rao, C. S. Hanumantha(2005): Agriculture, Food Security, Poverty and Environment: esays on post reform India, Oxford University Press, new Delhi.
9. Report: Asian Development Bank(2010): Agriculture, Food Security and rural Development, Oxford
10. Reutlinger, S.,(1977); Food Insecurity: Magnitude and Remedies, Washington, U.S.A.
11. Shiva, bandana(1991): The Violence of Green Revolution: Third World Agriculture, Ecology and Politics, Zed Books University Press, New Delhi Weekly, Vol. 29 No.4

PAPER GEO-303: Special Paper
Process-form Relationship in Fluvial System & Applied Techniques in Fluvial Geomorphology

Unit-29 Process-form Relationship in Fluvial System

Course objectives and expected outcome:

Students will learn how to apply theoretical knowledge of geomorphology in wide range of engineering and management problems ranging from drainage basin management to hazard management. They are trained to apply geomorphic understanding on water management, landuse planning, sewage and solid waste management. They are also trained on their contribution in EIA and EMP. This course aims in revival of the applied value of the discipline.

1. Stream Energy: Impelling forces. Resisting force in channel: valley-scale resistance, channel-scale resistance and boundary resistance.
2. Entrainment, transport and deposition of sediment. Bed forms and bed material transport along sand-bed rivers. Instream-depositional landforms
3. Bank erosion and Channel shifting
4. Climate change and possible impacts on river system
5. River basin and Integrated River Basin Management (Case study on Shilabati/ Kangsabati/ Subarnarekha Basin)

Suggested References:

1. Chorley R.J., Schumm S.A and Sugden, D.E. 1985. *Geomorphology*, Methuen, London.
2. Chorley, R.J. 1969 introduction to fluvial processes. London: Methuen and Co.
3. Chow, V.T. 1959 *Open Channel Hydraulics*, Mc Graw-Hill, New York: p 680.
4. Chow, V.T., Maidment, D.R. and Mays, L.W. 1988. *Applied Hydrology*, New York, McGraw-Hill Book Company.
5. Fryirs, K.A. and Brierley,G.J. 2013 *Geomorphic Analysis of River Systems: An Approach to Reading the Landscape*. Chichester: Wiley-Blackwell
6. Leopold, L.B., Wolman, M. G. and Miller, J. P. 1964. *Fluvial processes in geomorphology*. San Fransisco: W. H. Freeman.
7. Morisawa, M. *Rivers; Forms and Processes*, London: Longman, 1885.
8. Maiti, R. K. 2016 *Modern approaches to fluvial geomorphology*. NewDelhi: Primus
9. Ro. Charlton, *Fundamentals of Fluvial Geomorphology*, London: Routledge, 2008.
10. Schumm S.A. 1977. *The Fluvial System*, A Willey Interscience Publication, John Wiley & Sons, New York.

Unit-30 Applied Techniques in Fluvial Geomorphology

Course objectives and expected outcome:

Students will learn about the empirical methods to estimate various geomorphic attributes by using field instruments or through models run by sophisticated software. This will offer them training on data generation, computation and analysis. This course aims to enable learners deal with real world problems using advanced technology.

1. Basin Morphometry: Linear, areal and relief morphometric techniques.
2. Estimating flow velocities, discharge and stage: Theoretical and empirical techniques.
3. Sediment discharge estimates: Bed load and suspended load.
4. Anthropogenic impacts of river systems: dam site selection and impact assessment.
5. Watershed delineation, preparation of DEM using GIS.

Suggested References:

1. Chorley R.J., Schumm S.A and Sugden, D.E. 1985. *Geomorphology*, Methuen, London.
2. Chorley, R.J. 1969 introduction to fluvial processes. London: Methuen and Co.
3. Chow, V.T. 1959 Open Channel Hydraulics, Mc Graw-Hill, New York: p 680.
4. Chow, V.T., Maidment, D.R. and Mays, L.W. 1988. Applied Hydrology, New York, McGraw-Hill Book Company.
5. Fryirs, K.A. and Brierley,G.J. 2013 Geomorphic Analysis of River Systems: An Approach to Reading the Landscape. Chichester: Wiley-Blackwell
6. Leopold, L.B., Wolman, M. G. and Miller, J. P. 1964. Fluvial processes in geomorphology. San Fransisco: W. H. Freeman.

7. Morisawa, M. Rivers; Forms and Processes, London: Longman, 1885.
8. Maiti, R. K. 2016 Modern approaches to fluvial geomorphology. NewDelhi: Primus
9. Ro. Charlton, Fundamentals of Fluvial Geomorphology, London: Routledge, 2008.
10. Schumm S.A. 1977. The Fluvial System, A Willey Interscience Publication, John Wiley & Sons, New York.

PAPER GEO-304: Elective Paper (CBCS)

Geography of West Bengal and Geography of tourism

Unit-31 Geography of West Bengal

Course objectives and expected outcome:

Students will be able to learn about the regional boundaries of geomorphological regions in West Bengal, their unique characteristics and regional importance.

1. Regional geomorphology of West Bengal with special reference to physiographic divisions.
2. Drainage systems of West Bengal
3. Geomorphology of Darjeeling Himalaya and Terai Region with special reference to landslides and alluvial fans.
4. Form, process and evolution of Ganga delta.
5. Geomorphology and soil-landform assemblages of lateritic badland (West Bengal), with special reference to Gangani

Suggested Readings

1. Bose, S. C. (1978). Geography of West Bengal.
2. Chakravorty, Satyesh (1972): Geography of West Bengal, Presidency College.
3. Choudhury, A.B, (1969): Geography of West Bengal, Ranjit, Tirtha (2008): Geography of India, Rawat Publications, Jaipur.
4. Goutam, Alka (2012): Advanced Geography of India, Sharda Pustak Bhawan, Allahabad
5. Husain, Majid (2011): Geography of India, Tata McGraw Hill Education, New Delhi.
6. Kapur Anu, (2002): Indian geography: voice of concern, Concept Publishing New Delhi.
7. Khullar D. R. (2011): India A Comprehensive Geography, Kalyani Publishers. 7. Singh, R. L. (2009): India: A Regional Geography, Ubs Publishers' Distributors (p) Ltd.
8. Starkel, L. and Basu, S. 2000 Rains, Landslides and Floods in the Darjeeling Himalaya, Indian National Science academy, New Delhi: 168p.

Unit-32: Geography of tourism

Course objectives and expected outcome:

Students will be able to learn about the importance of tourism as well as different types of tourism and their impacts on environment and society.

1. Definition of tourism and tourist; Classification of Tourists-local, national, and international
2. Types of tourism practices: Adventure, Medical, Pilgrimage, Leisure, Pleasure, Eco and cultural Tourism
3. Impact of Tourism Practices: Economic, Physical as well as Environmental, and Socio-cultural.
4. Sustainable Tourism: Concept and Indicators. Green Tourism, Eco-tourism
5. Policies' of Tourism in India.

Suggested Readings

1. Bhatia, A. K.1996: Tourism Development: Principles and Practices, Sterling Publishers, New Delhi.

2. Department of Tourism 2002: National Tourism Policy, Ministry of Tourism and Culture, Govt of India
3. Dhar, P.N. (2006) International Tourism: Emerging Challenges and Future Prospects. Kanishka, New Delhi.
4. Hall, M. and Stephen, P. (2006) Geography of Tourism and Recreation – Environment, Place and Space, Routledge, London.
5. Kamra, K. K. and Chand, M. (2007) Basics of Tourism: Theory, Operation and Practise, Kanishka Publishers, Pune.
6. Mathur, R.2007: International Tourism, ABD Publishers
7. Page, S. J. (2011) Tourism Management: An Introduction, Butterworth-HeinemannUSA. Chapter 2.
8. Raina, A.K., 2005: Ecology, Wild Life and Tourism Development: Principles, Practices and Strategies, Sarup & Sons
9. Raj, R. and Nigel, D. (2007) Morpeth Religious Tourism and Pilgrimage Festivals Management: An International perspective by, CABI, Cambridge, USA, www.cabi.org.
10. Sharma, J.K. ed.2000 : Tourism, Planning and Development-A new Perspective, Kanishka.
11. Singh Jagbir (2014) "Eco-Tourism" Published by - I.K. International Pvt. Ltd. S-25, Green Park Extension, Uphaar Cinema Market, New Delhi, India (www.ikbooks.com).
12. Tourism Recreation and Research Journal, Center for Tourism Research and Development, Lucknow

PRACTICAL COURSES (100 Marks)

PAPER **GEO-305:**
Advanced Quantitative Techniques and Physical Thematic Mapping

Unit-33: Advanced Quantitative Techniques
Course objectives and expected outcome:

The course, split into two units, corresponds to the basic and advance statistics, is a starting point of escalating the statistical analytical skills. It includes the founding concepts of probability distribution including the advanced linear modelling with matrix solution to the multivariate linear and non-linear model. These concepts are essential for augmenting the analytical skills of any beginner in Geography that includes both physical and social aspects of academic discipline. Upon completion of this course, the students get the benefit of having a strong mathematical and statistical analytical skills

1. Descriptive Statistics using MS Excel
2. Analysis of Variance: Objectives; One-way and Two-way ANOVA using SPSS Software
3. Multiple Regression: Linear multiple regression equation, Multiple and partial
4. correlation Coefficient using SPSS Software Cronbach's Alpha analysis using SPSS Software
5. Principal component analysis using SPSS Software

Suggested References:

1. Alvi. Z. (1995*): Statistical Geography: Methods and Applications*, Rawat Publication, New Delhi
2. John, C. D. (2002): *Statistics and Data Analysis in Geology*; John Wiley & Sons.
3. Mehmood, A (1977): Statistical methods in Geographical studies, Rajesh Pub. New Delhi
4. Pal, S.K. (1999): *Statistics for Geoscientists*, Concept publishing Company, New Delhi: 423p.
5. Sarkar, A. (2006): *Practical Geography; A systematic approach*, Orient Longman Ltd, Hydrabad,
6. Silk, J. (1979): *Statistical techniques in Geography*, George Allen and Unwin, London: 276p.
7. Swan, A.R.H.; Sandilands, M. and McCabe, P. (1995): *Introduction to Geological Data Analysis*, Blackwell. 446p.
8. Walford, P. (1995): *Geographical Data Analysis*, John Wiley and Sons Inc., New York: 446p.

Unit-34: Physical Thematic Mapping
Course objectives and expected outcome:

Students will develop cartographic skills for constructing various thematic maps and foster their abilities in showing the spatial distribution of various physical elements and their proper interpretation. Skill of understanding spatial integration among physical elements will be developed to foster the abilities of holistic abilities.

1.-Forest mapping and habitat fragmentation analysis.
2. Calculation and Mapping of Climatic Indices-Rainfall Deviation, Rainfall-Runoff, and Determination of Dry & Wet Period;
3. Analysis of Soil and Mapping (NPK, pH, Organic Matter);
4. Analysis of Water Quality and mapping (pH, DO);
5. Land Capability Mapping

Suggested References:

1. Singh, R.L. and Singh, R.P.B. 1992: Elements of practical Geography. Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. and Guptill, S.C. 1995: Elements of Cartography, John Wiley and Sons, New York.
2. Glenn, R. C. (1982). Soil Testing Handbook for Professional Agriculturists. Department of Plant and Soil Sciences.
3. Baver LD, Gardner WH & Gardner WR. 1972. Soil Physics. John Wiley & Sons.
4. Ghildyal BP & Tripathi RP. 2001. Soil Physics. New Age International.
5. Brady, Nyle C., 2001: The Nature and Properties of Soils, Prentice-Hall of India Private Ltd., New Delhi, India, 10th Edition.
6. Bunting, Brian T., 1967: The Geography of Soil, Hutchinson University Library, London UK, 2nd Edition.
7. Clarke, G.R., 1971: The study of soil in the field, Oxford University Press, Great Britain, UK, 5th Edition.
8. Fitz Patrick, E.A., 1983: Soils: their formation, classification, and distribution, Longman Group Limited, New York, USA, 2nd Edition.
9. Soil Survey Staff, 1951: Soil Survey Hand Book USDA, Agri. Hand book-18. Soil Survey Staff, 1975: Soil Taxonomy; a basic System of Soil Classification for making and Interpretation Soil Survey USDA, Agri. Hand Book-4936.
10. Rochelle, J. A., Lehmann, L. A., & Wisniewski, J. (Eds.). (1999). Forest fragmentation: wildlife and management implications. Brill.
11. Grose, C. J. (1999). Land capability handbook. Guidelines for the Classification of Agricultural Land in Tasmania. Second Edition, DPIWE Tasmania, Australia.
12. Klingebiel, A. A., & Montgomery, P. H. (1961). Land-capability classification (No. 210). Soil Conservation Service, US Department of Agriculture.
13. FAO (1974): A Framework for Land classification; Soil Bulletin No. 32, FAO, Rome.

PAPER GEO-306: Field Report
Course objectives and expected outcome:

This course aims to present the essence of geography as a field science. Students will develop their aptitude in observation, data generation through field survey, data analysis with various software and advanced techniques. They will also know how to represent spatial data through various cartographic

techniques and mapping. A hands on practical training is practiced through rigorous involvement in all the stages of pre-field, field and post field works

Unit-35: Preparation of field report (Special paper based)

Presentation of research work-25 (Grand Viva-10 and/or Power Point presentation-15)

Generation of report (within about 100 A4 size pages including 30-40 maps/diagrams/field photographs) on the basis of field works carried out

Suggested Readings

1. Compton,R.R.(1985): *Geology in the Field*,John Wiley and Sons.
2. Gardiner,V. and Dacombe,R.(1983): *Geomorphological Field Manual*, George Allen and Unwin, London
3. Goudie, A.(1981): *Geomorphological Techniques*, George Allen and Unwin, London
4. Kothari,R.C(2004):*Research Methodology*,New Age International Publishers, New Delhi.
5. Mahmood, A (1977): *Statistical methods in Geographical studies*, Rajesh Pub. New Delhi
6. Mathur,S.M (2001): *Guide to Field Geology*, Prentice Hall, India
7. Mishra,H.N (1998): *Research Methodology in Geography*,Rawat Publication.
8. *National Family Health Survey* (NFHS-3) 2005-2006, Vol-I and II International Institute for population Science,Mumbai
9. Pal, S.K. (1999): *Statistics for Geoscientists*, Concept publishing Company, New Delhi: 423p.
10. Ramachandran, P.(1971):*Training in Research Methodology in Social Sciences in India*, ICSSR, New Delhi
11. Shama,B.A.V. et al (1983): *Research Methods in Social Sciences*, Chaitanya Publishing House, Allahabad

Unit-36: Viva on field report (Special paper based)

Suggested Readings

1. Goudie, A.(1981): *Geomorphological Techniques*, George Allen and Unwin, London
2. Mathur,S.M(2001): *Guide to Field Geology*, Prentice Hall, India
3. *National Family Health Survey* (NFHS-3) 2005-2006, Vol- I and II International Institute for population Science,Mumbai
4. Pal, S.K. (1999): *Statistics for Geoscientists*, Concept publishing Company, New Delhi: 423p.
5. Ramachandran, P.(1971):*Training in Research Methodology in Social Sciences in India*, ICSSR, New Delhi
6. Shama,B.A.V. et al (1983): *Research Methods in Social Sciences*, Chaitanya Publishing House, Allahabad.

Semester- IV

Paper-401 Regional Development & Planning and Landscape Ecology & Planning

Unit-37: Regional Development & Planning Marks 25/ Credit 2
Course objectives and expected outcome:

This course is focused on the fundamental concepts of regional geography including the classical approach to define an area as region. It includes the methods of regional delineation and classification of region based on their properties. On completion of this course, the pupils get a comprehensive understanding of the regional analysis. They will also learn about the concept of planning region and their delineation methods and this understanding may help them to assist in various planning process.

1. Region: concept, type, Hierarchy of Regions, Methods of delineation of Region.
2. Regional planning and Planning region: Concept and types, Different approaches to regional planning, Planning regions of India, Environmental issues in regional development,
3. Regionalization: Processes and components, Schemes of Regionalization of India for development: tribal, agriculture, metropolitan,
4. Concept of development; Theoretical development of region: Marxist theory of regional development, Central place theory (Walter Christaller's), Dependency theory (A. G. Frank), Polarized Development and Uneven Development (Perroux, Friedman, Hirschman, Myrdal); Modernisation theory (W. W. Rostow)
5. Development policies in India under structural adjustment: sustainable development, PURA, Smart city, NITI Aayog

Reference

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3. Chandana, R.C. (2000): Regional Planning and Development, Kalyani Publishers
4. Ray Chaudhuri, J. (2009): An introduction to development and regional planning: with special reference to India, Orient BlackSwan.
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6. Sanyal, B. M (2001): Decentralized Planning- Themes and Issues, Concept.
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15. De Blij, H.J. and Muller, P.O. 1997: Geography: Realms Regions and Concepts, 8th edition, John Wiley and Sons Ltd., New York.
16. Agarwal, A.N. (1995): Indian Economy, Problems of Development and Planning, Vishwa Prakasan, New Delhi.
17. Wheeler, S. M. (2009): Planning for Sustainability, second edition, Routledge

Unit-38: Landscape Ecology & Planning Marks 25/ Credit 2

Course objectives and expected outcome:

Landscape ecology is the study of the pattern and interaction between ecosystems within a region of interest, and the way the interactions affect ecological processes, especially the unique effects of spatial heterogeneity on these interactions. This paper provides students with an introduction to the discipline of landscape ecology. Thus, this paper focuses on the characteristic scale of spatial pattern; defining the elements of pattern; connectedness, fractal geometry, how these aspects of pattern are interconnected in landscapes, and how they vary. It may help students detecting, analyzing, or simulating landscape change; and modelling populations or communities in landscape mosaics and educate students for professional life.

1. History and definition of landscape ecology, its relationship to other subfields of ecology, Causes of landscape pattern (abiotic, biotic, human land use and disturbance)
2. Data for studying landscapes (GIS, Remote Sensing): Measuring landscape pattern (spatial statistics, landscape pattern analysis)
3. Landscape disturbance dynamics: Agricultural intensification, deforestation and development.
4. Effects of landscape pattern on organisms, populations, communities and ecosystem processes
5. Landscape management and planning: Role of keystone species, conservation of fragmented habitats, sustainable landscape, and role of Traditional Ecological Knowledge (TEK) in conserving landscape. Role of GIS in landscape planning.

References:

1. Farina, Almo:Principles and Methods in Landscape Ecology Towards a Science of the Landscape Series: Landscape Series, Vol. 3,Springer
2. Forman R.T.T.: Land mosaic. The ecology of landscape and region. Academic press Cambridge UK
3. Frohn Robert C. (1997): Remote Sensing for Landscape Ecology: New Metric Indicators for Monitoring, Modeling, and Assessment of Ecosystems, Taylor & Francis
4. Gadgil Madhav, Guha Ramachandra : The Use and Abuse of Nature: incorporating This Fissured Land: An Ecological History of India and Ecology and Equity, Oxford University Press.
5. Hutchinson and Smith, D. (1996) : Ethnicity : Oxford University Press, Delhi
6. Jones, Emrys (1965): Human Geography, Chatto and Windies, London. Jones,
7. E. and Eyles, J. (1977): An Introduction to Social Geography, Oxford University Press, Oxford
8. Jordon and Lester, G. (1995) : The Human Mosaic, Harper and Row, New York
9. Turner M.G. & Gardner R.H .: Quantitative method in landscape ecology Springer-Verlag New York
10. Turner M.G. :Landscape Heterogeneity and disturbance Springer-Verlag , Germany
11. Turner, Monica G., Gardner, Robert H., O'Neill, Robert V.:Landscape Ecology in Theory and Practice Pattern and Process,Springer
12. Vink A.P.A.: Landscape ecology and land use, Longman, London & New York
13. Wu jianguo and Hobbs Richard j. (2007): Key Topics in Landscape Ecology, Cambridge University Press

Paper-402 Social & Cultural Geography and Contemporary Issues in Geography

Unit-39: Social & Cultural Geography Marks 25/ Credit 2

Course objectives and expected outcome:

The paper is based on the nature, scope and content of social and cultural Geography. The paper will examine the role of social divisions such as class, 'race'/ethnicity, gender and sexuality in shaping the social geographies of regions. Emphasis is given on cross-disciplinary, critical engagement with current events. On completion of the course, students are able to Understand the nature, scope, and concept, relationship between culture and social environment, and right of information act, the cultural complex and traits of culture and its concepts, evolution to civilization and cultural system according to religion, language and geography, and global cultural changes.

1. Social Geography: Definition, Schools of thought, recent trends, social structure and social processes, social stratification, social exclusion
2. Social Justice, Social wellbeing and Quality of life: Concepts
3. Concept of culture, cultural hearths and cultural realms of the world
4. Evolution of Cultural Geography
5. Concepts of cultural landscape, cultural heritage, cultural convergence, cultural segregation, cultural ecology

Reference

1. Hussain, M. (2010): Human Geography, Rawat Pub. Co., New Delhi.
2. Robinson H (1976): Human Geography, Mac Donald & Evans, London.
3. De Blij H.J. 1996: Human Geography: Culture, Society and Space, John Wiley and Sons Inc., New York.
4. Ahmad, Aijazuddin., 1999, Social Geography, Rawat Publication, New Delhi
5. Ahuja, Ram, 1999, Society in India, Rawat Publication, Delhi
6. Ahuja, Ram, Social Problems in India, Rawat Publication, New Delhi
7. Banerjee Guha, S. ed. (2004) Space,Society & Geography, Rawat Publication, Delhi
8. Jones, E., Eyles, J., An Introduction to Social Geography, Oxford University Press 9. Singh, G.N and Nath, Kashi (2004): Cultural Geography-Form and Process, Concept Publication, New Delhi.
9. Perry, A.J and Perry, E.K (2010): Contemporary Society: An Introduction to Social Science, Pearson Education, Noida, India
10. Johnston. R. J. (2000): The Dictionary of Human Geography.Blackwell. UK
11. Mitchell, D. (2000): Cultural Geography: A Critical Introduction, Wiley
12. Carter, J. And Jones, T.: Social Geography: An Introduction to Contemporary Issues, Edward Arnold, London

Unit-40: Contemporary Issues in Geography Marks 25/ Credit 2

Course objectives and expected outcome:

The syllabus provide a wider knowledge about the contemporary global and national issues like which will make the students more inquisitive to the recent research and make them interested to explore their potentialities to address these problems

1. Interstate and International water dispute with special reference to India
2. Global Climate Change and water scarcity: role of Geography
3. Political and environmental refugees: problems at global scale
4. Geographical perspectives of crime with special reference to crime against women
5. History of pandemics and their spatial perspectives

References

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2. Iyer, R.R., (1994a) "Federalism and Water Resources", Economic and Political Weekly, March 26, 733-738.
3. Gundimeda Haripriya and Howe Charles W. Interstate River Conflicts: Lessons from India and the U.S.
4. Cullet, Philippe, (2007), Water Law in India – Overview of Existing framework and proposed reforms, IELRC working paper, International environmental law research centre, Geneva, Switzerland

5. Allan, T. Watersheds and Problemsheds: Explaining the Absence of Armed Conflict over Water in the Middle East. MERNIA: Middle East Rev,Int Affairs. 2 (No. 1, March); 1998.
6. Gleick, P. Environment and Security: Water Conflict Chronology. Oakland, CA: Pacific Institute; (Updated October) 2008.
7. Arnold C. Dupuy, 2009 Global Climate Change And Water Scarcity: Potential Impact on International Conflicts *Technology* Vol. 11, Issue 3 Cognizant Communications Corporation pp 68-77
8. Mukheibir Pierre, 2010 Water Access, Water Scarcity, and Climate Change in Environmental Management (2010) 45 Springer Science+Business Media, LLC 2010 pp 1027–1039 10.

Paper-403 Population &Welfare Geography and Political Geography & globalisation

Unit-41: Population &Welfare Geography Marks 25/ Credit 2

Course objectives and expected outcome:

Through this module students will learn the various aspects of population growth process, its impact on economy, society and politics. Various policy regarding the control and development of human resources, their necessity, and outcome will be understood. This understanding will help them to take part in various govt schemes and programmes relating to population issues.

1. Theories of Population Growth- Malthusian, Neo-Malthusian, Boserup, Herbert Spencer's Theory.
2. Population Change- Factors affecting Population Change, Fertility & its measures, World pattern of Fertility, Measures of Mortality, Mortality pattern in the World.
3. Migration- Transnational Migration- Diaspora & Identity Crisis.
4. Welfare Approaches in Human Geography, Welfare Geography & Social Well-Being, Well Being & Level of Living
5. Discrimination, Deprivation and Poverty- Concept of Absolute & Relative Deprivation, Social Differentiation, Discrimination, Deprivation & Exclusion, Pattern of Rural & Urban Poverty.

Reference

1. Garnier, J Beajeau, 1966, Geography of Population, Commonwealth Printing Press Ltd. 2.
Hassan, M. Izhar, 2005, Population Geography, Rawat Publication.
2. Smith D.m. 1980 Human Geography: A welfare Approach, Edward Arnold. 4.
Bose, Ashis, 2001, Population in India, B.R. Publications, New Delhi.
3. Massimo, L.B. 2006, A concise History of World Population, Wiley-Blackwell(4th edition).

Unit-42: Political Geography & globalisation Marks 25/ Credit 2

Course objectives and expected outcome:

Students will develop their understanding on politics of space and spatial patterns of political and economic power distribution. This course will enable the of Government in India based on the principle of regional disparities in India. They will also know about the nature of conflict at national and global level centered on water and power resources. They will develop their interest in analyzing factors and local as well as global implications of economic and political agglomerations in the form of economic and political blocs. This course is focused on the fundamental concepts of globalization and its overall impacts on agriculture, industry, trade and culture. It also focused on the issues and challenges of globalization faced by the countries across the world. The students get a leading idea about the globalization and its consequences upon completion of this course.

1. Boundaries and Frontiers (with special reference to India). Global strategic views- Heartland and Rimland theories and their significance in present international politics.
2. Geography and federalism; Determinants of Electoral Behaviour

3. Geopolitics of Climate Change, Geopolitics of World Resources. Economic blocs (SAARC, ASEAN, OPEC, EU).
4. Concept of Liberalization, Privatization and Globalization (LPG). Impact of globalization on agriculture, industry and trade in India.
5. Globalization and cultural transformations.

References

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9. Jackson, WAD (1964): *Politics and Geographic Relationship*, PrenticeHall.
10. Mackinnon, D. and Cumbess, A. (2007): *An Introduction to Economic Geography: Globalization, Uneven development and ……*, Prentice Hall
11. Mc Cann(Eds)(2004):*From Local to the Global*, Rawat Publishers
12. Potter, R.B and Binns, Tony (Eds) (2001); Globalization and Development, Pearson Education Limited, Harlow
13. Taylor, P.J.(1985): *Political Geography, World Economy, Nation, State & Locality*, Longman, Landon. 19. Tomlinson, J (1999): *Globalization and Culture*, Cambridge Polity presss
14. Vertova, G. (2006): *The changing economic geography of Globalization*, Routledge 21. W.Murray (2006): *Geographies of Development*, Routhledge Publication
15. Weigest, H. (1957): *Principles of Political Geography*, Appleton century, Crasts Inc. New york. 23. Youngs, G. (2001): *Globalization, Communication and Technology*, Cambridge.

Paper-404 Regional Geomorphology of India and Physical, Human & Regional Development of Paschimanchal, W.B.

Unit-43: Regional Geomorphology of India Marks 25/ Credit 2

Course objectives and expected outcome:

Students will be able to learn about the regional boundaries of geomorphological regions in India, their unique characteristics and regional importance.

1. Major Physiographic Regions and their characteristics
2. Origin, geomorphology and drainage of Himalaya with special reference to Darjeeling.
3. Tectonics, drainage and geomorphology of Deccan Plateau.
4. Geomorphology and soil-landform assemblages of Chhotanagpur Plateau and its adjacent areas of West Bengal.
5. Geomorphology of Rajasthan desert with special reference to Marusthali.

References:

1. Ahmad, Enayat. (1972): *Coastal geomorphology of India*; Orient Longman.
2. Biswas, A. (1987): *Laterites and lateritoids, Explorations in the tropics*:

3. Mukhopadhyay, S.C: *Geomorphology Of The Subarnarekha Basin: The Chota Nagpur Plateau (eastern India*, the University of Burdwan,
4. Rawat, T. (2008*): Environment of the Himalayas*, Eastern Book Corporation
5. Sehgal, J and Blum, W.E et al. (1998): *Red and Lateritic Soils*, Oxford and IBH pub. 6. Sharma, Hari Shanker. (1982): *Perspectives in Geomorphology*; Concept.
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7. Starkel, L. and Basu, S. 2000 *Rains, Landslides and Floods in the Darjeeling Himalaya*, Indian National Science academy, New Delhi: 168p.
8. Deshpande C. D., 1992: India: A Regional Interpretation, ICSSR, New Delhi.
9. Johnson, B. L. C., ed. 2001. Geographical Dictionary of India. Vision Books, New Delhi.
10. Mandal R. B. (ed.), 1990: Patterns of Regional Geography – An International Perspective. Vol. 3 – Indian Perspective.
11. Sdyasuk Galina and P Sengupta (1967): Economic Regionalisation of India, Census of India
12. Sharma, T. C. 2003: India - Economic and Commercial Geography. Vikas Publ., New Delhi.
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19. Sharma, T.C. 2013: Economic Geography of India. Rawat Publication, Jaipur.

Unit-44: Physical, Human & Regional Development of Paschimanchal, W.B. Marks 25/ Credit 2

Course objectives and expected outcome:

The course will provide a detail view of geomorphological as well as regional setup of Paschimanchal, West Bengal. The students will get a wider knowledge about the different physical factors like relief, climate, forest, drainage. Interrelation between physical and cultural features is assessed in developing human resource.

1. Geomorphology of Rarh Plain in Southwest Bengal.
2. Weather characteristics and water resource management in Pachimanchal, W.B.
3. Forest Types, Degradations and their management practices in Pachimanchal, W.B.
4. Human Development Index of people living in the region of Pachimanchal, W.B.
5. Regional Development aspects and Environment Management Polices of Pachimanchal, W.B.

References:

1. Biswas, A. (1987): *Laterites and lateritoids, Explorations in the tropics*: V.S. Datye et. al., Prof. K.R.Dikshit felicitation Committee, Pune, PP.137-140.
2. District Census Handbook: Paschim Midnapore, Bankura & Puruliya districts,2011 Govt. of India
3. District gazetteer of Midnapore by O, Mally, 1911, Reprint from Govt. of West Bengal Press.
4. District Statistical Hand Book Govt. of West Bengal; Paschim Midnapore, Bankura & Puruliya districts; 2018.
5. History of Forest management in West Bengal - West Bengal Forest.
6. Mukhopadhyay, S.C: *Geomorphology Of The Subarnarekha Basin: The Chota Nagpur Plateau (eastern India*, the University of Burdwan,
7. Rawat, T. (2008*): Environment of the Himalayas*, Eastern Book Corporation
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Paper-405 Research Methodology and Research Exercise in Geography

Unit-45: Research Methodology Marks 25/ Credit 2

Course objectives and expected outcome:

The learners will get the initial training on various steps involved in geographical research. They will develop the idea on fundamentals of research methodology including data collection, methodology and report writing. This course aims to develop fundamental research aptitude among all the students

1. Approaches to research in geography: Inductive & Deductive, Objective & Subjective, Quantitative & Qualitative, Research Ethics.
2. Identification of Research Problems & Formulation of Theoretical background Literature Review, Research gap & Research Question.
3. Writing Research Proposal- Abstract & Synopsis, Objectives, Presentation of proposal, Bibliography, referencing Styles.
4. Methods of Data Collection- Primary & Secondary Data Target Groups, Preparation of Questionnaire, Survey Schedules, Interview.
5. Hypotheses- Definition, Types of Hypotheses, Test of Hypothesis with small samples, Type I & Type II Errors in Testing Hypothesis.

References:

1. Gomez, B & Jones III, J. P.(eds) 2010, Research Methods in Geography: A Critical Introduction(Vol.6), John Wiley & Sons.
2. Clifford, N., Cope, M., Gillespia, T. & French, S. (Eds) 2016, Key Methods in geography, Sage.
3. Kumar, R. 2019. Research methodology: A Step by Step Guide for Beginners, Sage Publications.
4. Ghosh B. N. 1982, Scientific Methods & Social Research Starling Publishers Ltd. 5. Young, P. V.1961, Scientific Social Survey & Research, Prentice hall, New York.
5. Creswell J., 1994: Research Design: Qualitative and Quantitative Approaches Sage Publications.
6. Dikshit, R. D. 2003. The Art and Science of Geography: Integrated Readings. Prentice-Hall of India, New Delhi.
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8. Mukherjee, Neela 2002. Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi.
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10. Special Issue on ―Doing Fieldwork‖ The Geographical Review 91:1-2 (2001).
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12. Wolcott, H. 1995. The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA

Unit-46: Research Exercise in Geography Marks 25/ Credit 2 (Field Report 15 and Presentation through PPT cum Viva 10)

Research Exercise on a specific given problem & Preparation of Report within 40-50 A4size pages & 15-20 maps & diagrams.

Research exercise should include:

1. Literature review, finding of research gap and formulating research question/hypothesis
2. Collection of data (primary / secondary) mentioning their sources
3. Data analysis with modern techniques
4. Major findings
5. Conclusion
6. References following standard style.

Paper-406 Spatial Analysis in Geography and Socio-Cultural Thematic mapping

Unit-47: Spatial Analysis in Geography Marks 25/ Credit 2

Course objective and expected outcome:

The focus of this course is to give a comprehensive understanding of the spatial organization through mathematical and statistical analysis. Upon completion of this course, the students get an inclusive knowledge and skills to perform spatial analysis at different spatial scale

1. Spatial Connectivity analysis: Centrality and connectivity Indices of Transport network, Shortest path analysis, Detour and spread.
2. Distance data analysis: Distance Matrix (Aggregate Travel Distance).
3. Point spatial distribution analysis: Uniformity, randomness and compactness.
4. Analysis of Directional Data: Rose diagram, Dominant Direction, Mean direction.
5. Analysis of Shape: Measures based on axial ratios, perimeters to areas, areas to axial length.

Unit-48: Socio-Cultural Thematic Mapping Marks 25/ Credit 2
Course objectives and expected outcome:

Students will develop cartographic skills for constructing various thematic maps and foster their abilities in showing the spatial distribution of various social elements and their proper interpretation. Skill of understanding spatial integration among social elements will be developed to foster the abilities of holistic abilities.

1. Mapping of social vulnerability
2. Mapping of social disparities, ethnic mapping.
3. Estimation and Mapping of Social Well-being, HDI.
4. Estimation and mapping of Human Poverty Index and Engle's ratio
5. Estimation and mapping of Labour Capacity Index

References

1. Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. and Guptill, S.C. 1995: Elements of Cartography, John Wiley and Sons, New York.
2. Basu, R. and Bhaduri, S. ed, 2007: Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.
3. Singh, R.L. and Singh, R.P.B. 1992: Elements of practical Geography. Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. and Guptill, S.C. 1995: Elements of Cartography, John Wiley and Sons, New York.