

M.A./M.Sc Syllabus in Geography

P.G. Department of Geography

Darrang College (Autonomous), Tezpur

Semester	Paper code	Paper name	Credit	Full marks
Semester I	GGY1016	Nature and Thoughts of Geography	6	80+20 (Theory + Internal Assessment)
	GGY1026	Geomorphology	6	80 +20 (Theory + Internal Assessment)
	GGY1036	Climatology and Biogeography	6	80 +20 (Theory + Internal Assessment)
	GGY1046	Economic Geography	6	80 +20 (Theory + Internal Assessment)
	GGY1054	Practical on Geomorphology, Climatology and Economic Geography	4	80 +20 (Theory + Internal Assessment)
Credit			28	
Semester II	GGY2066	Cartographic Methods in Geography	6	80 +20 (Theory + Internal Assessment)
	GGY2076	Geography of Environment and Development	6	80 +20 (Theory + Internal Assessment)
	GGY2086	Population and Settlement Geography	6	80 +20 (Theory + Internal Assessment)
	GGY2096	Geography of Regional Development of India with Special Reference to North-East India	6	80 +20 (Theory + Internal Assessment)
	GGY2104	Practical on Cartographic techniques, Population and Settlement Geography, and Regional development of India and N.E. India	4	80 +20 (Theory + Internal Assessment)
Credit			28	
	GGY3116	Quantitative Methods in Geography	6	80 +20 (Theory + Internal

				Assessment)
	GGY3123	Fundamentals of Remote Sensing, GIS and GPS	3	40+10 (Theory + Internal Assessment)
	GGY3133	Research Methodology in Geography	3	40+10 (Theory + Internal Assessment)
	GGY3146	Social, Cultural and Political Geography	6	80 +20 (Theory + Internal Assessment)
	GGY3164	Practical on Quantitative Methods & Research Methodology	4	80 +20 (Theory + Internal Assessment)
	GGY3156 (1)	Geoinformatics (Special paper)	6	80 +20 (Theory + Internal Assessment)
	GGY3156 (2)	Regional Development Planning (special paper)	6	80 +20 (Theory + Internal Assessment)
Semester III			28	
	GGY4176	Environment and Climate Change	6	80 +20 (Theory + Internal Assessment)
	GGY4186	Geography of Bhutan, Bangladesh and Japan	6	80 +20 (Theory + Internal Assessment)
	GGY4193	Practical on Remote Sensing and GIS	3	40+10 (Practical + Internal Assessment)
	GGY4206 (1)	Geoinformatics (special paper)	6	80 +20 (Theory + Internal Assessment)
	GGY4214 (1)	Geoinformatics (Practical)	4	80 +20 (Theory + Internal Assessment)
	GGY4223 (1)	Geoinformatics (Dissertation)	3	40+10
	GGY4206 (2)	Regional Development Planning (special paper)	6	80 +20 (Theory + Internal Assessment)
Semester IV				

	GGY4214 (2)	Regional Development Planning (Practical)	4	80 +20 (Theory + Internal Assessment)
	GGY4223 (2)	Regional Development Planning (Dissertation)	3	40+10
Credit			28	

Details of 1st semester

Title of the course	Nature and Thoughts of Geography
Course code	GGY1016
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. Through understanding of the basics of the subject ; 2. understanding of sophisticated models and techniques; 3. Interdisciplinary field – a field that crosses traditional boundaries between academic disciplines or schools of thought.

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 marks each)

Unit	Content
Unit 1	The field of Geography: Meaning, Scope, Definition and Nature, Place of Geography in the Classification of Sciences, interdisciplinary character of geographic study
Unit 2	Modern Geographical Thought towards emergence of new geography: Contribution of Alexander Von Humboldt, Karl Ritter, Vidal. de. La. Blache, Friedrich Ratzel, Carl O' Sauer, Richard Hartshorne, W.M. Davis
Unit 3	Approaches to study geography: nomothetic, quantitative, behavioural, humanistic, structurist, phenomenological, technological, applied, Marxist/radicalwelfare; Hagget's integrated approaches in geography: Spatial analysis, Ecological analysis, Regional complex analysis; David Harvey's modes of explanations: Cognitive, Morphometric, Functional, Temporal, System analysis Existing dualisms in geography: regional Vs systematic, physical Vs human, deterministic Vs possibilistic, historical Vs contemporary, the study of forma sites Vs the study of functional location
Unit 4	Development of Philosophical trends: Environmental determinism, Social Darwinism, Possibilism, neo-determinism, probabilism, positivism, pragmatism, functionalism, idealism, existentialism, realism, modernism, areal differentiation and their impact in the development in the field. Modern trends in geography: quantitative revolution, qualitative paradigms, routes to scientific explanation, locational analysis, models in geography and their applications

	Concept of place and space, spatial organization, spatial diffusion, spatial relationship, spatial interaction, spatial modeling
Unit 5	Post Modern concepts in geography: the critical revolution and challenges, geography of gender, space time dimension in geography, new environmentalism Indian Geography: present trend in Indian geography, inclusion of indigenous and sustainable knowledge system

Reading list:

Abler, R., Adams, J. and Gould, P.P., 1971: Spatial Organization: The Geographers' View of the World, Prentice-Hall, Englewood Cliff.

Ackerman, E.A., et al, 1965: The Science of Geography, Washington D.C., National Academy of Science/ National Research Council Pub. No. 1277.

Adhikari, Sudepta, 2015: Fundamentals of Geographical Thought, Orient Blackswan Pvt. Ltd., New Delhi.

Chorley, Richard, J. and Haggett, Peter (eds), 1967: Models in Geography, Methuen, London.

Chorley, Richard, J., 1973: Directions in Geography, Methuen, London.

Dikshit, R.D., 1994: The Art and Science of Geography, Prentice Hall of India, New Delhi.

Haggett, P., 2001: Geography: A Global Synthesis, Pearson Education, Essex, UK.

Hartshorne, R., 1939: The Nature of Geography, Association of American Geographers, Lancaster, Penn.

Hartshorne, R., 1959: Perspective on the Nature of Geography, Rand Mckully, Chicago.

Harvey, D., 1969: Explanation in Geography, St. Martin's Press, New York, 1969.

Johnston, R.J. et al. (eds), 1986: The Dictionary of Human Geography, Oxford, Basil Blackwell.

James, P: All possible worlds

Title of the course	Geomorphology
Course code	GGY1026
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80 +20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. Understanding of Principles and Concepts in Geomorphology; 2. Application of geomorphic concepts and techniques in the field; 3. Knowledge enrichment of glacial, fluvial and Aeolian processes. 4. Relate geomorphology to environment and applied issues.

(Principles & Concepts in Geomorphology (48 marks) to answer four questions, two questions carrying 16 marks each & two questions carrying 8 marks each)

Unit	Content
Unit 1	Definition & approaches: Historical objectives in Geomorphology, Contemporary geomorphology, morphology, Climatic geomorphology, process geomorphology, Geotechnical science, Applied geomorphology
Unit 2	Uniformitarianism & Catastrophism, Uniformitarianism versus Neo Catastrophism, time and space in geomorphology, morphology.
Unit 3	Models of landscape evolution: W.M. Davis; W. Penck; L.C. King; A Time-independent model: J.T. Hack, Dynamic equilibrium; System concept in geomorphology
Unit 4	Concepts & techniques in Applied geomorphology: Fluvial geomorphology, Palaeo-geomorphology, Environmental geomorphology, threshold concepts & application in geomorphology. Quantitative methods & techniques in geomorphology
Unit 5	<p>Geomorphic processes: Endogenetic & Exogenetic processes; fluvial, Aeolian, and glacial processes, Relationship of climate, vegetation and soil with geomorphic processes, Morphogenetic regions: concept and genesis, differential intensity and rate of operation of geomorphic processes in various morphometric regions</p> <p>Development of slopes: slope forming processes and slope forms.</p> <p>Drainage basin as a geomorphic unit: morphometric laws, fluid flow in</p>

	open channel, Discharge and velocity of flow in an open channel, variations of velocity and turbulence across a channel. Fluvial erosion, sediment-transport.
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Reading list

1. Ahmad, E., 1985: Geomorphology, Kalyani Publishers, New Delhi
2. Bloom, Arthur L, 1978: Geomorphology-A Systematic Analysis of Late Cenozoic Landforms, Prentice Hall, Englewood Cliffs, N.J.
3. Chorley, Richard J, 1972: Spatial Analysis in Geomorphology, Harper & Row Publishers, New York, London.
4. Chorley, Richard J. (ed), 1969: Water, Earth and Man, Methuen & Co. London.
5. Chorley, R.J. (ed.), 1969: Introduction to Geographical Hydrology, Methuen & Co.
6. Chorley, R.J. (ed), 1968: Models in Geography, Methuen & Co. London.
7. Chow, V.T., 1964: Handbook of Hydrology, McGraw Hill
8. Cooke, R.U. and Doornkamp, J.C., 1974: Geomorphology in Environmental Management
9. Cooke, R.U. and Warren, A., 1973: Geomorphology in Deserts, Batsford, London
10. Cotton, C.A. 1945: Geomorphology, John Wiley & sons Inc. New York
11. Crickmay, C.H., 1974: Work of the River, The McMillan Press Ltd. London.
12. Dayal, P. (2nd edition), 1996: A Textbook of Geomorphology, Shukla Book Depot, Patna
13. Derbyshire, E. (ed), 1976: Geomorphology and Climate, Wiley, London
14. Dixit, K.R.(ed), 1983: Contribution to Indian Geography/ Geomorphology, Heritage, New Delhi
15. Doornkamp, J.C. and King, C.A.M. 1971: Numerical Analysis in Geomorphology: An Introduction, St. Martins Press, New York
16. Dury, G.H., 1959: The Face of the Earth, Penguin Books.
17. Dury, G.H.(ed), 1966: Essays in Geomorphology, William Heinemann, London.
18. Embleton, C, Brunsdon, D, and Jones, D.K.C., (ed), 1978: Geomorphology: Present Problems and Future Prospects, Oxford University Press, London.
19. Embleton, C. and Thorns, J. 1979: Processes in Geomorphology, Arnold Heinemann, First Indian Edition, 1982.
20. Engeln, O.D. Von, 1942: Geomorphology, McMillan, London
21. Fairbridge, R.W. (ed), 1968: Encyclopedia of Geomorphology, Reinhold, New York.
22. Faniran, A. and Jeje, L.R., 1983: Humid Tropical Geomorphology, Longman, London.
23. Goudie, Andrew, et. Al. (eds), 1981: Geomorphological Techniques, George Allen & Unwin, London.
24. Gregory, K.J., 1985: The Nature of Physical Geography, Edward Arnold, London.
25. Gregory, K, J. and Walling, D.E., 1973: Drainage Basin- Form and Process, Edward

Arnold, London

26. Hails John, R. (ed) 1978: Applied Geomorphology, Elsevier Scientific Publishing Company, Amsterdam, Oxford, New York.
27. King, C.A.M., 1966: Techniques in Geomorphology, Edward Arnold, London.
28. Leopold, L.B., Wolman, M.G. and Miller, J.P., 1964: Fluvial Processes in Geomorphology, Freeman, San Francisco.
29. Lobeek, A.K., 1939: Geomorphology, McGraw Hill, New York.
30. Morisawa, Marie M., 1968: Streams, Their Dynamics and Morphology, McGraw Hills, New York
31. Morisawa, Marie M. (ed), 1981: Fluvial Geomorphology, George Allen & Unwin, London.
32. Morisawa, Marie M., 1985: River Forms and Process, Longman, London and New York.
33. Nelson, J. G. and Chambers, M. J. (ed): Geomorphology: Processes and Methods.
34. Penck, W., 1924: Morphological Analysis of Landforms, Mc Millan, London.
35. Petts, G.E. 1983: Rivers (Sources and Methods in Geography), Butterworths, London-Boston.
36. Petts, G.E. and I. Foster, 1985: Rivers and Landscape, Edward Arnold, London.
37. Pitty, A.F., 1971: Introduction to Geomorphology, Barnes and Nobel, New York
38. Richards, K, 1982: Rivers, Methuen, London.
39. Scheidegger, A.E., 1970: Theoretical Geomorphology, Soringer- Verlag, Berlin, Heidelberg, New Work.
40. Schumm, S.A., (ed), 1977: Drainage Basin Morphology, Dowden Hutchinson & Ross Inc.
41. Schumm, S.A, 1977: The Fluvial Systems, Wiley, New Work
42. Sharma, H.S, (ed), 1982: Perspectives in Geomorphology, Vols I to IV, Concept, New Delhi.
43. Sharma, V.K., 1986: Geomorphology, Earth Surface Processes and Forms, Tata McGraw Hill, New Delhi.
44. Sparks, B.W. 1960: Geomorphology, Longman, London, Second Edition.
45. Strahler, A.N., 1968: The Earth Science, Harper International Edition.
46. Strahler, A.N., 1969: Physical Geography, 3rd edition, Wiley.
47. Thomas, M.F., 1974: Tropical Geomorphology, McMillan, London.
48. Thornbury, W.D. 1969: Principles of Geomorphology, 2nd ed., Wiley International Edition, Wiley Eastern Reprin, 1984.
49. Wooldridge, S.W. and Morgan, R.S., 1948: The Physical Basis of Geography, Longman (First Published in 1937).
50. Worcester, P.G., 1965: A Textbook of Geomorphology, Van Nostrand, 2nd Edition, East West Edition, New Delhi.
51. Young, A, 1972: Slope, Longman, New York, Oliver and Boyd, Edinburgh.

Title of the course	Climatology and Biogeography
Course code	GGY1036
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory+ Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. Knowledge about different phenomena of weather and climate specially vagaries of Indian monsoon and techniques of weather forecasting; 2. Deeper understanding of plant-animal association in varying habitats and environments; 3. Practical utility in the field while carrying out research on issues of climate and biogeography. 4. Evaluate the impact of climate change on biosphere.
Unit	Content
Unit 1	Climatology (48 marks) (To answer four questions, two questions carrying 16 marks each and two questions carrying 8 marks each)
1	Defining the field of Climatology; Importance of Climatology in geographical studies
2	Factors affecting the distribution of insolation on the globe, Insolation; atmospheric temperature; horizontal and vertical distribution of temperature
3	Atmospheric Pressure and Global Wind System: Vertical pressure gradient and horizontal pressure system; Surface winds, stratospheric winds, seasonal and local winds
4	Air masses and Fronts: Characteristics, Origin and modification of air masses, stability and instability
5	Climatic disturbances: cyclones, anticyclones, cloud bursts, drought
6	Classification of World Climate: Schemes of Koppen, Thornthwaite, & Trewartha
7	Monsoons: Mechanism of development, Distribution of monsoons, Trajectories and Irregularities, Effects of El-Nino
8	Techniques of weather forecasting: conventional and modern
Unit 2	Biogeography (32 marks) To answer three questions, one question carrying 16 marks and two questions carrying 8 marks each
1	Introduction to Biogeography: Meaning, nature, scope of biogeography and approaches (Evolutionary & Ecological)
2	Bio-energy cycles and food-chain

3	Soil characteristics and their significance
4	Habitat, Environment and Ecosystem; Plant-Animal Association in varying habitats and environments
5	Concept of Bio-diversity; Conservation of forest and wild life
6	National forest and environment policies

Reading list:

Climatology

- Barry, R.G. and Chorley, R.J., 1998: Atmosphere, Weather and Climate, Routledge, New York.
- Critchfield, H.J., 1975: General Climatology, Prentice Hall of India, New Delhi.
- Blair, T.A., 1954: Weather Elements, Prentice-Hall.
- Das, P.K., 1968: The Monsoons, National Book Trust, New Delhi.
- Griffith, J.F., 1966: Applied Climatology, Oxford University Press.
- Hobbs, J.E., 1980: Applied Climatology, Butterworths.
- Lal, D.S., 1998: Climatilogy, Sharda Pustak Bhawan, Allahabad.
- Lockwood, J.G., 1976: World Climatology: Environmental Approach, Edward Arnold Ltd., 41 Bedford Square, Wc IB 3 Dq.
- Lydolph, Paul, E., 1985: The Climate of the Earth, Rawman and Totowa, N.J.
- Miller, A. A., 1953: Climatology, Dutton.
- Rumney, George, R., 1968: Climatology and World's Climates, McMillan, London.
- Strahler, A.N., 1971: Physical Geography, John Wiley, New York
- Stringer, E.T., 1982: Foundations of Climatology.
- Hoirn, L.A., 1980: An Introduction to Climate, International Series.
- Trewartha, G.T. and Horn, L.A., 1980: An Introduction to Climate, International Series.
- Oliver, J.E. and Hiddore, J. J., 2002: Climatology: An Atmospheric Science, Pearson Education, Delhi.

Biogeography

- Bhattacharyya, N.N., 2003: Biogeography, Rajesh Publications, New Delhi.
- Bradshaw, M.J., 1979: Earth and Living Planet, ELBS, London. Bunting,
- Goudie, Andrew, 1981: The Human Impact, Basil Blackwell, Oxford.
- Hussain, M. (ed), 1994: Biogeography (Part I&II), Anmol Publications Pvt. Ltd. New Delhi.
- Newbegin: Plant and Animal Geography.
- Odum, E.P., 1977: Ecology.
- Robinson, H., 1982: Biogeography, E.L.B.S., Mc Donald & Evans, London.
- Russell, E.W., 1973: Soil Condition and Plant Growth, Long man, London.
- Smith, R.L., 1977: Ecology of Man-An Ecosystem Approach.
- Simmons, I.G., 1974: Biogeography: Natural and Cultural, London.
- Tiby, 1982: Biogeography, Longman.

Title of the course	Economic Geography
Course code	GGY1046
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. Understanding of location, distribution and spatial organization of economic activities across the world; 2. Knowledge of geographical and other factors which influence man's productivity; 3. Knowledge of different farming techniques and modernization of agriculture; 4. Practical utility in the field while carrying out research on agriculture and economic geography. 5. Understand the importance of technology in economic development

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 marks each)

Unit	Content
Unit 1	Field of Economic Geography: Meaning, significance and theoretical development
Unit 2	Approaches to Economic Geography: Theoretical, Institutional and Problem solving
Unit 3	Concepts and Models in Economic Geography: Von Thunen's theory of geographic rent, Spatial Demand Cone, Weberian industrial location model, Suicclair's model, Raw Strong's model, Growth Pole model
Unit 4	Introduction to Global Economic System: Concept & Classification of economic activities
Unit 5	Primary activities: Geography of pastoral farming, Geography of agriculture, place of agriculture in global economy, critical study of large-scale & small-scale agriculture, Regional pattern of agriculture in the world with special reference to USA, Israel and China
Unit 6	Modernization of Agriculture: Intensification, Crop diversification, Mixed farming.
Unit 7	Economic geography of power resources: Global pattern of energy production; Conventional

	sources of energy - water, coal and petroleum; and non-conventional sources of energy - solar, wind and nuclear.
Unit 8	Secondary activities: Manufacturing (Cotton, Textile, Iron & steel), Concept of manufacturing region, special economic zones & technological park with special reference to USA, UK, Japan, Technology & development-global perspectives.
Unit 9	Tertiary activities: Transport, trade & services

Reading list:

- Alexander, 1986: Economic geography, Prentice Hall Inc. (E.E.Edition)
- Bhalla, G.S. and Tyagi, D.S., 1989: Indian Agricultural Development, I.S.I.D., New Delhi.
- Chaudhury, M.R., 1970: Indian Industries: Development and Location, Oxford and IBH, Calcutta.
- Das, M.M., 1984: Peasant Agriculture in Assam, EBH (India) Publishers, Guwahati.
- Forbes, D.K., 1984: Geography of under Development, John Hopkins Univ. Press, Baltimore.
- Gunner, Alexanderson, 1988: Geography of Manufacturing, Prentice Hall Inc, (E.E. Edition)
- Isard, W., 1956: Location and Space Economy, MIT Press, Cambridge.
- Isard, W., 1975: Introduction to Regional Sciences, Engel wood, Cliffs.
- Leong, G.C. and Morgan, G.C., 1992: Human and Economic Geography, Oxford University Press, New York.
- Losch, A., 1954: The Economics of Location, New Haven.
- Miller, E.W., 1977: Manufacturing: A study of Industrial Location, Pennsylvania State University Press, Pennsylvania.
- Mohammad, N. (ed), 1992: New Destinations in Agricultural Geography, Concept Publishing Co., New Delhi
- Pryde, P.R., 1983: Non -Conventional Energy Resources, Wiley, New York.
- Rostov, W. W., 1960: The Stages of Economic Growth, Cambridge University Press, New York.
- Roy, P. K. and Mukherjee, S., 1993 (2nd Edition): Economic Geography: An Appraisal of Resources, New Central Book Agency, Calcutta.
- Roy, P. (2007): Economic Geography: A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.
- Sharma, T.C., 2013: Economic Geography of India, Rawat Publications, Jaipur.
- Sushkin, Yulian, G., 1980: Economic Geography: Theory and Models, Progress Publishers, Moscow.
- Smith, David M., 1981: Industrial Location: An Economic Geographical Analysis, Wiley, New York
- Symons, L., 1979: Agricultural Geography, West view Press, Colorado.
- Tarrant, J.R., 1980: Agricultural Geography, Wiley, New York.
- Thomas, R.S. and Corbin, P.B., 1974: The Geography of Economic Activity, McGraw Hill, New York
- Wheeler, J.O. and Muller, P.O., 1981: Economic Geography, John Wiley & Sons, New York.

Title of the course	Practical on Geomorphology, Climatology and Economic Geography
Course code	GGY1054
Total Credit (theory)	4
Contact hours	60
Distribution of Marks	80+20 (Practical + Internal Assessment)
Course outcomes	Practical utility in the field while carrying out research on geomorphology, climatology and economic geography.

Unit	Content
Unit 1	Geomorphology (39 marks) (to attempt 3 questions carrying 13 marks each)
1	Morphometric Analysis: 1. Relative relief maps based on Smith's method (2 Assignment) 2. Slope maps using Wentworth's method (2 Assignments)
2	Analysis of Basin Morphology: 1. Drainage ordering, calculation of bifurcation ratio, length ratio, basin circularity ratio, Analysis of laws of stream number, stream length and drainage basin area (6 Assignments) 2. Preparation of drainage density, drainage frequency and drainage texture maps (3 Assignments)
3	Area-Height Relationship: 1. Hypsometric curve and hypsometric integral (2) 2. Altimetric frequency curve and histogram (2)
4	DEM Analysis: Slope, aspect
Unit 2	Climatology (13 marks) (to attempt 1 questions carrying 13 mark)
1	Climograph, Hythergraph and Ergograph (3 Assignments) Rainfall dispersion graph, rainfall variability and equipluve maps.(3 Assignments) Water deficiency and surplus graphs (2 Assignments)
Unit 3	Economic Geography (13 marks) (to attempt 1 questions carrying 13 mark)
1	1. Spatial variation in landuse and cropping pattern of North-East India using pie graph (2 Assignments) 2. Trend analysis of production of different commodities with the help of bandgraph and using moving average and least squares methods. (3 Assignments) 3. Analysis of landholding and income pattern (2 Assignments) 4. Choropleth mapping of cropping intensity of N.E. India (2 Assignments) 5. Determination of the levels of economic development using simple

	composite index (2 Assignments) 6. Spatial analysis of crop concentration in N.E. India and Assam (2 Assignments)
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Practical Note-book & Viva-voce (15 marks)

1. Evaluation (10 marks)
2. Viva-voce (5 marks)

Reading list:

- Chorley, Richard J. (ed), 1969: Water, Earth and Man, Methuen & Co. London.
- Chorley, R.J. (ed), 1968: Models in Geography, Methuen & Co. London.
- Doornkamp, J.C. and King, C.A.M. 1971: Numerical Analysis in Geomorphology: An Introduction, St. Martins Press, New York.
- Fairbridge, R.W. (ed), 1968: Encyclopedia of Geomorphology, Reinhold, New York.
- Faniran, A. and Jeje, L.R., 1983: Humid Tropical Geomorphology, Longman, London.
- Goudie, Andrew, et. Al. (eds), 1981: Geomorphological Techniques, George Allen & Unwin, London.
- Gregory, K, J. and Walling, D.E., 1973: Drainage Basin-Form and Process, Edward Arnold, London.
- King, C.A.M., 1966: Techniques in Geomorphology, Edward Arnold, London.
- Leopold, L.B., Wolman, M.G. and Miller, J.P., 1964: Fluvial Processes in Geomorphology, Freeman, San Francisco.
- Misra, R.P., and Ramesh, A., 1989: Fundamentals of Cartography, Concept Publishing co. New Delhi.
- Monkhouse, F.J., and Wilkinson, H.R., 1989: Maps and Diagrams, B. I., Publications Pvt. Ltd., New Delhi.
- Petts, G.E. and I. Foster, 1985: Rivers and Landscape, Edward Arnold, London.
- Singh, R.L. and Singh Rana, P.B., 1998: Elements of Practical Geography, Kalyani Publishers, New Delhi.
- Strahler, A.N., 1969: Physical Geography, 3rd edition, Wiley.
- Anderson, T.W., 1958: Introduction to Multivariate Statistical Method, John Wiley & sons, New York.
- Berry, B.J.L. and Marble, D.F., 1968: Spatial Analysis: A Reader in Statistical Geography, Prentice-Hall, Inc.
- Chorley, R.J. and Haggett, P., (ed), 1968: Models in Geography, Methuen & Co. Ltd.
- Fitzgerald, Brian, P., (General editor): Science in Geography, Series 1 to 4, Oxford University Press.
- Gregory, S., 1978: Statistical Methods and the Geographers, Longman.
- Hammond, R. and McCullagh, P., 1977: Quantitative Techniques in Geography: An Introduction, Clarendon Press.
- Johnston, R.J., 1978: Multivariate Statistical Analysis in Geography, Longman.
- King, L.J., 1969: Statistical Analysis in Geography, Prentice Hall. Inc.
- Mahmood, A., 2005: Statistical Methods in Geographical Studies, Rajesh Publications, New

Delhi.

Sarkar, Ashis., 2008: Practical Geography :A Systematic Approach, Orient BlackSwan, New Delhi.

Details syllabus of 2nd Semester

Title of the course	Cartographic methods in Geography
Course code	GGY2066
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none">1. Understand what methods to use for geographical data analysis.2. Understand the principles of surveying and mapping.

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 marks each)

Unit	Content
Unit 1	History and Development of cartography, traditional and digital cartography. Sources of cartographic data, Cartographic techniques and methods in preparation of diagrams & maps
Unit 2	Measuring the Earth's properties of sphere, The earth: its shape and size, coordinate reference system on the sphere, map scale
Unit 3	Principles of surveying; field techniques (Triangulation, traversing & leveling) and mapping
Unit 4	Principles of mapping; base map preparation, concepts of point, line & area; concept of generalization, scale factor, choice of map projection (Zenithal, Conical, cylindrical & conventional); map design & layout
Unit 5	Classification of map, Thematic mapping: meaning and type; principles of thematic mapping, basic of ideas of isopleths, choropleth, and chorochromatic mapping
Unit 6	Techniques of physical and socio-economic data representation & mapping

Reading list:

Bygott, J.: An Introduction to Map Work and Practical Geography.

Campbell, J.,1984: Introductory Cartography, Prentice Hall Inc., Englewood Cliffs, N.J.

Cuff, D.J. and Mattson, M.T., 1982: Thematic Maps: Their Design and Production, Methuen, New Work.

Kanetkar, T.P. and Kulkarni, S.U.: Surveying and Levelling, Vol. I & II, Vidyarthi Gritha Prakashan, Pune.

Kellaway, G.P.: Map Projections, Methuen & Co., London

Lawrence, G.R.P.,1964: Cartographic Methods, Oxford University Press, London.

Lewis, P., 1967: Maps and Statistics, Methuen & Co. Ltd., London

Misra, R.P. and Ramesh, A.,1995: Fundamentals of Cartography, Concept Publishing Company, New Delhi.

Monkhouse, F.J. and Wilkinson, H.R.,1989: Maps and Diagrams, B.I. Publications, New Delhi.

Nag, P., 1992: Thematic Cartography and Remote Sensing, Concept publishing Co., New Delhi.

Nag, P. and Kudra, M., 1998: Digital Remote Sensing, Concept Publishing Co., New Delhi.

Patel, A.N. and Singh, S., 1999: Principles of Remote Sensing, Scientific Publishers (India), Jodhpur.

Raisz, E.: General Cartography, McGraw Hill Co., London.

Raisz, E.: Principles of Cartography, McGraw Hill Co., London.

Robinson, A.H., et al: Elements of Cartography, John Wiley & Sons, New York.

Singh, R.L.: Elements of Practical Geography, Kalyani Publishers, New Delhi.

Steers, J.A., 1965: An Introduction to the Study of Map Projection, University of London, London.

Title of the course	Geography of Environment and Development
Course code	GGY2076
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80 + 20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. It provides the scope to develop a better understanding of environment from local to global perspectives. 2. Increasing awareness towards environment and to equip with the methodologies of need based sustainable developmental plan.

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 marks each)

Unit	Content
Unit 1	Man environment relationship: man's interaction with environment through time; approaches to the study of man environment relationship
Unit 2	Man as a factor of climate change: population growth and environment, industrialization, urbanization, greenhouse effect, global warming, environmental pollution, environmental hazards and disaster.
Unit 3	Development process: nature and trend of development in national and global perspectives.
Unit 4	Environment and development: concept of environment and development, Appraisal and conservation of environment and natural resources and sustainable resource development.
Unit 5	Global environment problems: types and extent of area specific major environmental problems.

Reading list:

- Park, C., 1997: The Environment, Routledge, London.
- Pickering, K.T. & L.A. Owne, 1994: An Introduction to Global Environmental Issues, Routledge, London.
- Singh, S., 1991: Environmental Geography, Prayag Pustak Bhawan, Allahabad.
- Goudie, A., 1984: The Nature of Environment, Basil Blackwell, London.
- Strahler, A.N. and A.H. Strahler, 1976: Geography and Man's Environment, John Willey, New York.
- Simon, I.G., 1982: Biogeographical Process, Allen & Unwin, London.
- Newson, M., 1992: Land, Water and Development, Routledge, London.
- Varma, P.S. & V.K. Agarwal, 1989: Principles of Ecology, S. Chand & Co., New Delhi.
- Ress, J., 1985: Natural Resources, Routledge, London.

Cantledge, B (ed), 1992: *Monitoring the Environment*, Oxford University Press, Oxford.

Title of the course	Population and Settlement Geography
Course code	GGY2086
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. The course enables the students to understand population issue in spatial dimension to diagnose the problem issue arise out of population growth. 2. Understanding the settlement, both in urban and rural context equip students to prepare need based sustainable settlement plans and policies.

(To answer four questions, two questions carrying 16 marks each & two questions carrying 8 marks each)

Unit	Content
Unit 1	Population geography (48 marks) To answer four questions: two questions carrying 16 marks each and two questions carrying 8 marks each
1	Concept and scope of population geography, Data source; population dynamics, fertility, mortality & migration. Concept of ageing; Young, stationary and stable population
2	Population theories: Malthus theory of population growth; Demographic transition theory.
3	Components of population growth: fertility, mortality and migration; trend of population growth in the world and its different parts; patterns, processes and consequences of migration.
4	Demographic and socio-economic characteristics of population and associated issues: Global perspective and comparison between developed and developing countries
5	Population-resource: Problems of under, over, declining & zero population; Concept of human development; problems & policies: Optimum population, family welfare & planning, population policies in developed and developing countries
6	Population-Development, Conflict, Concept of rich & poor worlds and their global perspective: Neo-Malthusian theory; Future perspectives: Growth scenario and relationship with development
Unit 2	Settlement Geography (32 marks) To answer three questions, one question carrying 16 marks and two questions carrying 8 marks each

1	Defining the field of settlement of geography; its development trend, significance and approaches
2	Origin and growth of rural and urban settlements; Characteristics of rural and urban settlements; Spatial patterns of settlements.
3	Morphology of rural and urban settlements; theories related to internal structure of urban settlements; distance-decay rule in urban context
4	Rural-urban relationship: dichotomy and continuum; settlement hierarchy with reference to central place theory; concept of centrality; primate city concept; rank-size rule; concept of urban fringe; spatial system: size classification of rural settlement

Reading list:

- Ahmad, A., et. al (eds), 1997: Demographic Transition: The Third Third-World Scenario, Rawat Publications, Jaipur and New Delhi.
- Chandna, R.C., 1986: A Geography of Population, Kaylani Publishers, New Delhi.
- Clarke, J.I., 1972: Population Geography, Pergamon Press, Oxford.
- Carter, H., 1972: The Study of Urban Geography, Edward Arnold, London.
- Haggett, P., 1972: Geography: A Modern Synthesis, Harper & Row, New York.
- Money, D.C., 1972: Patterns of Settlement, Evan Brothers, London.
- Peters, G.L. and Larkin, R.P., 1979: Population Geography: Problems, Concepts and Prospects, Kendall/ Hunt Iowa.
- Robinson, H., 1981: Population and Resources, Macmillan Press, London.
- Singh, R.L. and Singh, K.N., (eds), 1975: Readings in Rural Settlement Geography, BHU, Varanasi.
- Singh, R.Y., 1994: Geography of Settlements, Rawat Publications, Jaipur and New Delhi.
- Sandram, K.V. and Nangia, S., (eds): Population Geography, Heritage Publishers, New Delhi.
- Trewartha, G.T., 1969: A Geography of Population: World Pattern, John Wiley & Sons, Inc., New York.
- Woods, R., 1979: Population Analysis in Geography, Longman, London.
- Zelinsky, W., 1966: A Prologue to Population Geography, Prentice-Hall, Englewood Cliffs.

Title of the course	Geography of Regional Development of India with Special Reference to North-East India
Course code	GGY2096
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	<ol style="list-style-type: none"> 1. Development of a better spatial perspective of a country like India with greater physical and social disparity. Such issues have both utilitarian and applied aspects in a broader context. 2. Understand the physical setting of India and its impact on Geo-political issues.

Unit	Content
Unit 1	Geography of Regional Development of India (48 marks) (To answer four questions: two questions carrying 16 marks each & two questions carrying 8 marks each)
1	India as a geographical entity; unity in diversity; locational significance
2	Physical background of regional development: relief, drainage, climate, soil and Vegetation.
3	Mineral and power resources and development: iron ore, coal, petroleum and water power potential, and development scenario.
4	Population and development issues: population growth and its socio-economic implications, literacy, urbanization, occupation and social structure and development inequalities.
5	Regional disparities in economic development: agriculture, industry and transport and Communication.
6	Geo-politics, intra-regional relations & development: The challenges of regionalism, border dispute, geopolitics of resources like water, land & maritime resources, issues of insurgency, regional cooperation-SAARC, prospects & challenges, impact, India & BRICS
Unit 2	Geography of Regional Development of North-East India (32 marks) To answer three questions, one question carrying 16 marks and two questions carrying 8 marks each
1	North-East India: location and strategic significance; the land of seven sisters.
2	Physical characteristics and their relation to development: relief, drainage, climate, soil and vegetation.

3	Natural resources, their utilization and development: forests, coal, petroleum, natural gas And water, and development scenario.
4	Population and development: population growth and distribution, Migration, population characteristics and their socio-economic implications.
5	Agriculture and development: problems of agriculture; agricultural modernization (problems and prospects) and economic development.
6	Spatial pattern of socio-economic development (state level) and strategies for future development.

Reading list:

- Agarwala, S.N., 1988(First reprint): India's Population Problems, Tata McGraw Hill Publishing Co. Ltd. New Delhi
- Barua, P.C., 1990:Development Planning of North East India, Mittal Publications, New Delhi.
- Bhagabati, A.K. et al, 2001: Geography of Assam, Rajesh Publications, New Delhi.
- Bhatt, L.S., 1973: Regional Planning in India, Statistical Publishing Society, Calcutta.
- Bhattacharyya, N.N. (2010): North-East India: A Systematic Geography, Rajesh Publications, New Delhi.
- Bose, A., (ed) 1967: Pattern of population Changes in India- 1951-61, Allied Publishers,Bombay.
- Census of India Publications on India and North-Eastern States.
- Das, H.P., 1971: Geography of Assam, NBT, New Delhi.
- Das, M.M., 1984: Peasant Agriculture in Assam, Inter India Publications, New Delhi.
- Dutta Ray, B., et. al (eds), 2000: Population, Poverty and Environment in North EastIndia,Concept Publishing Co., New Delhi.
- Davis, K., 1951: Population of India and Pakistan, Princeton University Press, Princeton.
- Despande, C.D., 1992: India: A Regional Interpretation, ICSSR, New Delhi.
- Dhar, P.K., 1988 (2nd Edition): The Economy of Assam, Ashomi Prakashani
- Duncan, G., 1967: Resource Utilization and the Conservation, Concept in Readings in Economic Geography, New York.
- Gananathan, V.S., 1967: Economic Geography of India, NBT, India, New Delhi.
- Govt. of India, 1965: The Gazetteers of India, Publication Division, Ministry of Information and Broadcasting, New Delhi.
- Isard, Walter, 1960: Methods of Regional Analysis, MIT Press.
- Kundu, A and RazaMoonis, 1982: Indian Economy: Regional Dimension, Center for Study of Regional Development, JNU, New Delhi.

Mohapatra, A.C. and Routrey, J.K. (eds) 1998: Regional Development and Planning, Rawat Publications, New Delhi.

Misra, R.P.: Regional Planning: Concepts, Techniques and Policies, University of Mysore, Mysore.

Misra, et. al, 1974: Regional Development Planning in India- A Strategy, Institute of Development Studies, Mysore.

Mitra, Ashok, 1967: Levels of Regional Development in India, Vol. I, Census of India Publications, New Delhi.

Nag, P. and Sengupta, S.: Geography of India, Concept Publications, New Delhi.

N.E.C.: Basic Statistics for North Eastern Region, Shillong, 1990-91 onwards.

North East India Geographical Society: North Eastern Geographer, Department of Geography, Gauhati University.

Rao, V.L.S.P., 1964: Regional Planning, Indian Statistical Institute and Asia Publishing House, Calcutta.

Richardson, H.W., 1969: Regional Economics, Weidenfield and Nelson, London.

Sdasyuk, G. and Sengupta, P., 1968: Economic Regionalization of India, Census of India Publications, New Delhi.

Singh, R.L., (ed), 1968: India- Regional Studies, 21st IGC, New Delhi

Singh, R.L., (ed), 1971: India: A Regional Geography, National Geographical Society of India, Varanasi.

Sharma, T.R., 1949: Location of Industries in India, Hind Kitab, Bombay.

Spate, O.H.K. and Learmonth, A.T.A., 1967: India and Pakistan- Land, People and Economy, Methuen & Co. London.

Srivastava, M.A., 1967: Trade of India, S. Chand & Co. Delhi.

Taher M. and Ahmed, P., 2000: Geography of North East India, Mani-Manik Prakash, Guwahati.

The Geographical Society of North Eastern Hill Region (India): Hill Geographer, Shillong

Title of the course	Practical on Cartographic techniques, Population and Settlement Geography, and Regional development of India and N.E. India
Course code	GGY2104
Total Credit (theory)	4
Contact hours	60
Distribution of Marks	80+20 (Practical + Internal Assessment)
Course outcomes	Practical on these issues help the students to portray problems as well as resource based in spatial perspectives and encourage the students to accommodate the significance of dimension in planning and policy making.

Unit	Content
Unit 1	Cartographic techniques (30 marks) To attempt 3 questions carrying 10 marks each)
1	Traversing and topographic surveying with the help of prismatic compass and theodolite. (3)
2	Contouring and profile levelling with the help of dumpy level. (2)
3	Construction of map projections (3) (i) Zenithal gnomonic (Equatorial case) (ii) Lambert's conical equal-area projection (iii) Gall's cylindrical stereographic projection
4	Map reading and analysis, preparation of base map. (2)
5	Representation of physical and socio-economic data using sphere diagram, flow chart, isolines and transect chart. (4)
Unit 2	Population and Settlement Geography (13 marks) (To attempt 1 questions carrying 13 marks each)
1	Population concentration and density pattern in North East India and Assam (6 Assignments)
2	Trend of population growth (Exponential and Non-Linear methods) and population projection of India, N.E. India/Assam/India (6Assignments)
3	Determination of spatial mean center of population, spatial mean center of urban Population of selected areas (3 Assignments)
4	Age-sex pyramid of developed, developing and underdeveloped countries (6 assignments)
5	Determination of settlement hierarchy using centrality index. (2 Assignments)
6	Population Density Gradient Analysis (2 Assignments)

Unit 3	Regional Development of India and North East India (12 marks) To attempt 1 questions carrying 12 marks each)
1	Spatial pattern of population density in Assam (district level) and dispersion of population density in India (state level). (3)
2	Mapping of population distribution of North-East India and analysis of its relationship with relief. (3)
3	Analysis of connectivity and centrality of transport networks in North East India. (4)
4	Determination of levels of infrastructural development in North East India using simple composite index. (2 Assignments)
Unit 4:	Field work (Preferably outside the state) (10 marks)
Unit 5	Practical Note-book & Viva-voce (15 marks) 1. Evaluation of Practical Notebook (10 marks) 2. Viva-voce (05 marks)

Reading list:

1. Berry, B.J.L. and Marble, D.F., 1968: Spatial Analysis: A Reader in Statistical Geography, Prentice-Hall, Inc.
2. Chorley, R.J. and Haggett, P., (ed), 1968: Models in Geography, Methuen & Co. Ltd.
3. Fitzgerald, Brian, P., (General editor): Science in Geography, Series 1 to 4, Oxford University Press.
4. Gregory, S., 1978: Statistical Methods and the Geographers, Longman.
5. Hammond, R. and McCullagh, P., 1977: Quantitative Techniques in Geography: An Introduction, Clarendon Press.
6. King, L.J., 1969: Statistical Analysis in Geography, Prentice Hall. Inc.
7. Mahmood, A., 2005: Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi.
8. Misra, R.P., and Ramesh, A., 1989: Fundamentals of Cartography, Concept Publishing co. New Delhi.
9. Monkhouse, F.J., and Wilkinson, H.R., 1989: Maps and Diagrams, B. I., Publications Pvt. Ltd., New Delhi.
10. Sarkar, Ashis., 2008: Practical Geography :A Systematic Approach, Orient BlackSwan, New Delhi.
11. Singh, R.L. and Singh Rana, P.B., 1998: Elements of Practical Geography, Kalyani Publishers, New Delhi.

Details syllabus of 3rd Semester

Title of the Course	Quantitative Methods in Geography
Course Code	GGY3116
Total Credit (Theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	At the end of the course students should be able to: 1. Understand what methods to use for geographical data analysis. 2. Understand the principles of surveying and mapping.

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 marks each)

Unit	Content
I	Methodological development in geography: Quantitative and qualitative; significance of quantification in geographical analysis; limitation of quantitative techniques.
II	Geographic data matrix: nature and type of geographic data, levels of measurement, data source and acquisition techniques.
III	Sampling and its need in geographical data collection; sampling techniques (probability and non-probability sampling), application of probability in sample selection and sample data analysis, calculation of sample size.
IV	Application of inferential statistics in hypothesis testing, parametric and non-parametric test, selection of significance level.
V	Spatial analysis of geographic data: spatial pattern: point pattern, line pattern, regional or areal pattern, spatial relationship, spatial regression.
VI	Multivariate analysis in geography: Multivariate linear regression and principal component analysis.
VII	Conceptual basis of quantitative techniques in spatial distribution and concentration, spatial relationship, spatial interaction, spatial diffusion and regional pattern analysis.

Books Recommended for Course

1. Berry, B.J.L. and Marble, D.F., 1968: Spatial Analysis: A Reader in Statistical Geography, Prentice-Hall Inc., Englewood Cliff, J.N.
2. Chorley, R.J. and Haggett, P. (eds), 1967: Models in Geography, Methuen, London. Cole, J.P. and King, C.A.M., 1968: Quantitative Methods in Geography, Willey and Sons, New York.
3. Duncan, O.D., et al, 1961: Statistical Geography: Problems in Analysing Areal Data, Free Press of Glencoe, New York.
4. Davis, P., 1988: Data Description and Presentation (Science in Geography series), Oxford University Press, Oxford.
5. Elhance, D.N., 1972: Fundamental of Statistics, Kitab Mahal, Allahabad. Eyles, J. and Smith, D.M. (eds), 1988: Quantitative Methods in Human Geography, Polity Press, Oxford.
6. Gregory, S., 1963: Statistical Methods and the Geographers, Longman, London.
7. Hagget, P. and McCullagh, P., 1965: Locational Analysis in Human Geography, Arnold, London.
8. Hammond, R. and McCullagh, P., 1965: Quantitative Techniques in Geography, Clarendon Press, Oxford.
9. Jonston, R.J., 1978: Multivariate Statistical Analysis in Geography, Longman, London.
10. King, L.J., Statistical Analysis in Geography, Prentice Hall, Englewood cliff, N.J. Mahmood, A., 1999: Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi.
11. Mathews, J.A., 1981: Quantitative and Statistical Approaches to Geography: A Practical Manual, Pergamon Press, Oxford.
12. McCullagh, P., 1988: Data Use and Interpretation (Science in Geography Series, Part-4), Oxford University press, Oxford.
13. Pal, S.K., 1998: Statistics for Geoscientists: Techniques and Applications, Concept Publishing Company, New Delhi.
14. Smith, D.M., 1975: Patterns in Human Geography, Penguin Book.
15. Yeates, M.H., 1974: An introduction to Quantitative Analysis in Human Geography, McGraw Hill.

Title of the Course	Fundamentals of Remote Sensing, GIS and GPS
Course Code	GGY3123
Total Credit (Theory)	3
Contact hours	45
Distribution of Marks	40+10 (Theory + Internal Assessment)
Course outcomes	At the end of the course students should be able to: <ol style="list-style-type: none"> 1. Understand the rationale behind use of remotely sensed data its advantages and disadvantages. 2. Understand how GIS/GPS methodologies can be used to address spatial analysis from the theoretical perspective.

Unit	Content
<p>Group I: Remote Sensing (15 marks) To answer two questions, one question carrying 10 marks and another 5 marks</p>	<ol style="list-style-type: none"> 1. Basic Concepts and Principles of Remote Sensing. 2. Electro Magnetic Radiation; Wavelength regions of electromagnetic radiation. 3. Remote Sensing Systems: Platform, types of platforms & its characteristics. 4. Remote Sensing Data Interpretation: Visual and digital techniques; digital image processing. 5. Application of Remote Sensing in geomorphology, land use/land cover, forestry, rural and urban landscape study.
<p>Group II: GIS (15 marks) To answer two questions, one question carrying 10 marks and another 5 marks</p>	<ol style="list-style-type: none"> 1. Overview; History and Concepts of GIS 2. Field of GIS: Principles, components and functions. 3. Data type and structure of GIS; Raster and Vector data structure. 4. Spatial analysis techniques and Thematic representation of data in GIS. 5. GIS Softwares; Licensed and Open Source. 6. Application areas of GIS in geographical study.
<p>Group III: GPS (10 marks) To answer two questions carrying 05 marks each</p>	<ol style="list-style-type: none"> 1. Introduction to GPS technology and its working principles. 2. GPS elements and types of signals and receivers and data acquisition techniques; Accuracy of GPS data; Concept and principle of DGPS. 3. Application areas of GPS in geographical study.

Books Recommended for Course

1. Burrough, P.A.,1986: Principles of Geographical Information Systems in Land Resources Assessment, Clarendon Press, Oxford.
2. Burrough, P.A. and Mc Donnel, R.A.,1998: Principles of Geographical Information

Systems, Oxford University Press.

3. Colwell, R.N., 1983: Manual of Remote Sensing, Vol. I & II, American Society of Photogrammetry.
4. Curran, Paul, J., 1985: Principles of Remote Sensing, Longman Group Ltd. Gautam, N.C., 1970: Urban Landuse Study through Aerial Photo- interpretation Techniques, Pink Publishing House, Mathura.
5. Star, J. and Ester, J., 1990: Geographic Information System, Prentice-Hall. Liles and, T.M. and Kiefer, R.W., 1987: Remote Sensing and Image Interpretation, John Wiley.
6. Hord, R. Michael., 1986: Remote Sensing: Methods and Applications, John Wiley. Maguire, D. J., Goodchild, M. and Rhind, D. J., 1990: Geographical Information Systems: Principles and Applications, Longman Science and Technology Publications. Robinson, A. H., et al., 1995: Elements of Cartography, John Wiley.
7. Sabins, Floyd F., 1987: Remote Sensing Principles and Interpretation, W.H. Freeman and Company, New York.

Title of the course	Research Methodology in Geography
Course code	GGY3133
Total Credit (theory)	3
Contact hours	45
Distribution of Marks	40+10 (Theory + Internal Assessment)
Course outcomes	This course will help students how to proceed with tackling a research problem and the steps one should adopt and the tools and craft a geographer usually employs.

Unit	Content
Unit 1	Meaning of research and geographic research; types of research; Introduction to Research methodology in geography.
Unit 2	Formulation of a research problem.
Unit 3	Research design: statement of the problem, objectives, and research questions, methodology, significance, review of research works and referencing.
Unit 4	Inductive and deductive approaches in geographic research, concept development, model building and hypothesis testing.
Unit 5	Questionnaire design, sampling methods
Unit 6	Hypothesis in geography research
Unit 7	Research write up

Title of the course	Social, Cultural and Political Geography
Course code	GGY3146
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	1. To understand how language, religion, ethnicity tangent with lebensruam, frontiers and boundaries and influence the geography of a region.

Unit	Content
Unit 1	Social and Cultural Geography (40 marks) (To answer four questions, one carrying 16 marks & 3 carrying 8 marks)
1	Defining the field of social geography; development of social geography in Anglo-American countries and India.
2	Concept of social space, social group, social structure, social differentiation, social diversity, plurality, socio-spatial inequalities, social well-being.
3	Defining the field of cultural geography; its trend of development and significance.
4	Sauer's Morphology of Landscape School.
5	Themes and concepts in cultural geography: cultural hearth, cultural area, cultural region, cultural landscape, cultural history, cultural ecology, cultural diffusion and cultural integration, migration & cultural change
6	Patterns of world cultural regions with reference to (a) language,(b) religion and (c) Ethnicity.
Unit 2	Political Geography (40 marks) To answer four questions, one carrying 16 marks and three carrying 8 marks each
1	Defining the field of political geography and its significance
2	Historical development of political geography; schools of thought: landscape school, ecology school and organismic school.
3	Approaches to the study of political geography: historical, morphological and functional
4	Relevance of space in political geography, concepts of territoriality-claims over land, water & air as territories, concepts in political geography: State as geographical and political unit, territorial state and international relation

5	Contemporary International relations: post 1990 transition in world economy and India, Global North Vs Global South, Role of china-BRICS, BIMSETC
6	Geopolitical problems in global and Indian context.

Reading list:

Social Geography

- Ahmad, A., 1999: Social Geography, Rawat Publications, Jaipur and New Delhi.
- Ahmad, A., (ed), 1993: Social Structure and Regional development: A Social Geography Perspective, Rawat Publications, Jaipur.
- Carter, John and Trevor, Jones. 1989: Social Geography: An Introduction to Contemporary Issues, Edward Arnold, London.
- Eyles, J.: 'Social Geography', in Johnston, R.J., et al, The Dictionary of Human Geography.
- Jones, E. and Eyles, J., 1977: An Introduction to Social Geography, Oxford University Press, Oxford and New York.
- Jones, E,(ed), 1975: Readings in Social Geography, Oxford University Press, Oxford.
- Sharma, H.N., 2000: 'Social Geography' in Singh, J. (ed.) Progress in Indian Geography (1996-2000), INSA, New Delhi.
- Smith, D.M., 1977: Human Geography: A Welfare Approach, Edward Arnold, London.
- Sopher, D.E. (ed), 1980: An Exploration of India: Geographical Perspectives on Society and Culture, Longman, London.
- Srinivas, M.N., 1986: India: Social Structure, Hindustan Publishing Corporation, Delhi.
- Taher, M., 1994: An Introduction to Social Geography: Concept and Theories, NEIGS, Guwahati.

Cultural Geography

- Crans, Mike, 1998: Cultural Geography, Routledge, London.
- Dancan, J. and Ley, D. (eds), 1992: Place/Culture/Representation, Routledge, London.
- Gritzer, Charion, F., 1984: 'The Scope of Cultural Geography', Journal of Geography, Volume 65, pp.4-11.
- Jackson, Richard.H.and Hudman, Lloyel. E., 1990: Cultural Geography, West Publishing Company, New York.
- Johnston, R.J., Gregory, Derek and Smith, David M. (eds), 1994: The Dictionary of Human Geography, Blackwell, Oxford.
- Jordan, T.G. and Rowntree, L.: The Human Mosaic: A Thematic Interpretation in Cultural Geography.
- Noble, A.G. and Dutt, A.K. (eds), 1982: India: Cultural Pattern and Processes, West View Press / Boulder, Colorado.
- Sauer, Carl.O., 1963: Land and Life, University of California Press, Berkley.
- Thomas, W.L. (ed.), 1959: Man's Role in Changing the Face of the Earth, University of Chicago Press, Chicago.

Zelinsky, W., 1973: The Cultural Geography of America, Princeton University Press, Princeton, N.J.

Political Geography

Adhikari, S., 1996 : Political Geography, Rawat Publications, Jaipur and New Delhi.

De Blij, H.J., 1972 : Systematic Political Geography, John Wiley, New York.

Dikshit, R.D., 1982 : Political Geography : A Contemporary Perspective, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Muir, R., 1975 : Modern Political Geography, Macmillan Ltd., London.

Pounds, N.J.G., 1972 : Political Geography, McGraw Hill, New York.

Prescott, J.R.V., 1972 : Political Geography, Methuen, London.

Sukhwai, B.L., 1979: Modern Political Geography of India, Sterling, New Delhi.

Taylor, P.J., 1989: Political Geography, Longman, London.

Title of the course	Practical on Quantitative Methods & Research Methodology
Course code	GGY3164
Total Credit (theory)	4
Contact hours	60
Distribution of Marks	80+20 (Practical + Internal Assessment)
Course outcomes	Students will be able to learn the different quantitative, cartographic and surveying techniques and its applications in geographical studies.

Unit	Content
Unit 1	Quantitative Methods (40 marks) To attempt 3 questions carrying 10 marks each
	<ol style="list-style-type: none"> 1. Determination of spatial mean centre, median centre and modal centre of settlement (3 Assignment) 2. Distribution pattern of settlement using Nearest neighbor Analysis statistics 3. Application of elementary matrix algebra in multivariate data analysis. (3 Exercises) 4. Application of probability distributions (normal, poisson and binomial) in geographical analysis. (3 Exercises) 5. Application of relevant hypothesis testing techniques (parametric and nonparametric) in geographical data analysis; use of z, t, f and χ^2 (Chi- square) statistics. (4 Exercises) 6. Simple and multiple correlation and regression analysis; non-linear relationship (rank size relationship and distance decay) analysis. (4 Exercises) 7. population potential surface mapping, shape index and transport network analysis. (4 Exercises) 8. Techniques of multivariate analysis in areal classification and regionalisation: <ol style="list-style-type: none"> (a) Triangular graph (b) Composite scores - composite z score and principal component analysis. (3 Exercises) 9. Data Grouping Techniques for Choropleth mapping and Accuracy Assessment: parameters of normal distribution, nested means, quartiles (2 Exercises)
Unit 2	Research Methodology (40 marks) To attempt 4 questions carrying 5 marks

	each
1.	Field work & Research methodology (20 marks)
Contents	Field work in geographical studies: Defining the field and identifying the case studies-Rural/Urban/Physical/Environmental
	Data collection: Type and sources of Data; Methods of collection; Data analysis: Qualitative Data analysis; Quantitative data analysis; data representation techniques
	Field techniques-Observation, questionnaire/interview with special focus group discussion, space survey (Transects/Quadrants, Constructing & sketch)
	Use of field tools
	Designing the field report-Aims and objectives, methodology, analysis and discussion
2	1. Field book preparation & evaluation (15 marks)
	2. Viva-voce (5 marks)

Each student will prepare an individual report based on primary and secondary data collected during field work.

Title of the course	Geoinformatics (Special paper)
Course code	GGY3156 (1)
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	Derive a comprehensive understanding of the use of RS/GIS/GPS techniques and their integration

Unit	Content
Unit 1	Remote Sensing (32 marks) To answer three questions, one question carrying 16 marks and two questions carrying 8 marks each
1	Remote Sensing System/technology: Definition, principles and field of study; Types of Remote Sensing (Aerial and Satellite Remote Sensing)
2	Electromagnetic spectrum, energy radiation principles, energy interactions in atmosphere and with earth surface features
3	Fundamentals of aerial photography: aerial cameras, spectral and radiometric characteristics.
4	Geometric characteristics of aerial photographs; scale and ground coverage; classification of aerial photographs; tilt and relief displacement.
5	Remote Sensing Systems - Sensors, Platforms, CCDs and resolution
6	Earth models, datum, coordinate systems, UTM zones
7	Satellite data products from USA, ESA and India.
Unit 2	Geographic Information System (32 marks) To answer three questions, one question carrying 16 marks and two questions carrying 8 marks each
1	Defining the field of GIS; development trend; components of GIS.
2	Data input, storage and maintenance; manipulation, analysis and output
3	GIS data models and spatial data structure
4	Raster and vector data formats and raster to vector and vector to raster conversion.
5	GIS databases, RDBMS and queries
6	Integration of remote sensing data and GIS.
Unit 3	Global Positioning System (16 marks) To answer two questions carrying 8 marks each
1	GPS concepts, navigation principles, GPS receivers, DGPS, errors and accuracy

2	Real world GPS applications: Spatial data updating, Urban planning, forestry, disaster management and infrastructure planning.
3	Drones, UAVs and microsattellites: Applications in smart agriculture, environmental conservation, urban planning and climate studies

Reading list:

- Bolstad, Paul. 2012. GIS Fundamentals: A First Text on Geographic Information Systems, Xan Edu. Publishing Inc. Ann Arbor.
- Dessers. E.2014. Spatial Data Infrastructures at Work: Analysing the Spatial Enablement of Public Sector Processes. Leuven University Press, Belgium.
- DeMers, Michael. N.2008. Fundamentals of Geographic Information Systems. Wiley.
- Fazal, S.2008. GIS Basics. New Age International Pvt. Ltd Publishers.
- Jensen, John R. 2015. Introductory Digital Image Processing: A Remote Sensing Perspective, Pearson Education.
- Lillesand, T.M. and Kiefer, R.W., 1987. Remote Sensing and Image Interpretation, John Wiley.
- Lo, C. P. and Yeung, A.K.W.2006. Concepts and Techniques of Geographic Information Systems. Prentice Hall.
- Misra, Pratap and Enge, Per.2010. Global Positioning System: Signals, Measurements, and Performance. Ganga-Jamuna Press, Lincoln,MA.
- Nedovic-Budic, Z., Crompvoets, J. and Georgiadou, Y. 2011. Spatial Data Infrastructures in Context: North and South. CRC Press: Taylor & Francis.
- Steinberg, Sheila L & Steinberg, 2015. Steven J. GIS Research Methods: Incorporating Spatial Perspectives, ESRI Press: Redlands

Title of the Course	Regional Development Planning (special paper)
Course Code	GGY3156 (2)
Total Credit (Theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory+ Internal Assessment)
Course outcomes	Students would be able to know and understanding of regional development, its approaches, regionalization techniques and the need for conservation and management of resources for development.

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 marks each)

Unit	Content
Unit I	The Concept of region, regional planning and regional development Basic principles and objectives of regional planning. Types of regional planning: sectoral, spatial and temporal planning Approaches to regional planning: Synoptic, functional and ad-hoc or specific
Unit II	Concept of resource regions Conservation and management of resources for regional development
Unit III	Theories of spatial distribution: <ul style="list-style-type: none"> • Growth Pole theory of Perroux and Boudeville • Core-periphery theory of Frederick • Cumulative causation theory of Gunnar Myrdal • Multi-level Growth Foci concept of R. P. Misra
Unit IV	Methods of regionalization and techniques of regional planning: Analytical and Procedural
Unit V	Decentralization and Multi-level planning in India Town and Country Planning Urban Planning: Physical expansion of cities, open and green space, urban island

Suggested Readings:

- Banerjee, A. and Kar. B., 1999: Economic Planning and development of North Eastern States, Kanishka Publications, New Delhi.
- Choud, M. and Puri, V. K., 1983: Regional Planning in India, Allied Publications, New Delhi.
- Deb, B. J., 1995: Regional Development in North East India, Reliance Publications, New Delhi.
- Friedman, J. and William Alonso (eds), 1964: Regional Development and Planning, Cambridge, Mass. M.I.T. Press.
- Friedman, J., 1973: Utilization, Planning and National Development, Bererly Hills, Sage Publications.
- Gallion, A. B. and Simon Eisner, 1974: The Urban Pattern: City Planning and Design, East West Press Pvt. Ltd., New Delhi and Van Norstrand Reinhold Co.
- Glasson, J., 1974: An Introduction to Regional Planning, Hutchinson Educational Ltd., London.
- Gogoi, J. K., 1978: The Government of India's Policy for Regional Development- A Summing Up and a Critique, North Eastern Econ. Rev. II (3), July- Sept.
- Goswami, A., 1981: Assam's Industrial Development: Urgency of New Direction, Econ. Pol. Weekly, XVI (21)
- Hilhorst, J.G.M. and Dunham, D.M., 1971: Issues in Regional Planning, Institute of Social Studies, The Hague.
- Holier, G. P., 1988: Regional Development, in Michael Pacione (ed.), The Geography of the Third World: Progress and Prospect, Rutledge, London and New York.
- Isard, Walter et al, 1998: Methods of Interregional and Regional Analysis, Ashgate Publishing Ltd., Aldershot.
- Kidwai, A. H., 1985: Disparities in the Levels of Regional Development and Spatial Differentiation in India in the Historic Context, CSRD, JNU, Mimeo.
- Mishra, R. P., Sundaram, K.V. and Rao, P., V.L.S., 1974: Regional Development Planning in India; A New Strategy, Vikas Publications, New Delhi.
- Mishra, R.P., 1992: Regional Planning; Concept, Techniques, Policies and Case Studies, Concept Publications, New Delhi.
- Mohapatra, A.C., 1985: The Concept of region, Hill Geographer, IV (1)
- Mohapatra, A.C. and Rootray, J.K., 1998: Regional Development and Planning, Rawat, Jaipur.
- Mukherjee, A., 1991: Methodology and Database for Decentralized Planning, Heritage, New Delhi.
- Mukherjee, A., 1993: A Perspective Plan for A Hill District, Heritage, New Delhi.
- Pannerselvam, A., 1999: Regional Development in the Developing Countries: A Search for Appropriate Theory, Space, 12 (2).
- Ridell, R., 1985: Regional Development Policy, St. Martin's Press, New York.
- Sandesara, J.C., 1992: Industrial Policy and Planning, 1947-91: Tendencies, Interpretations and Issues, Sage Publications, New Delhi.
- Sanyal, B. M., 2001: India: Decentralized Planning, Concept, New Delhi.
- Smith, B.C., 1965: Regionalism, Action Society Trust, London.

Details syllabus of 4th Semester

Title of the course	Environment and Climate Change
Course code	GGY4176
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	The course will sensitize the student about the mechanism of climate and its drivers. Learners will explore the impacts on various sectors viz. hydrosphere, cryosphere, and biosphere. Students further learn different organizational setup and policies related to climate change.

Unit	Content
Unit 1	Ecology, Environment and Society (40 marks)
1	Introduction to ecology, scope & principles of ecology. Ecosystem & structure & functions, Energy flow, food chains/food web, nutrient cycles
2	Environment: Meaning and components, Environment of land, water & forest in N.E. India
3	Ecology & society: Approaches: Environmental determinism, possibilism, neo-determinism & Human ecology models, Livelihood environment & development, environment valuation and accounting, Issues of environment and equity
Unit 2	Environment and Climate Change (40 marks)
1	Anthropogenic (green house-Kyoto gases) and natural radioactive forcing (Solar cycles-Milankovich cycle), Global warming
2	Atmospheric circulation, El Niño Southern Oscillation (ENSO), Walker Circulation, Indian Ocean dipole clouds, aerosols.
3	Evaluation of climate models, types, climate projection and prediction
4	Climate change: Impacts, vulnerabilities, adaptation and mitigations strategies: global initiatives with particular reference to India

5	Organization and policies: IPCC, Kyoto protocol, UNFCCC, Carbon credits, Carbon footprints, Water footprints
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Reading list:

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
2. Schmidt, G., Wolfe, J., & Sachs, J. D., (2009). Climate Change: Picturing the Science, 1st Edition, W. W. Norton & Company.
3. Framer, G. T., & Cook, J. (2013). Climate Change Science: A Modern Synthesis-The Physical Climate (Vol. 1): Springer Netherlands.
4. IPCC. (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth AR of the IPCC in T.F. Stocker, et al., (Eds.), (pp. 1535). CUP, Cambridge and New York.
5. IPCC. (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth AR of the IPCC In R.K. Pachauri and L.A. Meyer/ Core Writing Team IPCC, Geneva.
6. IPCC. (2014). Summary for policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth AR of the IPCC. In C.B. Field, et al., (eds.) pp. 1-32. CUP, Cambridge and New York.
7. IPCC. (2014). Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. In O. Edenhofer, et al., (Eds.). CUP, Cambridge and New York.
8. Sumi, A., Fukushi, K., & Hiramatsu, A. (2010). Adaptation and mitigation strategies for climate change. Japan: Springer Science & Business Media.
9. Eccleston, Charles H. (2011). Environmental Impact Assessment: A Guide to Best Professional Practices. Chapter 5. ISBN 978-1439828731
10. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences and Reflections, Prentice Hall of India, New Delhi.
11. Websites: www.wri.org/wri/biodiv; www.earthwatch.org; www.canari.org http://cavehill.uwi.edu/cermes/CLMEPub/ENG/Brochure_Eng ; www.panda.org

Title of the course	Geography of Bhutan, Bangladesh and Japan
Course code	GGY4186
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	Students will learn the scope of south-east Asian countries in regional collaboration, cooperation, in sustainable environmental and resource management.

Unit	Content
Unit 1	Geography of Bhutan (25 marks)
1	Location and situation of Bhutan; locational significance in relation to India; geopolitical history
2	Physical Framework: Physiography, climate, vegetation, forest policy and biodiversity
3	Socio-Cultural Background: Population, ethno-religious and linguistic composition, literacy and educational pattern, urbanization level
4	Economic Geography: Resource potential, agriculture, industry, transport system, tourism development, trade relations with India, patterns of economic development
Unit 2	Geography of Bangladesh (30 marks)
1	Location and situation of Bangladesh; locational significance in relation to India; geo-political history
2	Physical Framework: Physiography, climate, soil, vegetation and environmental problems
3	Socio-Cultural Background: Population, ethno-religious composition, literacy and educational pattern, urbanization level, population problems and policies

4	Economic Geography: Resource potential, agriculture, place of consumer goods industry, transport system, tourism development, trade relations with India, problems and prospects of economic development
Unit 3	Geography of Japan (25 marks)
1	Location and situation of Japan; locational significance in relation to India; geopolitical history
2	Physical Framework: Physiography, climate, vegetation, biodiversity and environmental policies
3	Socio-Cultural Background: Population, ethno-religious and linguistic composition, literacy and educational pattern, urbanization level, ageing of population, socio-economic implications of ageing
4	Economic Geography: Resource potential, agriculture, industry, transport system, trade relations with India, problems and prospects of economic development

Reading list:

Hugh Brammer, Bangladesh: Landscapes, Soil Fertility and Climate Change, The University Press Limited (UPL), 2016.

Ahmed Choudhury, Giasuddin and Anwar Ali, Storm Surges in Bangladesh : An Introduction to

CEGIS Storm Surge Model, The University Press Limited (UPL), 2014.

Ahmed Choudhury, Giasuddin, Ken'ichi Nakagami, Jianhua Li, Kensuke Fukushi , Strategic Adaptation Towards Water Crisis, The University Press Limited (UPL), 2014.

Philip Gain, The Chittagong Hill Tracts Man-Nature Nexus Torn, Society for Environment and Human Development (SHED), 2013.

Hugh Brammer, The Physical Geography of Bangladesh, The University Press Limited (UPL), 2012.

Hugh Brammer, Land Use and Land Use Planning in Bangladesh, The University Press Limited (UPL), 2002.

Anonym, Geo-spatial Tools for Analysis of Flood plain Resources, Environment and GIS Support Project for Water Sector Planning (EGIS), The University Press Limited (UPL), 2000.

Muhammad Z Mamun and A T M Nurul Amin, Densification: A Strategic Plan to Mitigate River bank Erosion Disaster in Bangladesh, The University Press Limited (UPL), 1999.

Hugh Brammer, The Geography of the Soils of Bangladesh, The University Press Limited (UPL), 1996.

A Atiq Rahman , SaleemulHuq and Gordon R Conway, Environmental Aspects of Surface Water Systems of Bangladesh, The University Press Limited (UPL), 1990.

Hugh Brammer, Climate Change: Sea-level Rise and Development in Bangladesh, The University Press Limited (UPL), 2014.

Tawhidul Islam and AnantaNeelim, Climate change in Bangladesh: A Closer Look into Temperature and Rainfall Data, The University Press Limited (UPL), 2010.

Hugh Brammer, Can Bangladesh be Protected from Floods?, The University Press Limited (UPL), 2004.

Pradyumna P. Karan, Bhutan: A Physical and Cultural Geography, University Press of Kentucky. 196

Anonym, Manorama Year Book, 2017, Mammen Mathew, MalayalaManorama Press, 2016.

Fraser, Bhattacharya and Bhattacharya, Geography of Himalayan Kingdom: Bhutan, Concept Publishing Company, New Delhi, 2011.

Henry Francis Blanford, An Elementary Geography of Burma, India and Shillong,

RanjitTirtha, Geography of Asia, Rawat Publications, Jaipur.

Akitoshi Hiraoka: Janpanese Advance into the Pacific Ocean, The Albatross and the Great Bird Rush.

Morris, John, of Japan: Advance Japan: A Nation Thoroughly in Earnest.

Title of the course	Practical on Remote Sensing and GIS
Course code	GGY4193
Total Credit (theory)	3
Contact hours	45
Distribution of Marks	40+10 (Practical + Internal Assessment)
Course outcomes	The students will learn and acquire the skills in applying the advanced techniques of Remote Sensing, GIS and GPS in their study and research, which will lead them to quality research.

Unit	Content
Unit 1: Practical Works (30 marks) To attempt 3 questions carrying 10 marks each	<ol style="list-style-type: none"> 1. Fundamentals of Photogrammetry: determination of photo scale, object height, slope between two points and relief displacement (4 exercises) 2. Interpretation of aerial photographs and preparation of land use map, settlement map and road map (4 exercises) 3. Interpretation of satellite imagery and preparation of land use/ land cover and fluvialgeomorphic maps (4 exercises) 4. Digitization of different layers of spatial information (Point, line and polygon) and their thematic representation (5 exercises) 5. Study of changing land use and river course using remote sensing and GIS techniques (4exercises) 6. GPS data collection (Point, Line and Polygon) and plotting (4 exercises)
Unit II: Practical Notebook and Viva-voce (<ol style="list-style-type: none"> 1. Practical Notebook Assessment (5 marks) 2. Viva-voce (5 marks)

Reading list:

Burrough, P.A.,1986: Principles of Geographical Information Systems in Land ResourcesAssessment, Clarendon Press, Oxford.

Burrough, P.A. and McDonnel, R.A.,1998: Principles of Geographical Information Systems, Oxford University Press.

Colwell, R.N.,1983: Manual of Remote Sensing, Vol. I & II, American Society of Photogrammetry.

Curran, Paul, J., 1985: Principles of Remote Sensing, Longman Group Ltd. Gautam, N.C.,1970: Urban Landuse Study through Aerial Photo- interpretation Techniques, Pink Publishing House, Mathura.

Star, J. and Ester, J., 1990: Geographic Information System, Prentice-Hall. Lilesand, T.M. and

Kiefer, R.W., 1987: Remote Sensing and Image Interpretation, John Wiley.

Hord, R. Michael., 1986: Remote Sensing: Methods and Applications, John Wiley. Maguire, D. J.,

Goodchild, M. and Rhind, D. J.,1990: Geographical Information Systems: Principles and Applications, Longman Science and Technology Publications. Robinson, A. H., et al., 1995: Elements of Cartography, John Wiley.

Sabins, Floyd F., 1987: Remote Sensing Principles and Interpretation, W.H. Freeman and Company, New York.

Title of the course	Geoinformatics (special paper)
Course code	GGY4206 (1)
Total Credit (theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory + Internal Assessment)
Course outcomes	The students will enrich themselves with the techniques and skills of Remote Sensing, GIS and GPS and be able to apply these in quality study and research in geography.

Unit	Content
Unit 1	Spatial Analysis in GIS (40 marks)
1	Spatial Data and their geometric attributes including topology
2	Attribute Data in GIS and their management principles and techniques
3	Thematic representation of attributes in GIS
4	Integration of spatial and non- spatial data in GIS
5	Geo processing and spatial analysis tools in GIS
6	Vector based and raster based spatial analysis tools
7	Network and spatial analysis tools
8	DEM/ DTM preparation
9	Spatial Decision Support Systems, Environmental Impact Analysis and Spatial Data Infrastructure, Clearinghouse Networks and Geoportals.
Unit 2	Image Analysis, Interpretation and Processing (15 marks)
1	Introduction to image interpretation
2	Basic Principles of image interpretation
3	Elements of image interpretation

4	Image rectification and registration
5	Image enhancement techniques
Unit 3	Digital Image Classification (15 marks)
1	Principles of Image classification: Image space, feature space, image classification
2	Image classification process, preparation, unsupervised and supervised classification
3	Classification algorithms
4	Post classification analysis, ground truthing and accuracy assessment and validating the result.
Unit 4	Application of GIS and Remote Sensing in Modelling the Environment (10 marks)
1	Applications of remote sensing with special reference to land, water, forests, settlements and urban areas and climate change.
2	Land governance and GIS

Title of the course	Geoinformatics (Practical)
Course code	GGY4214 (1)
Total Credit (theory)	4
Contact hours	60
Distribution of Marks	80+20 (Practical + Internal Assessment)
Course outcomes	The students will be able to know the methods associated with the analysis of different geoinformatics techniques and its applications.

Unit	Content
Unit 1 (65 marks)	<ol style="list-style-type: none"> 1. Design of work-plan /schematic chart / flow-chart (geoinformatics components and functions, georeferencing procedure, Georeferencing a part or whole topographical map and satellite Imagery Creation of a relational data model. Spatial data types – comparison of different satellite imageries (6 exercises) 2. Digitization of maps using standard GIS package – point, line and polygon features from small and large scale maps Revenue Circle / Block / District level map of the state /region or from topographical sheets on 1:250,000 or 1:50,000 or 1:63,360 scales) . (4exercises) 3. Adding attributes by joining and relating data, display of attribute data through cartographic methods (2exercises) 4. Decision support mapping for point and line features (4exercises) 5. Extraction of polyline and polygon features of specific themes from a georeferenced imagery (2 exercises) 6. Preparation of thematic maps from various attributes(demographic, climatic, socioeconomic)of point, line and polygon features (2 exercises) 7. Preparation of thematic maps from nominal data – such as soils, geology, vegetation types / administrative units (2 exercises) 8. Digital Image Processing – Enhancement principles and techniques (6 exercises) 9. Image Classification techniques – Unsupervised and Supervised

	<p>10. Integration of remote sensing data in GIS environment – Land Use/Land Cover (LULC)</p> <p>11. Integration of GPS data in GIS environment for point features, line features and Polygon features. (8 exercises)</p> <p>12. Land Governance and GIS (2 Exercises)</p> <p>13. Usage of established models such as USLE and RUSLE (2 exercises)</p>
Unit 2	<p>Practical Notebook and Viva-voce (15 Marks)</p> <p>1. Practical Notebook Assessment (10 marks)</p> <p>2. Viva-voce (5 marks)</p>

Title of the course	Geoinformatics (Dissertation)
Course code	GGY4223 (1)
Total Credit (theory)	3
Contact hours	45
Distribution of Marks	40+10 (Dissertation + Internal)
Course outcomes	Students will write a dissertation on suitable topic related to special paper applying all required methodology and dissertation writing procedure.

1. Each student will have to prepare a dissertation under the guidance of respective teacher as per specialization following appropriate methodology, data base and literature review.
2. The dissertation duly signed by the guide concerned has to be submitted to the department at least one week before the scheduled date of examination.
3. The marks distribution of dissertation in the final semester examination is as follows:
 - (i) Total marks: 40
 - (ii) Evaluation of Content: 25 (average between external and internal examiners)
 - (iii) Viva-voce: 15 (exclusively by the external examiner)

Reading list:

- Bolstad, Paul. 2012. GIS Fundamentals: A First Text on Geographic Information Systems. XanEdu Publishing Inc. Ann Arbor.
- Dessers. E. 2014. Spatial Data Infrastructures at Work: Analysing the Spatial Enablement of Public Sector Processes. Leuven University Press, Belgium.
- DeMers, Michael. N. 2008. Fundamentals of Geographic Information Systems. Wiley.
- Fazal, S. 2008. GIS Basics. New Age International Pvt Ltd Publishers.
- Jensen, John R. 2015. Introductory Digital Image Processing: A Remote Sensing Perspective. Pearson Education.
- Lillesand, T.M. and Kiefer, R.W., 1987. Remote Sensing and Image Interpretation, John Wiley.
- Lo, C. P. and Yeung, A.K.W. 2006. Concepts and Techniques of Geographic Information Systems. Prentice Hall.
- Misra, Pratap and Enge, Per. 2010. Global Positioning System: Signals, Measurements, and Performance. Ganga-Jamuna Press, Lincoln, MA.
- Nedovic-Budic, Z., Crompvoets, J. and Georgiadou, Y. 2011. Spatial Data Infrastructures in Context: North and South. CRC Press: Taylor & Francis.
- Steinberg, Sheila L & Steinberg, Steven J. 2015. GIS Research Methods: Incorporating Spatial Perspectives, ESRI Press: Redlands.

Title of the Course	Regional Development Planning
Course Code	GGY4206 (2)
Total Credit (Theory)	6
Contact hours	90
Distribution of Marks	80+20 (Theory+ Internal Assessment)
Course outcomes	The students will acquire applied knowledge how any region can be development through proper planning of the resources and other potentials.

(To answer seven questions, three questions carrying 16 marks each and four questions carrying 8 Marks each)

Unit	Content
Unit I: Regional Development Planning in India and Selected Countries	<p>Regional Development Planning for sustainable development: Some perspectives from the developed and developing nations.</p> <p>Concept of Development, Development indicators: Per capita income, energy consumption, resource and infrastructure base, and demographic indicators.</p> <p>Pattern of World economic development: agriculture, industrial, commercial and technological</p> <p>Regional Planning in India in relation to Five Year Plans, Planning Commission and NITI Aayog</p> <p>Regional development perspectives in Israel, Netherlands, China.</p> <p>Urban policy and urban planning in India</p> <p>Planning for problems areas, depressed regions</p> <p>Area Development Programmes: Hill Area Development Program, Tribal Area Development Program.</p>

	<p>Case studies of regional development planning exercises - National Capital Region; North East Council; Concept of Physical Plan, Components of Physical Plan: Neighborhood planning</p>
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Detail syllabus of 4th semester

Title of the Course	Regional Development Planning (Practical)
Course Code	GGY4214 (2)
Total Credit (Theory)	4
Contact hours	60
Distribution of Marks	80+20 (Practical+ Internal Assessment)
Course outcomes	The students will be able to know the methods associated with the analysis of different regional development planning. The students will also learn the problems and prospects of regional development planning in a region with some practical exposure trips.

Unit	Content
Unit I: Practical Works (65 marks) (To attempt 5 questions carrying 13 marks each)	<p>Regionalization using methods of:</p> <ul style="list-style-type: none"> • Overlapping of different themes • Ranking using mean and standard deviation. • Factor analysis. <p>Network analysis</p> <ul style="list-style-type: none"> • Application of aggregate connectivity for regional development using alpha, beta, gamma and cyclomatic Number • Application of shape and tortuosity indices for developing planning strategy <p>Delimiting influence areas of nodal centers using:</p> <ul style="list-style-type: none"> • Breaking point method • Gravity potential method and potential surface mapping <p>Application of input-output analysis for prediction of short-range change in regional development.</p>

	Exercises on shift share analysis for regional studies.
Unit II: Practical Notebook and Viva - voce (15 marks)	Practical Notebook Assessment (10 marks) Viva-voce (5 marks)

Detail syllabus of 4th semester

Title of the Course	Regional Development Planning (Dissertation)
Course Code	GGY4223 (2)
Total Credit (Theory)	3
Contact hours	45
Distribution of Marks	40+10 (Dissertation+ Internal)
Course outcomes	Students will write a dissertation on suitable topic related to special paper applying all required methodology and dissertation writing procedure.

Unit	Content
Unit	<ol style="list-style-type: none">1. Each student will have to prepare a dissertation under the guidance of respective teacher as per specialization following appropriate methodology, data base and literature review.2. The dissertation duly signed by the guide concerned has to be submitted to the department at least one week before the scheduled date of examination.3. The marks distribution of dissertation in the final semester examination is as follows:<ol style="list-style-type: none">a) Total marks: 40b) Evaluation of Content: 25 (average between external and internal examiners)c) Viva-voce: 15 (exclusively by the external examiner)

Reading Materials:

Banerjee, A. and Kar. B., 1999: Economic Planning and development of North Eastern States, Kanishka Publications, New Delhi.

Choud, M. and Puri, V. K., 1983: Regional Planning in India, Allied Publications, New Delhi.

Deb, B. J., 1995: Regional Development in North East India, Reliance Publications, New Delhi.

Friedman, J. and William Alonso (eds), 1964: Regional Development and Planning, Cambridge, Mass. M.I.T. Press.

Friedman, J., 1973: Utilization, Planning and National Development, Beverly Hills, Sage Publications.

Gallion, A. B. and Simon Eisner, 1974: *The Urban Pattern: City Planning and Design*, East West Press Pvt. Ltd., New Delhi and Van Norstrand Reinhold Co.

Glasson, J., 1974: *An Introduction to Regional Planning*, Hutchinson Educational Ltd., London.

Gogoi, J. K., 1978: *The Government of India's Policy for Regional Development- A Summing Up and a Critique*, North Eastern Econ. Rev. II (3), July- Sept.

Goswami, A., 1981: *Assam's Industrial Development: Urgency of New Direction*, Econ. Pol. Weekly, XVI (21)

Hilhorst, J.G.M. and Dunham, D.M., 1971: *Issues in Regional Planning*, Institute of Social Studies, The Hague. 97

Holier, G. P., 1988: *Regional Development*, in Michael Pacione (ed.), *The Geography of the Third World: Progress and Prospect*, Rutledge, London and New York.

Isard, Walter et al, 1998: *Methods of Interregional and Regional Analysis*, Ashgate Publishing Ltd., Aldershot.

Kidwai, A. H., 1985: *Disparities in the Levels of Regional Development and Spatial Differentiation in India in the Historic Context*, CSRD, JNU, Mimeo.

Mishra, R. P., Sundaram, K.V. and Rao, P., V.L.S., 1974: *Regional Development Planning in India; A New Strategy*, Vikas Publications, New Delhi.

Mishra, R.P., 1992: *Regional Planning; Concept, Techniques, Policies and Case Studies*, Concept Publications, New Delhi.

Mohapatra, A.C., 1985: *The Concept of region*, Hill Geographer, IV (1)

Mohapatra, A.C. and Rootray, J.K., 1998: *Regional Development and Planning*, Rawat, Jaipur.

Mukherjee, A., 1991: *Methodology and Database for Decentralized Planning*, Heritage, New Delhi.

Mukherjee, A., 1993: *A Perspective Plan for A Hill District*, Heritage, New Delhi.

Pannerselvam, A., 1999: *Regional Development in the Developing Countries: A Search for Appropriate Theory*, Space, 12 (2).

Ridell, R., 1985: *Regional Development Policy*, St. Martin's Press, New York.

Sandesara, J.C., 1992: *Industrial Policy and Planning, 1947-91: Tendencies, Interpretations and Issues*, Sage Publications, New Delhi.

Sanyal, B. M., 2001: *India: Decentralized Planning*, Concept, New Delhi.

Smith, B.C., 1965: *Regionalism*, Action Society Trust, London.