

**DEPARTMENT OF GEOGRAPHY & APPLIED GEOGRAPHY
UNIVERSITY OF NORTH BENGAL**

Accredited by NAAC with Grade A

**CHOICE BASED CREDIT SYSTEM SYLLABUS
M.A./M. Sc in Geography & Applied Geography**

SEMESTER SYSTEM



ENLIGHTENMENT TO PERFECTION

Duration: Two Years

TOTAL MARKS: 1600

Total Credits: 64

- i) Theory: 32 Credits**
- ii) Practical: 16 Credits**
- iii) Ability Enhancement Course: 16 Credits**

EACH SEMESTER: Total Marks: 400

Total Credits: 16

2017

FIRST SEMESTER
DEPARTMENT OF GEOGRAPHY & APPLIED GEOGRAPHY
UNIVERSITY OF NORTH BENGAL

Course code	Course name	Type	Category	Instruction hours per week	Total marks	Duration of exam (hours)	Credits
THEORY							
GAG-101	Geomorphology	Theory	Core	4	50	2	2
GAG-102	Climatology	Theory	Core	4	50	2	2
GAG-103	Economic Geography	Theory	Core	4	50	2	2
GAG-104	Settlement Geography	Theory	Core	4	50	2	2
PRACTICAL							
GAG-105	General Practical	Practical	Core	8	100	5	4
ABILITY ENHANCEMENT COURSE							
GAG-106	Article Review	Continuous Evaluation	Core	2	25		1
GAG-107	Comprehensive Viva	Continuous Evaluation	Core	2	25		1
GAG-108	Seminar	Continuous Evaluation	Core	2	25		1
GAG-109	Tutorial	Continuous Evaluation	Core	2	15+10* =25		1
Total marks and credits in the First Semester				32 hours	400		16

* 10 marks will be for class attendance.

Mark allotted for percentage of class attended by the student	
% of classes attended by the student	Mark allotted
75-76	1
76-78	2
78-80	3
80-85	6
85-90	8
90 and above	10

SECOND SEMESTER
DEPARTMENT OF GEOGRAPHY & APPLIED GEOGRAPHY
UNIVERSITY OF NORTH BENGAL

Course code	Course name	Type	Category	Instruction hours per week	Total marks	Duration of exam (hours)	Credits
THEORY							
GAG-201	Applied Geography (Physical)	Theory	Core	4	50	2	2
GAG-202	Applied Geography (Physical)	Theory	Core	4	50	2	2
GAG-203	Applied Geography (Cultural)	Theory	Core	4	50	2	2
GAG-204	Applied Geography (Cultural)	Theory	Core	4	50	2	2
PRACTICAL							
GAG-205	General Practical	Practical	Core	8	100	5	4
ABILITY ENHANCEMENT COURSE							
GAG-206	Applied Geography Project Work	Continuous Evaluation	Core	4	50		2
GAG-207	Comprehensive Viva	Continuous Evaluation	Core	2	25		1
GAG-208	Tutorial	Continuous Evaluation	Core	2	15+10*=25		1
Total marks and credits in the Second Semester				32 hours	400		16

* 10 marks will be for class attendance.

THIRD SEMESTER
DEPARTMENT OF GEOGRAPHY & APPLIED GEOGRAPHY
UNIVERSITY OF NORTH BENGAL

Course code	Course name	Type	Category	Instruction hours per week	Total marks	Duration of exam (hours)	Credits
THEORY							
GAG-301	Biogeography and Soil Geography	Theory	Core	4	50	2	2
GAG-302	Geographical Thoughts	Theory	Core	4	50	2	2
GAG-303	Population Geography	Theory	Core	4	50	2	2
GAG-304	Regional Geography of India	Theory	Core	4	50	2	2
PRACTICAL							
GAG-305	General Practical	Practical	Core	8	100	5	4
ABILITY ENHANCEMENT COURSE							
GAG-306	Comprehensive Viva	Continuous Evaluation	Core	2	25		1
GAG-307	Group Discussion	Continuous Evaluation	Core	2	25		1
GAG-308	Seminar	Continuous Evaluation	Core	2	25		1
GAG-309	Tutorial	Continuous Evaluation	Core	2	15+10*=25		1
Total marks and credits in the Third Semester				32	400		16

*10 marks will be for class attendance

**FOURTH SEMESTER
DEPARTMENT OF GEOGRAPHY AND APPLIED GEOGRAPHY
UNIVERSITY OF NORTH BENGAL**

Course code	Course name	Type	Category	Instruction hours per week	Total marks	Duration of exam (hours)	Credits
THEORY							
GAG-401	Oceanography	Theory	Core	4	50	2	2
GAG-402	Regional Planning & Development	Theory	Core	4	50	2	2
GAG-403	Optional Course#	Theory	Elective Paper	4	50	2	2
GAG-404	Optional Course#	Theory	Elective Paper	4	50	2	2
PRACTICALS							
GAG-405	Optional Course Practical#	Practical	Elective Paper	4	50	3	2
GAG-406	General Practical	Practical	Core	4	50	3	2
ABILITY ENHANCEMENT COURSE							
GAG-407	Comprehensive Viva	Continuous Evaluation	Core	4	25		1
GAG-408	Optional Course Dissertation	Continuous Evaluation	Core	2	50		2
GAG-409	Tutorial	Continuous Evaluation	Core	2	15+10*=25		1
Total marks and credits in the Third Semester				32	400		16

Any one Optional Course is to be selected out of the following:

1. Applied Pedology
2. Cartography
3. Fluvial Geomorphology
4. Population Geography
5. Urban Geography

* 10 marks will be for class attendance.

SEMESTER – I
TOTAL MARKS: 400
TOTAL CREDITS: 16

THEORY: (Total Marks: 200)
(Total Credits: 08)

COURSE CODE: GAG–101 (GEOMORPHOLOGY)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT– I: Geomorphic Analysis

Objectives and history of Geomorphology. Methods of Geomorphic analysis: Geochronological methods - documentary evidence, artifacts, dendrochronology, pollen analysis, thermoluminescence, isotopic dating. Geomorphic Threshold: concept and types. Extreme events and equilibrium.

UNIT – II: Hill slope

Processes for slope development; Slope forms; Slope evolution - parallel retreat and slope replacement models.

UNIT – III: Rocks & Landforms

Characteristics of rocks and its influence in the evolution of landforms: Case study of Granite, Basalt & Limestone.

UNIT – IV: Dynamics of fluvial processes

Hydrological characteristics of an open channel flow, Stream power, Mechanisms of fluvial erosion, transportation and deposition. River valley: valley profiles and shape. Channel pattern: braided, meandering, straight; Erosional and depositional processes & landforms: flood plains, terraces, alluvial fans, deltas.

References

1. Ahnert, Frank, 1998: Introduction to Geomorphology, Arnold Publishers Ltd., London, UK, 1st Edition.
2. Alt, David, 1982: Physical Geology: Approach, Wardsworth Publishing Company, California, USA, 1st Edition.
3. Bartholomed, Rolland B. and Tillery, Bill W., 1984: Earth Science, D.C. Heath & Co., Lexinton, USA, 1st Edition.
4. Bradshaw, M.J., Abbott, A.J. and Gelsthorpe, A.P., 1978: The Earth's Changing surface, Hodder & Stoughton, London, UK, 1st Edition.
5. Butzer, Karl W, 1976: Geomorphology from the Earth, Harper and Row, Publishers, New York, USA, 1st Edition.
6. Chorley, Richard J. (ed.), 1969: Introduction to Physical Hydrology, Methuen & Co. Ltd., London.
7. Chorley, R. J. & Kennedy, 1971; Physical Geography: A systems approach, Prentice Hall.
8. Chorley, Richard J., Schumm, Stanley, A. and Sugden, David E., 1985: Geomorphology, Methuen & Company, New York, USA, 1st Edition.
9. Cooke, R. U. and Doornkamp, J.C., 1997: Geomorphology in environmental management: A new introduction, Oxford University Press, New York, 2nd Edition.
10. Davis, Stanley N., Reitan, Paul H. and Pestrong, Raymond, 1976: Geology: Our Physical Environment, McGraw-Hill Book Company, New York, USA, 1st Edition.

11. Derbyshire, E., Gregory, K. J. and Hails J. R., 1979: Geomorphological Processes: Studies in Physical Geography, Butterworths, London, UK, 1st Edition.
12. Embleton, Clifford and Thornes, John, (Ed.), 1980: Processes in Geomorphology, Arnold-Heineman Publishers (India) Pvt. Ltd., New Delhi, 1st Indian Edition.
13. Flint, Richard Foster and Skinner, Brian J., 1977: Physical Geology, John Wiley & Sons, New York, USA, 2nd Edition.
14. Gabler, Robert E., Brazier, Sheila, Sagar, Robert J. and Wise, Daniel L., 1982: Essentials of Physical Geography, Saunders College publishing, New York, USA, 2nd Edition.
15. Garner, H.F., 1974: The origin of Landscapes: A Synthesis of Geomorphology, Oxford University Press, Inc., New York, USA, 1st Edition.
16. Gerrard, A. J., 1988: Rocks and Landforms, Unwin Hayman, London, UK, 1st Edition.
17. Gilluly, James, Waters, Arron C. and Woodford, A.O., 1968: Principles of Geology, W.H. Freeman and Company, London & Toppan Company, Ltd., Tokyo, Japan, 3rd Edition.
18. Holmes, Arthur, 1965: Principles of Physical Geology, 1st ELBS and Nelson Edition, London, UK, 2nd Edition.
19. Kale, Vishwas S. and Gupta, Avijit, 2001: Introduction to Geomorphology, Orient Longman, Calcutta, 1st Edition.
20. King, Lester C., 1967: The morphology of the earth: A study and synthesis of world scenery, Oliver and Boyd, Edinburg, UK, 2nd Edition.
21. Larousse, 1961: Encyclopedia of the Earth, Prometheus Press, New York, USA, Batchworth Press, Ltd.
22. Rice, R. J., 1977: Fundamentals of Geomorphology, Longman Group Ltd., London, UK, 1st Edition.
23. Selby, M. J., 1993: Hillslope materials and processes, Oxford University Press, Oxford, 2nd Edition.
24. Small, R. J., 1978: The study of Landforms: A Textbook of Geomorphology, Cambridge University Press, Cambridge, UK, 2nd Edition.
25. Strahler, Arthur N., 1960: Physical Geography, John Wiley & Sons, Inc., New York, USA, 2nd Edition.
26. Strahler, Arthur N., 1963: The Earth Sciences, Harper's Geosciences Series, Harper & Row, Publishers, New York, USA, 1st Edition.
27. Trinkler, K. J., 1989: History of Geomorphology: From Hutton to Hack, Unwin Hayman, Winchester, USA, 1st Edition.
28. Worcester, Philip G., 1948: A Textbook of Geomorphology, D. Von Nostrand Co., Inc., New York, USA, 2nd Edition.

COURSE CODE: GAG-102 (CLIMATOLOGY)

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT - I: Nature and scope of climatology: Climatology and its relationship with meteorology; Atmospheric motion: forces controlling motion of air; Jet stream; Precipitation mechanism; Acid rain: causes & impact; Greenhouse effect.

UNIT - II: Ocean atmospheric interaction: El Nino Southern Oscillation (ENSO) and La Nina. Atmospheric disturbances: Thunderstorms – origin, characteristics, classification and distribution; Western disturbances.

UNIT - III: Climatic change: Evidences, possible causes and impact; Global warming: environmental impacts and society's response.

UNIT - IV: Applied climatology: Methods of data collection. Weather forecasting: historical perspectives and modern development. Hydro-meteorology: concept and applications. Agro-meteorology: concept and applications.

References

1. Barry, R. G. and Chorley, R. G., Atmosphere, Weather and Climate, Methuen & Co., London, 1968.
2. Byers, H. R., General meteorology, McGraw Hill Book Co., New York, 1959.
3. Craig, R. A., The Upper Atmosphere – Meteorology and Physics, Academic Press, New York, 1965.
4. Critchfield, H. J., General Climatology, Prentice Hall of India Pvt. Ltd., New Delhi, 1975.
5. Crowe, P. R., Concepts in Climatology, Longmans, London, 1971.
6. Das, P. K., The Monsoons, N.B.T., New Delhi, 1970.
7. Flohn, H. (Ed.), General Climatology, Elsevier, Amsterdam, 1969.
8. Haurwitz, B. and Austin, J. M., Climatology, McGraw Hill Book Co., New York, 1944.
9. I.M.D., Monsoons of the World, I.M.D., New Delhi, 1960.
10. Kendrew, W. G., Climatology, Oxford University Press, 1957.
11. Landsberg, H., Physical Climatology, Gray Printing Inc. Du. Bois, Paris, 1958.
12. Mason, B. J., Clouds, Rain and Rain making, Cambridge University Press, Cambridge, 1962.
13. Mason, B. J., The Physics of Clouds, Oxford University Press, New York, 1970.
14. Petterssen, Sverre, Introduction to Meteorology, McGraw Hill Book Co., New York, 1958.
15. Rasool, S. I. (Ed.), Chemistry of the Lower Atmosphere, Plenum Press, New York, 1975.
16. Ratcliffe, J. A., (Ed.), Physics of the Atmosphere, Academic Press, New York & London, 1960.
17. Riehl, H., Jet Streams of the Atmosphere, Colorado University, Colorado, 1969.
18. Saha, P. K., El-Nino – La Nina/ENSO and its Impact on Global Climate in ‘Contemporary Dimensions in Geography’, University of Burdwan, Burdwan, 2000.
19. Saha, P. K., Nature and Natural Processes in ‘Environment’, Calcutta University, Calcutta, 2000.
20. Saha, P. K., & Bhattacharyya, P. K., Adhunik Jalavayu Vidya (Modern Climatology), West Bengal State Book Board, Calcutta, 1999.
21. Trewartha, G. T., An Introduction to climate, McGraw Hill Kogakusha, Ltd., Tokyo, 1968.

COURSE CODE: GAG–103 (ECONOMIC GEOGRAPHY)

Full Marks: 50

Time: Two Hours

Credits: 02

- UNIT – I: Fundamentals of Economic Geography:** Definition and scope of economic geography, Fundamental concepts and approaches to study economic geography. Classification of economic activities and their changing trend; types of economic systems and classification of world in to various economies; Economic Regions and Regionalisation; Theories of economic development.
- UNIT – II: Agricultural Geography:** Von Thunen’s model of agricultural land use and its modifications; Selected agricultural concepts: crop concentration, crop diversification, crop combination, agricultural productivity & efficiency.
- UNIT – III: Industrial Geography:** Theories of industrial location; Alfred Weber, Tord Palander, August Losch, Walter Isard and Rawstron’s principles. Methods of measuring the spatial distribution of manufacturing; Industrial Regions of the World; Spatial Variations in Production and Transport Costs.
- UNIT – IV: Transport and Marketing Geography:** Development of transport geography; Modes of transportation and transport cost; Transport network connectivity and accessibility; Transportation and Economic Development, Spatial Interactions and the Gravity Model; Definitions and origin of Market; Typology of markets, Market system in rural economy; Market system in urban economy, role of market in the development of trade and commerce.

References

1. Bengston, N. A. & Royen M. V.: Fundamentals of Economic Geography,
2. Berry Conkling & Ray: The Geography of Economic Systems, Prentice Hall.
3. Ghosh, B. C.: Industrial Location.
4. Halt, Hodder and Lee: Economic Geography
5. Husain, Majid: Agricultural Geography, Inter-India Publications, Delhi, 1979.
6. Llyod P. L. & Dicken P.: Location in Space: A theoretical approach to economic Geography.
7. Losch, A., The Economics of Location, University Press, Yale, New Haven, 1954.
8. McCart and Lindberg- A Preface to Economic Geography.
9. Miller, E. W.: A Geography of Manufacturing.
10. Singh J. and Dhillion. S. S.: Agriculture Geography, McGraw Hill, India, New Delhi 1984.
11. Smith, D. M.: Industrial Location, John Wiley & Sons, N.Y., 1971.
12. Smith, D. E.: Industrial Location - An Economic Geographical Analysis.
13. Smith, J. C. and Phillip, M. O.: Industrial and Commercial Geography, Henry
14. Symons. L.: Agricultural Geography, Bell and Sons, London, 1972.
15. Wheeler, J. O., et al: Economic geography, John Wiley, New York, 1995.

COURSE CODE: GAG-104 (SETTLEMENT GEOGRAPHY)

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT - I: Origin and distribution of Settlements: Origin and distribution pattern of rural settlements and urban centers (with special reference to India)

UNIT - II: Classification of Settlements: Rural settlements and urban centers (with special reference to India)

UNIT - III: Settlement Structure: Models explaining morphological pattern of rural settlements (with special reference to India), Models and theories explaining morphological pattern of urban centers, shape analysis of rural settlements and urban centers.

UNIT - IV: Settlement Hierarchy: Central place theory; theory of Walter Christaller and August Losch, Measurements of centrality, Hierarchy of settlements in India.

References

1. Ambrose, Peter, 1970: Concepts in Geography, Vol.-I, Settlement Pattern, Longman.
2. Baskin, C., (Translator) 1996: Central Places in Southern Germany, Prentice-Hall Inc. Englewood Cliffs New Jersey, Originally written by C.W. Christaller in German with title Dio Zentralen Orle Suddeutsch land in 1933.
3. Haggett, Peter, Andrew D. Cliff and Allen Frey (Ed.) 1979: Locational Models, Arnold Heinemann.
4. King, Leslie, J., 1986: Central Place Theory, Saga Publications, New Delhi.
5. Mayer, M. Harold and Clyde F. Kohn (Ed.) 1967 Readings in urban Geography, Central Book Depot, Allahabad.
6. Mitra, Asok, Mukherjee S. and Bose, R., 1980: Indian Cities Abhinav Publications, New Delhi.
7. Nangia, Sudesh, 1976: Delhi Metropolitan Region, K.B. Publications, New Delhi.
8. Prakasa, Rao, V. L. S., 1992: Urbanisation in India: Spatial Dimensions, Concept Publishing Co., New Delhi.
9. Ramachandran, R., 1992: Urbanisation and Urban Systems in India, Oxford University Press, New Delhi.
10. Singh, R. L. and Kashi Nath Singh (Ed.) 1975: Readings in Rural Settlement Geography, National Geographical Society of India, Varanasi.
11. Ucko, M. J., Ruth Tringham and G. W. Dimbleby (editors) 1972: Man, Settlement and Urbanism, Duckworth.

12. United Nations Centre for Human Settlements (HABITAT) 1996: An Urbanising World, Global Report on Human Settlements, Oxford University Press for HABITAT.

PRACTICAL: (Total Marks: 100)
(Total Credits: 04)

COURSE CODE: GAG–105 (GENERAL PRACTICAL)

Full Marks: 100
Credits: 04

Time: Five Hours

UNIT – I: Computer Applications in Geography (Marks: 25)

- i) Computronics, Computer organization, Components of Hardware and Software.
- ii) Operating Systems: MS-DOS, MS-Windows, etc.
- iii) Data Structure and Data Format, A – D and D – A presentation, Data representation, Computer Programming and Networking.
- iv) Familiar with MS-Office, Page Maker, Corel Draw, etc.
- v) Scanning, Geo-referencing, Mosaicing, Sub-setting, Database creation, Theme layer creation, Classification and Re-classification, Labelling, Layer calculation, and Mapping.

UNIT – II: Statistics (Marks: 25)

- i) Samples & Sampling: Sampling units and sample frame, Methods of different sampling, estimates of mean, proportion and their standard errors, sample size.
- ii) Bi-variate analysis: Measuring the strength of association and relationship; Scatter diagram, Product moment correlation coefficient and Spearman's rank correlation coefficient, Ordinary least squares method; Simple linear regression equation, prediction, explanation, residuals, test of significance of the regression coefficient and correlation coefficient.
- iii) Chi-Square tests for goodness of fit and association.

UNIT – III: Map Projections (Marks: 25)

- i) Gall's Stereographic Projection
- ii) Mercator's Projection
- iii) Mollweide's Projection
- iv) Simple Conical Projection with two Standard Parallels
- v) Conical Equal Area Projection with one Standard Parallel
- vi) Conical Equal Area Projection with two Standard Parallels
- vii) Conical Orthomorphic Projection with one Standard Parallel
- viii) Interrupted Sinusoidal Projection
- ix) UTM Projection

UNIT – IV: Surveying (Marks: 25)

- i) Plane table survey: Intersection & Radiation method
- ii) Contouring of an area with the help of Dumpy Level
- iii) Measurement of height of an object with the help of Theodolite when the base is inaccessible.
- iv) Theodolite survey: Principles and Application, Traversing, Computation of Co-ordinates and areas.

References

1. Ebdon, David, 1983: Statistics in Geography: A Practical Approach, Basil Blackwell Publisher, Oxford, England, 1983.
2. Goon, A. M., et al: Fundamentals of Statistics.
3. Frank, Harry & Steven C. Althoen, 1994: Statistics: Concepts and Applications, Cambridge University Press, Cambridge, UK, Cambridge low price edition, 1997.

4. Hinks, A. R.: Map Projections, Cambridge University Press, Cambridge, UK, 1st Edition, 1921.
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10. Raisz Erwin.: Principles of Cartography, International Student Edition, McGraw-Hill Book Co. Inc., Tokyo, Japan, 1st Edition, 1962.
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13. Roy, P.: An Analytical Study of Map Projections, Applied and Mathematical Geographic Studies, Calcutta, 1st Edition, 1988.
14. Sarkar, Ashis: Practical Geography – A Systematic Approach, Orient Longman, Calcutta, 1st Edition, 1991.
15. Sarkar, Ashis and Roy, P., 1983: Some selected Map Projection for India – their relative efficiencies, Geographical Review of India, Kolkata, Vol. 43, No. 2.
16. Singh, R. L.: Elements of Practical Geography, Kalyani Publishers, New Delhi, 1st Edition, 1979.
17. Snyder, John P.: Flattening the Earth-Two thousand years of Map Projections, The University of Chicago Press, Chicago, 1st Edition, 1997.
18. Steers, J.A.: An introduction to the Study of Map Projections, University of London Press Ltd., London, Thirteenth Edi., 1962.
19. Stout, K.J. and Blunt, L., 1994: Three-Dimensional Surface Topography, Penton Press, London, 1st Edition.
20. Tobler, W. R.: Automation and Cartography, in Geographical Review of India, Calcutta, Vol. 49, No. 4.

ABILITY ENHANCEMENT COURSE: (Total Marks: 100)

(Total Credits: 04)

COURSE CODE GAG–106:	Article Review	(Marks: 25; Credit: 01)
COURSE CODE GAG–107:	Comprehensive Viva	(Marks: 25; Credit: 01)
COURSE CODE GAG–108:	Seminar	(Marks: 25; Credit: 01)
COURSE CODE GAG–109:	Tutorial	(Marks: 15+10*= 25; Credit: 01)

SEMESTER – II
TOTAL MARKS: 400
TOTAL CREDITS: 16

THEORY: (Total Marks: 200)
(Total credits: 08)

COURSE CODE: GAG–201 (APPLIED GEOGRAPHY - PHYSICAL)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT – I: Land and Terrain Evaluation

- i) Principles, Methods and Applications of land and terrain evaluation.
- ii) Models of land capability: USDA, UK
- iii) Models of land suitability: FAO
- iv) Terrain classification: CSIRO, MEXE models.

UNIT - II: Soil erosion and degradation

- i) Soil erosion: Factors influencing soil erosion; Types and mechanism of soil erosion; Impact of soil erosion.
- ii) Soil erosion assessment: USLE model
- iii) Soil Alkalinisation, Salinisation, and Desertification: Causes, distribution and impacts.
- iv) Soil conservation: Methods, Principles and Strategies

References

1. Bennett, H. H.: Soil Conservation.
2. Bibby, J.S. and Machney, D.: Land Use Capability Classification; Soil Survey; England and Wales, Harpenden, U.K. Technical Monograph No. 1.
3. Bridges, E.M. and Davidson, D.A. (Ed.): Principles and Applications of Soil Geography, Longman Group Limited, London, UK, 1st Edition, 1982.
4. Dent, David and Young, Anthony: Soil Survey and Land Evaluation, George Allen & Unwin, Great Britain, UK, 1st Edition, 1981.
5. FAO (1974): Approaches to land classification, Soil Bulletin No. 22.
6. FAO (1976): A framework of Land Evaluation, Soil Bulletin No. 3.
7. FAO (1978): UNESCO/UNEP – Assessment of Soil loss by water erosion.
8. Foth, Henry D. and Schafer, John W.: Soil Geography and Land Use, John Wiley & sons, New York, 1st Edition, 1980.
9. Gerrard, A.J.: Soil and Landform.
10. Gondie, Andrew, et al, 1990: Geomorphological Techniques, 2nd Edition, Unwin Hyman, London.
11. Hails, John R.: Applied Geomorphology.
12. Hart, M.G.: Geomorphology: Pure and Applied, George Allen and Unwin, London, UK, 1st Edition, 1986.
13. Hole, Francis D. and Campbell, James B.: Soil landscape analysis, Routledge & Kegan Paul, 1st Edition, 1985.
14. Hudson, N.W.: Soil Conservation.
15. Klingbiel, A.A. and Montgomery, P. 1961: Land capability classification: Soil conservation Series, USDA, Agricultural Handbook No, 210.
16. Mitchell, Colin W., 1973: Terrain Evaluation: The World's Landscapes, An introductory handbook to the history, principles and methods of practical terrain assessment, Longman Group Limited, London, UK, 1st Edition.
17. Morgan, R.P.C.: Soil erosion and conservation.

18. Olson, Gerald W.: Field Guide to Soils and the Environment: Applications of soil surveys, Chapman and Hall, New York, USA, 1st Edition, 1984.
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20. Stamp, L. Dudley.: The Land of Britain: its use and misuse, Longmans, Green and Co. Ltd., in conjunction with Geographical Publications Ltd., London, 3rd Edition, 1962.
21. Townshend J.R.C: Terrain Evaluation.
22. Way, Douglas S.: Terrain Analysis: A guide to Site Selection Using Aerial Photographic Interpretation, Community Development Series. Dowden, Hutchinson & Ross, Inc., Pennsylvania, USA, 1st Edition, 1973.

COURSE CODE: GAG–202 (APPLIED GEOGRAPHY - PHYSICAL)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT – I: Landslides (with special reference to Darjeeling-Sikkim Himalaya)

- i) Occurrences of landslides in Darjeeling-Sikkim Himalaya
- ii) Forces producing slope instability
- iii) Methodology for identifying landslide prone area
- iv) Landslide hazard zonation
- v) Stabilization of landslide and landslide management

UNIT – II: Floods

Physical events and Natural hazards, impacts and interpretation of flood hazard. River floods: Geophysical processes, Spatial Characteristics. Coastal floods: Flood producing processes in coastal and estuarine areas. Flood estimation, Flood defense, Flood forecasting and warning, Mitigation and management of flood losses.

References

1. Baker, Victor R., Kochel, R. Craig and Patton, Peter C., 1988: *Flood Geomorphology*, a Wiley-Interscience Publication, John Wiley & Sons, New York.
2. Basu, S. R. & Sarkar, S. 1985; Some considerations on recent landslides at Tindharia and their control, Indian Journal of Power and River Valley Development, 188-194.
3. Chow, Ven Te (Editor-in-Chief), 1964: *Handbook of Applied Hydrology: A Compendium of Water Resources Technology*, McGraw-Hill Book Company, New York.
4. Cooke, R. U. and Doornkamp, J. C., 1997: *Geomorphology in environmental management: A new introduction*, Oxford University Press, New York, 2nd Edition.
5. Dutta, K. K. 1966; Landslips in Darjeeling and neighboring hill slopes in June, 1950: Bul. GSI, B (15), 7-30.
6. Nautiyal, S. P. 1966; On the stability of certain hill slopes in and around Darjeeling, W. B. Bul. G.S.I. B (15), 31-48.
7. Sarkar, S. 1999; Landslides in Darjeeling Himalaya, India; Transactions, Japanese Geomorphological Union, vol. 20-3, p.299-315.
8. Selby, M. J., 1993: *Hill-slope materials and processes*, Oxford University Press, Oxford, 2nd Edition.
9. Sharpe, C. F. S. 1960; *Landslides and related phenomena*, Pageant Book Inc.
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11. Smith, Keith and Roy Ward, 1998: *Floods: Physical processes and Human impacts*, John Wiley & Sons, Chichester, England.
12. Statham, Ian, 1977: *Earth Surface Sediment Transport: Contemporary problems in Geography*, Oxford University Press, Oxford.

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COURSE CODE: GAG-203 (APPLIED GEOGRAPHY- CULTURAL)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT – I: Urban Planning

- i) Definition and characteristics of global cities.
- ii) Contemporary world urbanization with special reference to India
- iii) History of urban planning & policy in India.
- iv) Master Plan: necessity and data requirements.
- v) Case study of City/Master Plan.
- vi) Slums: definition; causes of formation and remedial measures.
- vii) Planning thought: Contribution of Ebenezer Howard; Patrick Geddes, Le Corbusier and C.A. Doxiadis.

References

1. Abercrombie, P. – Town and Country Planning
2. Begde, P.V. – Ancient and Medieval Town Planning in India.
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4. Centre for Urban Studies, Indian Institute of Public Administration: Slum Clearance and Improvement
5. Desai and Pillai – Slums and Urbanisation, Popular Prakashan, Bombay 1970.
6. Director of Town Planning – Master Plan for Jajpur Road, Directorate of Town Planning, Orissa 1975.
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UNIT - II: Environmental Management and Environmental Impact Assessment

- i) Environmental Management: concept, aspects and approaches.
- ii) Environmental Management of deforested areas.
- iii) Environmental Management of urban areas.

- iv) Environmental Management of wastelands.
- v) Environmental Impact Assessment
- vi) Environmental legislation and implementation in India.

References

1. Anders & Lloyd: Natural Disasters, 1984, IIAD.
2. Scheink, Valdimir (Ed.): Earthquake Hazard and Risk, Kluwer Academic publications.
3. Sharma, V. K. (Ed.): Natural Disasters, Indian Institute of Public Administration, New Delhi, 1994.
4. Simon, Ross: Hazard Geography, Longman, 1987.
5. Glasson, J; Therivel, R. & Chadwick, A – Introduction to Environmental Impact Assessment, 2nd Edition, 1999, UGC Press Limited, London.
6. Khoshoo, T. N. – Environmental Concerns and Strategies.
7. Khoshoo, T. N. – Environmental properties in India and sustainable development – 73rd session Indian Science Congress, New Delhi.
8. Negi, S. S. – Environmental Conservation.
9. Negi, Sharad Singh – Environmental Problems in the Himalaya, Dehra Dun, 1983.
10. Singh, H. H. and others (Ed.) – Geography and environment – Issues and challenges.
11. Singh, L. R. and others (Ed.) – Environmental Management – the Allahabad Geographical Society, University of Allahabad.
12. Singh, Savindra – Environmental Geography, 1999, Prayag Pustak Bhawan, Allahabad.

COURSE CODE: GAG-204: (APPLIED GEOGRAPHY - CULTURAL)

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT – I: Geography of Tourism

- i) Fundamental concepts and scope of Geography of Tourism; definition of tourism terms;
- ii) Geographical Elements of Tourism, Components of tourism and its characteristics
- iii) Determinants of tourism demands; pattern of growth and motivating factors;
- iv) Tourism Impacts: Positive and negative Impacts of tourism - socio cultural, economic, environmental and political;
- v) Ecotourism and its role in sustainable development
- vi) Tourism Policy and planning in India; Emerging trends and new thrust areas of Indian tourism.

References

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2. Cooper, Fletcher, Tourism, Principles and practices (1993) Pitman
3. D. Pearce Bhatia; Tourism Today Seth: Tourism Management (New Delhi, Sterling)
4. H. Robinson; Geography of Tourism
5. J.K. Sharma; Tourism Planning and Development
6. Kaul: Dynamics of Tourism (New Delhi, Sterling)
7. M. Dixit; Tourism Geography and Trends
8. Mill and Morisson; Tourism Systems
9. Mill and Morrison – The Tourism system an Introductory Text (1992) Prentice Hall
10. P. C. Sinha; Tourism Geography
11. P.C. Sinha, Tourism Evolution Scope Nature & Organization. Anmol Publication.
12. P.C. Sinha, Tourism Management. Anmol Publication.
13. P.C. Sinha; Tourism Management Vol. - 4
14. P.S. Gill, Dynamics of Tourism (4 Vols.) Anmol Publication.
15. Prannath Seth; Successful Tourism Management

16. Sagar Singh; Studies in Tourism

UNIT - II: Geography of Rural Development

- i) **Concept of Rural Development:** Definition and Scope of Rural Development; Causes of Rural Backwardness; Need for Rural Development; Constraints of Rural Development.
- ii) **Rural Development Policies and Strategies-** Indicators of Rural Development; Need for a Rural Development Policy, Rural Development Policy in India, Strategies for Rural Development in India.
- iii) **Rural Development Programmes in India:** Historical perspective of Rural Development Programmes in India; Agriculture Development relating Programmes; Ongoing Self Employment and Wage Employment programs, Poverty alleviation Programme, Micro Finance and SHGs.
- iv) **Rural Infrastructural and Social Sector Development programmes:** Rural Electrification, Rural Road, Rural Housing, Rural Health care and family welfare programmes, Empowerment of Rural Women through Self Help Groups; Janani Suraksha Yojana, Rural Drinking water and sanitation programmes, Rural Education-Sarva Siksha Mission.

References

1. Gerald, Meir.: Leading Issues in Rural Development, Oxford University Press, New Delhi
2. Reddy, Venkata, K.: Agriculture and Rural Development (A Gandhian Perspective), Himalaya Publishing House.
3. Singh, Katar.: Rural Development – Principles, Policies and Management, Sage Publications. New Delhi
4. Sundaram, Satya, I.: Rural Development, Himalaya Publishing.
5. Todaro, Michael P.: Economic Development, Pearson Education.

PRACTICAL: Total Marks: 100

Total Credits: 04

COURSE CODE: GAG-205 (GENERAL PRACTICAL)

Full Marks: 100

Time: Five Hours

Credits: 04

UNIT – I: Study of Topographical Maps

(Marks: 25)

- i) Morphometric Analysis of Drainage Basin: Stream Ordering (Horton and Strahler), Drainage Density and Texture.
- ii) Basin Circularity and Elongation.
- iii) Altimetric Curve, Hypsometric Curve.
- iv) Ruggedness Index, Dissection Index.
- v) Nearest Neighbour Analysis of Settlements (based on Topographical Maps).
- vi) Quantitative Relation between Settlement and different Relief Aspects by Linear Regression Analysis.

UNIT – II: Weather Instruments

(Marks: 25)

- i) Pluviometric chart.
- ii) Thermo-hydrograph
- iii) Barometric chart.

UNIT – III: Thematic Mapping

(Marks: 50)

- i) Methods of measuring - crop combination, agricultural efficiency, location quotient and co-efficient of geographical association.

- ii) Time Series analysis for measuring trend of land value /land use by the method of Semi averages and Least Squares - Straight line and Parabola of the second degree.
- iii) Measurement of breaking points and detour index
- iv) Spatial Distribution of Population Mapping and Population Potential.
- v) Lorenz Curve, Ginni's coefficient of localisation and Centographic measures.

References

1. Command of the Defence Council: Textbook of Topographic Surveying, Ministry of Defence, London, 4th Edition, 1965.
2. Cromley, Robert G., 1997: Digital Cartography, Prentice Hall, Englewood Cliffs, New Jersey, 1st Edition.
3. Ebdon, David: Statistics in Geography: A Practical Approach, Basil Blackwell Publisher, Oxford, England, 1983.
4. Misra, R. P.: Fundamentals of Cartography, Concept Publishing Company, New Delhi, Revised & Enlarged Edition, 1989.

ABILITY ENHANCEMENT COURSE: Total Marks: 100

Total Credits: 04

COURSE CODE: GAG-206: Applied Geography Project Work (Marks: 50/Credits: 02)

COURSE CODE: GAG-207: Comprehensive Viva (Marks: 25/ Credits: 01)

COURSE CODE: GAG-208: Tutorial (Marks: 15+10*=25/Credits: 01)

For all Applied Geography Courses

Project work containing at least 50 pages (including maps & diagrams) involving the applications of any one of the topics of Applied Geography syllabus will be prepared by the student. The project report based on fieldwork (normally not exceeding a week and under the supervision of a teacher) should be well represented by suitable statistical techniques and cartographic methods.

SEMESTER – III
TOTAL MARKS: 400
TOTAL CREDITS: 16

THEORY: (Total Marks: 200)
(Total credits: 08)

COURSE CODE: GAG–301 (BIO-GEOGRAPHY AND SOIL GEOGRAPHY)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT – I: Development and Content of Biogeography. Habitat and Plant-animal association. Zoogeography: realms and regions. Phytogeography: Plant evolution, Raunkiaer's classification of plants, Distribution: Patterns, Factors and types. Plant association and succession.

UNIT – II: Patterns of diversity. Depletion of bio-diversity through natural and man induced causes. Environment: Levels of environmental awareness. Misuse of the environment. Environmental hazards: Meaning, Types and Impact. Explanations of present-day plant distribution. Ecosystem of grassland, marine, and desert.

UNIT - III: Factors of Soil Formation
i) Active factors
ii) Passive factors
iii) Climatogenic soil formation
iv) Podzolisation
v) Laterization

UNIT - IV: Composition of Soil
i) Soil Texture
ii) Soil Structure
iii) Soil colour
iv) Soil Organic matter
v) Soil Reaction

References

Bio-Geography

1. Aaradhana, P. S., 1998: Himalayan Ecology, Rajat Publications, Delhi.
2. Brodie, Juliet, 1985: Grassland studies; Practical ecology series, George Allen & Unwin Publishers Ltd., London.
3. Brown, James H. and Gibson, Arthur C., 1983: Biogeography, The C.V. Mosby Co., St. Louis, USA.
4. Chapman, J. L. and Reiss, M. J. 1999: Ecology: Principles and Applications, Cambridge Low-Price Edition, Delhi, 2nd Edition.
5. Eyre, S. R., (Ed.) 1971: World Vegetation types, Macmillan, London.
6. Eyre, S. R., 1968: Vegetation and Soils; a world picture, Edward Arnold, London, 2nd Edition.
7. G. Tyler Miller, Jr., 1992: Living in the environment: an introduction to environmental science, Wadsworth, Inc., California, 7th Edition.
8. Gupta, R. K., Dabral, B. G., Homji, V. M. Meher and Puri, G. S., 2000: Forest Ecology; Environment, Forests and rainfall, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, Vol. 3.
9. Kellman, Martin C., 1975: Plant Geography, Methuen & Co. Ltd., London.
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12. Robinson, H., 1972: Biogeography, ELBS, London, 1st Edition.
13. Silvertown, Jonathan W., 1982: Introduction to plant population ecology, Longman Group Ltd., England.
14. Strain, B. R. and Billings, W. D., (Ed.) 1974: Vegetation and Environment, Dr. W. Junk. B.V. Publishers, The Hague.
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17. Waring, Richard H. and Running, Steven W., 1998: Forest Ecosystems; analysis at multiple scales, Academic Press, London, 2nd Edition.
18. Woodward, F. I., 1987: Climate and Plant distribution, Cambridge series in Ecology, Cambridge University Press, Cambridge.

Soil Geography

19. Brady, Nyle C., 2001: The Nature and Properties of Soils, Prentice-Hall of India Private Ltd., New Delhi, India, 10th Edition.
20. Bunting, Brian T., 1967: The Geography of Soil, Hutchinson University Library, London UK, 2nd Edition.
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23. Foth, Henry D., 1984: Fundamentals of Soil Science, John Wiley & Sons, Inc., New York, USA, 7th Edition.
24. Gerrard, John, 2000: Fundamentals of Soils, Routledge Fundamentals of Physical Geography Series, Routledge, London, UK, 1st Edition.
25. Jenny, Hans, 1941: Factors of Soil Formation: A system of Quantitative Pedology, McGraw-Hill Book Co., Inc., New York, USA, 1st Edition.
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27. Means, R. E. and Parcher, J. V., 1963: Physical properties of Soils, Prentice-Hall of India (Pvt.) Ltd., New Delhi, 1st Edition.
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30. 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.
31. Townsend, W.N., 1973: An introduction to the scientific study of Soils, Edward Arnold (Publishers) Ltd., London, UK, 1st Edition.

COURSE CODE: GAG-302 (GEOGRAPHICAL THOUGHTS)

Full Marks: 50
Credits: 02

Time: Two Hours

Unit - I: Geography during the Ancient and Medieval period

- i) Ancient period: Contribution of Greeks, Romans and Indians.
- ii) Medieval period: Dark Age in Geography; Arab Geographical thoughts; Age of Explorations and Travels.

Unit - II: Geography during the modern period (Since 18th Century)

- i) Contribution of German School.

- ii) Contribution of French School.
- iii) Contribution of Russian School.
- iv) Contribution of American School.
- v) Contribution of British School.

UNIT – III: Recent Trends in Geography (Since 1950)

- i) Positivist spatial science view point and systems approach.
- ii) Behavioural Geography.
- iii) Humanistic Geography.
- iv) Relevant, Liberal and Radical Geography.

UNIT - IV: Explanation in Geography

- i) Philosophy, Methodology and Explanation in Geography.
- ii) Role of Laws, Theories and Models in explanations in Geography.

References

1. Abler, Ronald; Adams, John S. Gould, Peter, 1971: Spatial Organization: The Geographer's View of the World, Prentice Hall, N.J.
2. Ali, S. M. 1966: The Geography of Puranas, Peoples Publishing House, Delhi.
3. Ambrose, P. Analytical Human Geography.
4. Amedeo, Douglas, 1971: An Introduction to Scientific Reasoning in Geography, John Wiley, U.S.A.
5. Annals of Association of American Geographers Vol.69. No.3, 1979.
6. Blunden, J., Hagget P., Hamnett C. & Sarre P. Ed., Fundamentals of Human Geography: A reader.
7. Brown, E.H. (Ed): Geography, yesterday and tomorrow.
8. Coffey, William J., Geography towards general spatial systems approach.
9. Cox, K. R. & Colledge R. C.: Behavioural problems in Geography revisited.
10. Cox, K. R.: Man, Location and Behaviour: An Introduction to Human Geography,
11. Dickinson, R. E.; The makers of modern Geography.
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13. Gould, J. R: An introduction to Behavioural Geography
14. Hagget, Peter; Geography: A modern synthesis.
15. Hagget, Peter; Locational analysis in Human Geography.
16. Hartshorne, R, 1959: Perspectives on Nature of Geography, Rand McNally & Co.
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18. Harvey, David, Explanation in Geography
19. Husain, Majid; 1984: Evolution of Geographical Thought, Rawat Publications, Jaipur.
20. James, P. E.; All possible world: A history of Geographical Ideas.
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22. Johnston, R. J., 1983: Philosophy and Human Geography, Edward Arnold, London.
23. Johnston, R. J., 1988: The Future of Geography, Methuen, London.
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26. Minshull, Roger, 1970: The Changing Nature of Geography, Hutchinson University Library, London.
27. Minshull, Roger, Regional Geography: Theory and Practice.
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29. Peet, Richard, Radical Geography: Alternative view points on Contemporary Social issues.
30. Smith, D. M., Human Geography: A Welfare approach.
31. Taylor, Griffith, Geography in the twentieth century.

COURSE CODE: GAG-303 (POPULATION GEOGRAPHY)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT - I: Population Geography: Scope and content of Population Geography, Development of Population geographical thought, Sources of Population data, Classical & Modern theories in Population.

UNIT - II: Population Dynamics: Fertility; concepts, measures & world pattern. Mortality: concepts, measures & world pattern, Migration: causes, consequences and world pattern.

UNIT - III: World Population & Development: Population Resource Region, Human Development Index, Population & Economic Development.

UNIT - IV: India's Population: Population distribution & density, Growth of population, Age-sex structure, Literacy, Economic activities, Scheduled Caste & Scheduled Tribe population, Population Policy.

References

1. Berclay George W. – Techniques of Population analysis.
2. Bhattacharya A. – Human migration through the ages, The Calcutta Review, new Series, Vol. III, No. 1, 1977.
3. Bhattacharya A. – Population Geography of India.
4. Bilasborrow, Richard E and Daniel. Hogan, Population and Deforestation in the Humid Tropics, International Union for the Scientific Study of Population, Belgium, 1999.
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18. Premi, M. K., India's Population: Heading Towards a Billion, B. R. Publishing Corporation, 1991.
19. Smith, R. I. (Ed.) – The ecology of man.
20. Srinivasan, K. and M. Vlassoff, Population Development Nexus in India: Challenges for the New Millenium. Tata McGraw – Hill, New Delhi, 2001.
21. Srinivasan, K., Basic Demographic Techniques and Applications Sage publications, New Delhi 1998.
22. Sundaram K. V. and Sudesh Nangia, (ed.), Population Geography, Heritage, Publications, Delhi 1986.
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26. Woods, R. Population Analysis in Geography. Longman, London 1979.
 27. Zelinsky Wilbur, A prologue to Population Geography, Prentice Hall, 1966.

COURSE CODE: GAG-304 (REGIONAL GEOGRAPHY OF INDIA)

Full Marks: 50
Credits: 02

Time: Two Hours

UNIT - I: Genesis of Indian Monsoon; role of Jet Stream on Indian Monsoon; distribution of rainfall and rainfall zones in India; climatic regions and their characteristics; identification of drought and flood prone areas in India.

UNIT -II: Forest types, forest products and problems of Indian forestry, forest conservation; Soil types, extent of soil erosion and conservation in India; India's water resources, water scarcity and conservation.

UNIT - III: Agricultural characteristics; Command Area Development Programmes in India, and Special Economic Zones, Green Revolution and White Revolution in India; Major agro-climatic regions of India.

Unit - IV: Conventional and non-conventional energy sources, India's growing energy demand and solutions; Industrial development: Historical perspective and development during the plan periods, industrial regions, industrial problems.

References

1. Atkinson, E. T., (Ed) 1882: Geology of the Himalayas, Cosmo Publications, New Delhi, India, Reprinted from The Himalayan Districts of the NWn provinces of India", Reprinted in 1993.
2. B.C.C. & I. – West Bengal: An Analytical Study.
3. Bagchi, K. and Mukherjee, K. N.: Diagnostic survey of West Bengal, A Research Publication, Vols. I – IV, Calcutta University, 1980.
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9. Deshpande, C. D., 1992: India: a Regional Interpretation ICSSR & Northern Book Centre.
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11. F. E. Pergiter: The Sundarbans.
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14. Hunter, W. W. 1875: Statistical Accounts of Bengal, Trubner & Company, London, UK, 1st Edition in India in 1973 by D. K. Publishing House, Delhi, India.
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17. Kundu, A. and Raza, Moonis, 1982: Indian Economy: The Regional Dimension. Spectrum Publishers, New Delhi.

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21. Robinson, Francis, 1989: The Cambridge Encyclopedia of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan & Maldives. Cambridge University Press, London.
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PRACTICAL: Total Marks: 100

Total credits: 04

COURSE CODE: GAG–305 (GENERAL PRACTICAL)

Full Marks: 100

Time: Five Hours

Credits: 04

UNIT – I: Remote Sensing

(Marks: 25)

- i) Remote Sensing of the Environment, Electromagnetic Radiation Principles, Interaction of EMR with earth surface features, Spectral Regions, Bands, Colour cube and Grey levels, digital numbers and brightness value.
- ii) Spectral Regions, Corrections of Remotely sensed data.
- iii) Elements of Visual Image Interpretation for Mapping and database-cum-information extraction.

UNIT – II: GIS

(Marks: 25)

- i) The components of a Geographical Information Systems (GIS).
- ii) Data Models.
- iii) Geographical data in the Computer.
- iv) Data Inputs, Verification, Storage, and Output generation.
- v) Applications of GIS as a tool for DSS.

UNIT – III: Aerial Photo interpretation

(Marks: 25)

- i) Development of air photo techniques: Application of air photo techniques in geography, type of air photograph and their application to situations; orthophotos, stereoscopic measurement of terrain elevation by using parallax bar, elements of subject identification, photo-mosaics, DEM and DTM, and their comparison with topographical maps.
- ii) Simple geometry of air photograph, measurement and corrections of relief and tilt displacement, measurement of object height, area and scale, stereo-photography and its planning, applications, sequence and objectives.
- iii) Identification of elements/features of natural and cultural landscape and mapping.
 - a) Natural landscape, Geomorphic features and Vegetation.
 - b) Cultural landscape: Settlements, transportation, agricultural and non-agricultural pattern.

UNIT – IV: Statistical techniques using computer software

(Marks: 25)

i) Univariate Methods:

- a) Data Distribution (Tabular): Discrete and Continuous Frequency Distribution;
- b) Data Distribution (Graphical): The Dot Plot, The Box and Whisker Plot, The Scatter Plot; Non - cumulative grouped distribution, Cumulative Distribution;
- c) Data Distribution (Numerical): Measures of Central Tendency; Measures of Dispersion: Absolute and Relative, Lorenz Curve.

ii) Techniques of Bivariate and Multivariate Analysis:

- a) Bivariate Distribution;
- b) Correlation analysis; Linear Regression Analysis;
- c) Multiple Correlation Analysis, Multiple Linear Regression Analysis.

References

1. Argyrous, G., 2000: Statistics for Research, Sage Publications, New Delhi
2. Bonham-Carter, Graeme F., 1994: Geographic Information Systems for Geoscientists: Modelling with GIS, Pergamon, Ontario, 1st Edition.
3. Burrough, Peter A. and McDonnell, Rachael A., 2000: Principles of Geographical Information Systems, Spatial Information Systems and Geostatistics, Oxford University Press, Noida, Delhi, India
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ABILITY ENHANCEMENT COURSE: Total Marks: 100
Total Credits: 04

COURSE CODE: GAG–306: Comprehensive Viva	(Marks: 25/Credit: 01)
COURSE CODE: GAG–307: Group Discussion	(Marks: 25/Credit: 01)
COURSE CODE: GAG–308: Seminar	(Marks: 25/Credit: 01)
COURSE CODE: GAG–309: Tutorial	(Marks: 15+10*=25/ Credit: 01)

SEMESTER – IV
TOTAL MARKS: 400
TOTAL CREDITS: 16

THEORY: (Total Marks: 200)
(Total credits: 08)

COURSE CODE: GAG–401 (OCEANOGRAPHY)

Full Marks: 50
Credits: 02

Time: Two Hours

- Unit – I:** Nature and scope of oceanography, history of oceanographic expedition; distribution of water; major features of ocean basins; bottom topography of Indian, Pacific and Atlantic Oceans; Ocean deposits.
- Unit – II:** Impact of Humans on the Marine Environment: law of the sea, exclusive economic zone, food and mineral resources of the sea, India's off-shore wealth.
- Unit – III:** Physical and chemical properties of sea water; density, temperature and salinity; ocean currents, waves & tides; sea level changes.
- Unit – IV:** Coastlines & Shorelines, origin and characteristics of coastal features; Origin, characteristics and classification of continental shelf, continental slope, sub-marine canyons and coral reefs.

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COURSE CODE: GAG-402 (REGIONAL PLANNING AND DEVELOPMENT)

Full Marks: 50

Time: Two Hours

Credits: 02

- UNIT – I:** Region, Regionalization and Regional Planning: Concept of region, Classification of region, Methods of delineation of Region, Schemes of Regionalization of India, Concept of Planning and Regional Planning.
- UNIT – II:** Regional Development Theory: Growth pole theory by Perroux, Export base theory by North, Stages of economic growth theory by Rostow, Core-periphery model by Friedmann, Cumulative causation theory by Myrdal, Unbalanced growth theory by Hirschman, Marxist theory of regional development.
- UNIT – III:** Measures of inequality; Regional Disparity in India; Indicators of regional development, extent of interstate imbalances in India & policy measures to remove regional disparity.
- UNIT - IV:** Regional planning practices in India: District level planning and Block level planning. Target group and Target area approach.

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OPTIONAL COURSE THEORY

COURSE CODE: GAG-403 (OPTIONAL COURSE)

Applied Pedology

Full Marks: 50

Credits: 02

Time: Two Hours

UNIT – I: Pedogenesis

- i) Soil formers and factors of Soil formation.
- ii) Soil forming processes.
- iii) Soil Profile development under different Climatic conditions.

UNIT – II: Properties of Soils

- i) Physical Properties
- ii) Chemical Properties
- iii) Base Exchange Properties
- iv) Nutritional significance of Soil Reaction

UNIT – III: Soil Organic Matter

- i) Sources of Soil Organic Matter.
- ii) Factors affecting Soil Organic Matter.
- iii) Humus – Genesis and Nature.
- iv) Characteristics and importance of Humus
- v) Management of Soil Organic Matter.

UNIT – IV: Soil Nutrients

- i) Nitrogen
- ii) Phosphorous
- iii) Potassium
- iv) Micro-nutrients

OPTIONAL COURSE THEORY

COURSE CODE: GAG-404 (OPTIONAL COURSE)

Applied Pedology

Full Marks: 50

Credits: 02

Time: Two Hours

UNIT – I: Techniques of Soil Survey and Soil Classifications

- i) Procedures of Soil Survey.
- ii) Soil Mapping Units.
- iii) Evolution of Soil Classification Systems.
- iv) Some Classical Genetic Soil Classifications.
- v) USDA Soil Taxonomy.

UNIT – II: The Catena Concept

- i) The Catena and the Processes of erosion.
- ii) Catenary differentiation.
- iii) Soil changes within Catenas.
- iv) Catenas in different climates.
- v) Catenas and time.

UNIT – III: Pedo-geomorphology in Environmental Management

- i) Pedo-geomorphic relation within a drainage basin.
- ii) Man's interference with Pedo-geomorphic system.
- iii) The drainage basin in Land Evaluation.
- iv) Integrated Basin Planning and Eco-system studies

UNIT – IV: Methodology for Assessing Soil Degradation

- i) Methods for assessing soil degradation.
- ii) Desertification and degradation.
- iii) Salinization & alkalization of soils
- iv) Soil Pollution

OPTIONAL COURSE PRACTICAL

COURSE CODE: GAG– 405 (OPTIONAL COURSE PRACTICAL)

Applied Pedology

Full Marks: 50

Time: Three Hours

Credits: 02

- A. Methods of Soil sampling and preparation of soil samples.
- B. Laboratory Analysis of Soil Properties.
 - i) Measurement of Hygroscopic moisture.
 - ii) Mechanical Analysis (Robinson's method).
 - iii) Munsell colour analysis.
 - iv) Determination of Organic Matter and Organic Carbon (Walkley & Black's Rapid Titration method).
 - v) Soil pH (Kuhn's Colourimetric method).
 - vi) Soil Kit Box analysis (N.P.K., O.M. and pH).
 - vii) Keen Raczkowski measurement (Keen Box Analysis):
 - a) Soil specific gravity
 - b) Soil porosity
 - c) Volume expansion
 - d) Water holding capacity.
 - e) Soil density

References

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OPTIONAL COURSE THEORY

COURSE CODE: GAG-403 (OPTIONAL COURSE)

Cartography

Full Marks: 50

Time: Two hours

Credits: 02

UNIT - I: Spherical Trigonometry

- i) Fundamental Principles of Spherical Triangle, Spherical Excess.
- ii) Napier's Rule of circular parts.
- iii) Application for determination of distance, azimuth and area on the Earth's Surface.
- iv) Application of spherical trigonometry in polar zenithal cases of map projections – Gnomonic, Stereographic and Orthographic and calculation of distance, azimuth and scale variations.
- v) Gnomonic Projection (Cubic Development)

UNIT - II: Conical Projections

- i) Conical Orthomorphic with two standard parallels.
- ii) Conical Equal Area with two standard parallels.
- iii) Polyconic Projection.
- iv) Modified International Projections.
- v) Calculation of distance, azimuth and scale variations.

UNIT - III: Cylindrical Projections

- i) Cylindrical Equal Area Projection with two standard parallels.
- ii) Mercator's Projection.
- iii) Cassini's Projection.
- iv) Calculation of distance, azimuth and scale variations.

UNIT - IV: Conventional Projections

- i) Mollweide's Projection (Normal case)
- ii) Parabolic Projection (Normal case)
- iii) Parabolic Projection (Oblique case)
- iv) Hammer's Projection (Normal case)
- v) Calculation of distance, azimuth and scale variations.

OPTIONAL COURSE THEORY

COURSE CODE: GAG-404 (OPTIONAL COURSE)

Cartography

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT - I: Surveying with Theodolite and Levels

- i) Theodolite Traversing (Omitted Measurements), Determination of coordinates and area from the data.
- ii) Principles and methods of Triangulation Surveying, Base line measurement and corrections, Satellite stations.
- iii) Determination of heights, distance and reduced levels by Tachometric Surveying.
- iv) Principles, corrections for curvature and refraction of Reciprocal Surveying, and determination of reduced level of a place.

UNIT – II: Photogrammetry and Airphoto Interpretation

- i) Definition, scope and history of Aerial photography.
- ii) Fundamentals of photography.
- iii) Determination of scale of aerial photograph, Different corrections in Aerial photography.
- iv) Geometry of Aerial Photographs.
- v) Elements of Visual interpretation of air photographs.
- vi) Merits and demerits of air photo mosaics.
- vii) Image parallax and Parallax measurement
- viii) Preparation of maps from air photographs

UNIT - III: Remote Sensing and GIS

- i) Definition, scope and Basics of Remote Sensing.
- ii) Satellites, Platforms and Scanners.
- iii) Data acquisition and data products.
- iv) Manual Methods of Image Interpretation
- v) Digital Image Processing, rectification and enhancement.
- vi) Image classifications.
- vii) Components & Structure of GIS
- viii) Data Entry, Editing & Validation
- ix) Manipulation & Analysis
- x) Display & Product creation
- xi) Applications of Remote Sensing and GIS in different Geographical Studies

UNIT – IV: Instruments

- i) GPS
- ii) Total Station
- iii) Clinometer
- iv) Box Sextant

References

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OPTIONAL COURSE PRACTICAL

COURSE CODE: GAG– 405 (OPTIONAL COURSE PRACTICAL)

Cartography

Full Marks: 50

Time: Three Hours

Credits: 02

UNIT - I: Surveying

- i) Determination of area by traversing with Theodolite.
- ii) Base line corrections with the help of triangulation survey with Theodolite.
- iii) Determination of reduced level of a place by Reciprocal survey by Dumpy level.
- iv) Determination of difference in heights by Tacheometric surveying with Theodolite.

UNIT - II: Map Projections

- i) Gnomonic Projection (Cubic Development)
- ii) Conical Orthomorphic Projection with two Standard Parallels
- iii) Modified International Projection
- iv) Cylindrical Equal Area Projection with two Standard Parallels
- v) Parabolic Projection (Normal case)
- vi) Hammer's Projection

UNIT - III: Air photo Interpretation

- i) Calculation of Scale and number of photographs.
- ii) Identification of objects from air photo.
- iii) Visual interpretation of air photographs.
- iv) Preparation of mosaics from air photos.

UNIT - IV: Interpretation of Satellite Imagery and Application of GIS

- i) Visual interpretation of satellite imagery.
- ii) Digital Image processing, Filtering and Enhancements & Classification (Supervised & Unsupervised) Confusion Matrix
- iv) Salient features, characteristics and applications of – Multispectral and Hyperspectral, Thermal and Infrared, and Microwave Remote Sensing.
- iii) Application of GIS in Thematic Maps.

References

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2. Gupta, R. K. – Planning Natural Resources.
3. Higgings, A. L. – Higher surveying.
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5. Kanetkar, T. G. & Konkani S. V. – Surveying and leveling Part I & II.
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7. Kumar, G. S. – Aerial Photography.
8. Lieder, D. R. – Aerial Photo Interpretation – Principles theories and application.
9. Mailing, D. H. – Map Projection.
10. Misra, R. P. – Fundamentals of Cartography.
11. Raisz, E. – General Cartography.
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OPTIONAL COURSE THEORY

COURSE CODE: GAG-403 (OPTIONAL COURSE)

Fluvial Geomorphology

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT – I: Fundamentals of river hydraulics and mechanics

- i) Fluid mechanics.
- ii) Forces acting in channels.
- iii) Factors controlling flow velocity.
- iv) Velocity and its distribution.
- v) Measurement of velocity and discharge.
- vi) Types of stream flow.

UNIT – II: Hydraulic Geometry

- i) Shape of the channel.
- ii) Variation of Hydraulic Characteristics at a given Cross Section.
- iii) Variation of Hydraulic Characteristics in a Downstream Direction.
- iv) Longitudinal profile of the river Channel.
- v) Remote Sensing and GIS Applications to the Fluvial Environment.

UNIT - III: Transportation of the sediment load

- i) Dissolved load, Wash load and Bed-material load.
- ii) Competency and Capacity of a Stream.
- iii) Energy Losses in Stream flow.
- iv) The nature of Fluid Force and its relation to Debris Movement.
- v) Computation of Sediment Load.

UNIT – IV: Channel Behaviour

- i) Behaviour of Tidal channels and their associated problems of maintenance in South Bengal.
- ii) Flood problems of West Bengal and their remedies with special reference to North Bengal.
- iii) Effect of Embankment, Dam and Reservoir in Channel regime.
- iv) Hydrological Effects of Urbanization.

OPTIONAL COURSE THEORY

COURSE CODE: GAG-404 (OPTIONAL COURSE)

Fluvial Geomorphology

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT – I:

i) Major Changes of River Courses in Bengal during historical period

- a) Tista
- b) Damodar
- c) Bhagirathi-Hooghly
- d) Fluvial characteristics and impact of metamorphosis of North Bengal rivers

ii) Evolution of Drainage Patterns and their Geomorphic Characteristics of some Indian Rivers

- a) Ganga
- b) Brahmaputra
- c) Mahanadi

- d) Narmada
- e) Tapi

UNIT - II: Channel Forms and Processes of Indian Rivers

- i) Bhagirathi-Hooghly: considerations on channel decay and drainage problems
- ii) Tista.

UNIT – III: Drainage Basin as a Fundamental Geomorphic Unit

- i) Morphometric units.
- ii) Linear Aspects of the basin.
- iii) Areal Aspects of the basin.
- iv) Relief Aspects of the basin.

UNIT - IV:

- i) River Regimes**
 - a) Factors controlling river regimes
 - b) Types of river regimes

- ii) National Policy of Water Resource Development**
 - a) Irrigation and Water power.
 - b) Inter-Basin Water transfer.
 - c) Irrigation and hydro projects in India.
 - d) National Water Grid.

OPTIONAL COURSE PRACTICAL

COURSE CODE: GAG– 405 (OPTIONAL COURSE PRACTICAL)

Fluvial Geomorphology

Full Marks: 50

Time: Three Hours

Credits: 02

Quantitative and qualitative geomorphic analysis of a selected drainage basin:

- i) Morphometric analysis of drainage basin.
- ii) Use of Hydrological instruments.
- iii) Linear Correlation and Regression Analysis
- iv) Geomorphological mapping.
- v) Fluvio-Geomorphological mapping with the help of RS and GIS techniques.
- vi) Measurements for the case of fluvial processes;
 - a) Velocity: Manning and Chezy's method
 - b) Discharge: Slope area method
 - c) Flow types: Reynold's and Froude's Number
 - d) Estimation of runoff: Rational method
- vii) Hydrographs

References

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2. Basu, S. R.: Major changes of the river courses in West Bengal, Observer.
3. Basu, S. R.: On some aspects of fluvial dynamics of river Bhagirathi, Indian Journal of River Valley Development, 17 No. 11.
4. Basu, S. R., 1981: Some consideration on the process of sedimentation in Hooghly tidal channel, North Bengal University Review (Science & Technology), Vol.2.

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6. Chow, Ven Te, (Editor-in-Chief), 1964: *Handbook of Applied Hydrology: A Compendium of Water-resources Technology*, McGraw-Hill Book Company, New York, USA.
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OPTIONAL COURSE THEORY

COURSE CODE: GAG-403 (OPTIONAL COURSE)

Population Geography

Full Marks: 50

Time: Two Hours

Credits: 02

Unit - I: Basics of Population Study: Relation between Population Geography and Demography; Sources of Demographic Data; Spatial and Temporal Perspective of Population Growth in the World and India; Rural and Urban Population distribution pattern in India.

Unit - II: Components of Population Change: Fertility - Sources of data for fertility; Theories of fertility; Fertility Transition in Developed and Developing Countries (with special reference to India) in the world.

Unit - III: Components of Population Change: Mortality- Level and Trend of Mortality in Developed and Developing countries of the world with special reference to India; Causes of Infant Mortality; Reasons for decline in Infant Mortality in Developing countries of the world with special reference to India.

Unit - IV: Components of Population Change: Migration: Concept of Mobility and Migration; Sources of Migration data; Types of Migration; Internal migration Measures, Patterns and characteristics with special reference to India; International migration Measures, Patterns, Causes and Consequences; Theories and models of Migration.

OPTIONAL COURSE THEORY

COURSE CODE: GAG-404 (OPTIONAL COURSE)

Population Geography

Full Marks: 50

Time: Two Hours

Credits: 02

Unit - I: Composition of Population: Sex Composition: Types of Sex Ratio; Patterns of Sex Ratio in India and World; Age Composition: Determinants of Age Composition; Methods of Analysis of Age Structure; Patterns of Age Structure in India and World; Concept of Population Aging; Economic Composition: Measurement of Working Population; Determinants of Work Force, Occupational Structure of Population with special reference to India; Work Participation Rate in India.

Unit - II: Urbanisation: Definition of Urban and Other associated urban concepts as per Indian census; Urbanisation Process in developed and Developing countries of the World with special reference to India; Components of Urban Population Growth in Developed and Developing Countries of the world with special reference to India; Theories of Urbanisation in the Developing Countries of the world; Major Urbanisation problems and policies in the developing countries of the world.

Unit - III: Population and development: Modern Theories of Population and Development; Population and resource regions of the world and India; Population Growth and Environmental Degradation; Concept of Human Development; Measurement of Human Development Index; Human Development in India and World.

Unit - IV: Population Problems, Policies and Planning: Population Problems of the Developed and Developing countries of the world; Population Policies of the Developed and Developing countries of the world with special reference to India; National Health Programmes in India.

OPTIONAL COURSE PRACTICAL

COURSE CODE: GAG– 405 (OPTIONAL COURSE PRACTICAL)

Population Geography

Full Marks: 50

Time: Three Hours

Total credit: 02

UNIT - I:

- i) Measurement of density of population and its changes.
- ii) Trends of population growth.

UNIT - II: Determination of change of population pressure by central tendency

- i) Mean centres of population and area
- ii) Median centres of population and area

UNIT - III: Measures of Age sex

- i) Fertility
 - ii) Mortality
- (Selecting five developed and five developing countries of the world)

UNIT - IV: Age-sex ratio of selected countries of the world and India.

References

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2. Mitra, A.; India's Population, Vol. I & II.
3. Perpilou, A. V.; Human Geography.
4. Anthony Sellery – Africa –A social geography.
5. B. J. Garnier – Geography of Population.
6. B. J. Garnier – Geography of Population.
7. Berolay George W. – Techniques of Population analysis.
8. D. T. Valentey 1977 – An outline theory of population.
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11. Handbook of Population Census Methods – Vol. II, United Nations, 1958.
12. Kenneth Scott Latourette – The Chinese, their history and culture.
13. Mahammad A. – Sati Geographical studies.
14. Monkhouse and Wilkinson – Maps and Diagrams.

15. Paul, R. Ehrlich and Anne H. Enrlich – Population, Resources Environment.
16. R. B. Mandal & V.N.P. Sinha; Recent trends and concepts in geography, Vol. III.
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23. V. N. P. Sinha and R. B. Mandal – Dimensions in Geography.
24. Walter Fitzerland – Africa.

OPTIONAL COURSE THEORY

COURSE CODE: GAG–403 (OPTIONAL COURSE)

Urban Geography

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT – I: Scope and content of Urban Geography and its changing nature; definition of urban places.

UNIT – II: Origin and growth of Pre-industrial cities: the ancient cities and the medieval cities; growth of modern cities; trends in urbanization in the third world during the modern period with particular reference to India; rank-size relationship and city primacy

UNIT – III: Concept of Basic and Non-Basic Functions; Factors determining urban land values; spatial structure of urban land values; urban land value theory

UNIT – IV: Physical Structure and Functions of the C.B.D. Changing nature of C.B.D, Contemporary Urban morphological theories with special reference to India.

OPTIONAL COURSE THEORY

COURSE CODE: GAG–404 (OPTIONAL COURSE)

Urban Geography

Full Marks: 50

Time: Two Hours

Credits: 02

UNIT – I: Demographic Characteristics of Urban Population; Theories and pattern of rural-urban migration: its causes and impact.

UNIT – II: Urbanisation and environmental problems; Sustainable development and cities: its needs and implications; city as an ecological unit. Solid waste Management: Types and various sources; associated problems and planning with particular reference to Indian cities.

UNIT – III: The Concept and Structure of the city region; Impact of the city on its Countryside; Concept of Urban Field; Concept of sub-urbanisation, counter urbanisation and re-urbanisation.

UNIT – IV: Slums and urban renewal; neighborhood unit planning.

OPTIONAL COURSE PRACTICAL

COURSE CODE: GAG– 405 (OPTIONAL COURSE PRACTICAL)

Urban Geography

Full Marks: 50

Time: Three Hours

Credits: 02

UNIT – I: Spatial Analysis of Geographical data

- a) Analysis of line pattern (network analysis, connectivity index)
- b) Analysis of spatial and regional patterns (tests of clustering and regularity, standard score)

UNIT – II: Analysis of morphology of the urban area

- a) Preparation of thematic map of urban land use.
- b) Preparation of land use/land cover map using GIS technique.

UNIT – III: Application of matrix in geographical study.

UNIT – IV: Testing Urban Rank Size Rule & its applications.

References

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2. Allen, Noble & Dutt – Indian Urbanization and Planning Vehicles of Modernization.
3. Balchin, P. N. & J. L. Kieve – Urban Land Use Economics.
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8. Bose, A. – Studies in India’s Urbanization.
9. Breese, G. – Urbanization in Newly Developing Countries.
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18. Desai and Pillai – Slums and Urbanization.
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24. Hegde, P. V. – Ancient and Medieval Town Planning in India.
25. Johnson, J. H. – Urban Geography.
26. Jones, E. – Towns and Cities.
27. Maunder, P. S. & I. Majumdar – Rural Migration in an Urban Setting.
28. Mayer, H. M. & C. F. Kohn – Readings in urban Geography.
29. Northam, R. M. – Urban Geography.
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31. Quinn, J. A. – Urban Sociology.
32. Ratcliffe, J. – Introduction to Town and Country Planning.

33. Sexena, D. P. – Rural Migration in India.
34. Singh, R. L. (Ed) – The Ecology of Man.
35. Sjoberg, G. – The Pre-Industrial City.
36. Smailes, A. E. – Geography of Towns.
37. Warner, S. B. – Planning for a Nation of Cities.

GENERAL PRACTICAL

COURSE CODE: GAG– 406 (DIGITAL THEMATIC MAPPING)

Full Marks: 50

Time: Three Hours

Credit: 02

UNIT – I: Preparation of Choropleth Map by using Computer.

UNIT – II: Preparation of Chorochromatic (Mono and Multi) Map by using Computer.

UNIT – III: Preparation of Digital Thematic Map by using Statistical and Cartographic Techniques.

ABILITY ENHANCEMENT COURSE: Total Marks: 100

Total credits: 04

COURSE CODE: GAG–407: Comprehensive Viva (Marks: 25/Credit: 01)

COURSE CODE: GAG–408: Optional Course Dissertation (Marks: 50/Credits: 02)

COURSE CODE: GAG–409: Tutorial (Marks: 15+10*=25/Credit: 01)

FOR ALL OPTIONAL COURSES

The students will prepare a Dissertation containing at least 50 pages (including maps & diagrams) on any one of the topics of the concerned Optional Theory Course syllabus. The report will be based on fieldwork (normally not exceeding a week and under the supervision of a teacher) should be well represented by suitable statistical techniques and cartographic methods.