

**Banaras Hindu University**  
**Institute of Science, Department of Geography**  
**M. Sc./M.A. Two-Year Semester Course Outline, 2019-20**

**Semester-I**

<b>Paper Code</b>	<b>Type</b>	<b>Title</b>	<b>Credits</b>
GRM 101	Theory	Geographical Thought	4
GRM 102	Theory	Advanced Geomorphology	4
GRM 103	Theory	Hydrology	4
GRM 104	Practical	Basin Morphometry, Geological Map and Hydrological Analysis	2
GRM 105	Practical	Statistical Methods and Data Processing	2
GRM 106	Practical	Spatial Analysis: Locational and Network	2
GRM 107	Seminar	Assignment Based Seminar*	2
<b>TOTAL</b>			<b>20</b>

\*Topics will be drawn by lots and each student will deliver a presentation. Topics will be from the 3 theory papers—GRM 101 to GRM 103. All the staff members related to the topics will assess the presentation and average will be taken as final assessment.

**Semester-II**

<b>Paper Code</b>	<b>Type</b>	<b>Title</b>	<b>Credits</b>
GRM 201	Theory	Research Methodology	4
GRM 202	Theory	Geography of Resources	4
GRM 203	Practical	Village Survey: Instrumental and Socio-economic	4
<b>ONE paper of the special group to be selected from the following:</b>			
GRM 204A GRM 204B GRM 204C	Theory	<ul style="list-style-type: none"> <li>• Population Geography</li> <li>• Resource Planning</li> <li>• Advance Cartography</li> </ul>	4
<b>The corresponding practical of special group to be selected from the following:</b>			
GRM 205A GRM 205B GRM 205C	Practical	<ul style="list-style-type: none"> <li>• Representation of Population Data</li> <li>• Techniques in Resource Planning</li> <li>• Advance Surveying and Mapping Method</li> </ul>	2
GRM 206 S	Theory	Fundamentals of Remote Sensing <b>(SWAYAM Course)</b>	2
<b>TOTAL</b>			<b>20</b>

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**Semester – III**

<b>Paper Code</b>	<b>Type</b>	<b>Title</b>	<b>Credits</b>
GRM 301	Theory	Geographical Information System and its Application	4
GRM 302	Theory	Advanced Geography of India	4
GRM 303	Practical	Remote Sensing and GIS	2
GRM 304	Practical	Geographical Field Training	2
<b>ONE paper of the special group to be selected from the following:</b>			
GRM 305A GRM 305B GRM 305C	Theory	<ul style="list-style-type: none"> <li>• Geography of Rural Settlements</li> <li>• Regional Planning</li> <li>• Remote Sensing-I: Aerial Remote Sensing</li> </ul>	4
<b>The corresponding practical of special group to be selected from the following:</b>			
GRM 306A GRM 306B GRM 306C	Practical	<ul style="list-style-type: none"> <li>• Geography of Rural Settlements</li> <li>• Techniques of Regional Planning</li> <li>• Aerial Photo Interpretation</li> </ul>	2
GRM 307 S	Theory	Population and Development (SWAYAM Course)	2
<b>TOTAL</b>			<b>20</b>

**SEMESTER – IV**

<b>Paper Code</b>	<b>Type</b>	<b>TITLE</b>	<b>Credits</b>
GRM 401	Theory	Environmental Studies	4
GRM 402	Theory	Oceanography	4
GRM 403	Practical	Environmental and Soil Analysis	2
<b>ONE paper of the special group to be selected from the following:</b>			
GRM 404A GRM 404B GRM 404C	Theory	<ul style="list-style-type: none"> <li>• Urban Geography</li> <li>• Rural and Urban Planning</li> <li>• Satellite Remote Sensing</li> </ul>	4
<b>The corresponding practical of special group to be selected from the following:</b>			
GRM 405A GRM 405B GRM 405C	Practical	<ul style="list-style-type: none"> <li>• Methods and Techniques in Urban Geography</li> <li>• Methods and Techniques in Rural and Urban Planning</li> <li>• Satellite Image Interpretation</li> </ul>	2
GRM 406*		Field Work Dissertation and Presentation	4
<b>TOTAL</b>			<b>20</b>

\*GRM 406 Allotment of Supervisors to be made at the beginning of third semester. Dissertation and Presentation will be assessed for 50 and 50 marks respectively. Total Marks will be 100 only.

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**SEMESTER – I**  
**GRM101: Theory**  
**Geographical Thought**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Basic Concepts:** Nature of geographical knowledge; Man-environment interaction: new environmentalism; Concepts: space, place, environment, time and spatial organisation; Culture and cultural landscape.

**UNIT II**

**Modern Approaches:** Quantitative revolution; Humanistic geography: phenomenology and existentialism; Behavioural revolution; Contributions of Carl Sauer and Yi-Fu Tuan.

**UNIT III**

**Contemporary Trends:** Qualitative paradigm; Post-modernism and post-structuralism; Social theory and De/reconstruction. Welfare Geography; Marxist geography; Radical geography: contributions of David Harvey

**UNIT IV**

**Trends of Indian Geography:** Colonial and Postcolonial geography; Contributions of Indian geographers; Impact of thoughts of Gandhi, Nehru and Ambedkar on Indian geography; Indian geography: issues and challenges.

**Books Recommended**

1. Adams, P., Steven, H. and Karel, T. (eds.) (2001): *Texture of Place. Exploring Humanistic Geographies*. University of Minnesota Press, Minneapolis.
2. Daniels, P., Bradshaw, M., Shaw, D. and Sidaway, J. (2000): *An Introduction to Human Geography. Issues for the 21st Century*. Prentice Hall, London.
3. Dear, M. J. and Flusty, S. (2002): *The Spaces of Postmodernity: Readings in Human Geography*. Blackwell Publishers, Oxford.
4. Dikshit, R. D. (2004): *Geographical Thought. A Critical History of Ideas*. Prentice-Hall of India, New Delhi. (in English and Hindi).
5. Harvey, D. (1969): *Explanation in Geography*. Arnold, London.
6. Harvey, M. E. and Holly, P.B. (2002): *Themes in Geographic Thought*. Rawat Publications, Jaipur and New Delhi.
7. Hubbard, P., Kitchin, R., Bartley, B. and Fuller, D. (2002): *Thinking Geographically: Space, Theory and Contemporary Human Geography*. Continuum, London.
8. Johnston, R.J. (1985): *The Future of Geography*, Methuen and Company Ltd., New York. (2003 edition published).
9. Johnston, R.J. and Sidaway, J.D. (2004): *Geography and Geographers*. 6<sup>th</sup> edition, Edward Arnold, London.
10. Kapur, A. (ed.) (2001): *Indian Geography – Voice of Concern*. Concept Publishing. Company, New Delhi.
11. Martin, G. (2005): *All Possible Worlds. A History of Geographical Ideas*. 4<sup>th</sup> edition, Oxford University Press, New York.
12. Mathews, J. A. and Herbert, D. T. (eds.) (2004): *Unifying Geography. Common Heritage, Shared Future*. Routledge, London.
13. Peet, R. (1998): *Modern Geographical Thought*. Blackwell Publishers Inc., Massachusetts.
14. Sauer, C. O. (1963): *Land and Life*. University of California Press, Berkeley.
15. Sharma, P.R., Yadava, R.S., Sharma, V.N., (ed.) 2013: *Inter Disciplinary Advances in Geography*, R.K. Books, New Delhi.
16. Singh, R. L. and Singh, Rana P.B. (eds.) (1990): *Literature and Humanistic Geography*. National Geographical Society of India, BHU, Varanasi, Publication number 37
17. Singh, R. L. and Singh, Rana P.B. (eds.) (1992): *The Roots of Indian Geography: Search and Research*. National Geographical Society of India, B.H.U., Varanasi, Publication number 39.
18. Singh, Rana P. B. (2004): *Cultural Landscapes and the Lifeworld*. Indica Books, Varanasi.
19. Soja, E. (1989): *Post-modern Geographies*. Verso Press, London. Reprinted 1997: Rawat Publications, Jaipur and New Delhi.
20. Taylor, G. (ed.) (1953): *Geography in the Twentieth Century*. Methuen and Company Ltd. and Company, London.
21. Tuan, Yi-Fu (1977): *Space and Place. The Perspective of Experience*. Edward Arnold, London.
22. Singh, Ravi S (ed.) 2009. *Indian Geography: Perspectives, Concerns and Issues*. Jaipur: Rawat Publications
23. Singh, Ravi S (ed.) 2009. *Indian Geography in the 21<sup>st</sup> Centaury: The Young Geographers Agenda*. New Castle upon Tyne, UK: Cambridge Scholars Publishing.

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**SEMESTER - I**  
**GRM102: Theory**  
**Advanced Geomorphology**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Concepts.** Fundamental concepts of geomorphology; Concept of time: cyclic, graded and steady state; Concept of morphogenetic region; Concept of dynamic equilibrium; Recent trends in geomorphology.

**UNIT II**

**Drainage Basin Characteristics and Related Aspects.** Landscape evolution model; Drainage basin as a geomorphic unit; Basin morphometry: linear, areal, relief; Morphometric laws; Denudation and morpho-chronology and dating of landscapes; Soil erosion and its measurement.

**UNIT III**

**Hill Slope Evolution and Valley Development.** Theories of hill-slope evolution; Erosion surfaces; Evolution and development of river valleys; Classification of valleys; Drainage patterns and their significance.

**UNIT IV**

**Application Aspects.** Geomorphic hazards and mitigation measures; Geomorphology in engineering construction; Geomorphology in groundwater studies; Geomorphology in mining, agriculture and rural infrastructural development.

**Books Recommended**

1. Ahmed, E. (1985): Geomorphology. Kalyani Publishers, New Delhi.
2. Bloom, A. L. (1998/ 2001): Geomorphology. 3<sup>rd</sup> edition. Prentice Hall of India, New Delhi.
3. Chorley, R.J., Schumm S A and Sugden D E. (1984): Geomorphology. Methuen and Company Ltd., London.
4. Chow, V. T., D. R. Maidment and L. W. Mays (1988): Applied Hydrology. McGraw-Hill Inc., New York.
5. Dayal, P. (1994): A Text Book of Geomorphology. Kalyani Publishers, New Delhi.
6. Fairbridge, R.W. (ed.) (1968): Encyclopaedia of Geomorphology. Reinhold Book Corporation., New York
7. Gregory, K.J. and Walling, D.E. (1973): Drainage Basin Form and Process. Edward Arnold, London.
8. Jog, S. R. (ed.) (1995): Indian Geomorphology (2 vols.). Rawat Publications, Jaipur
9. Kale, V. and Gupta, A. (2001): Introduction to Geomorphology. Orient Longman, Hyderabad.
10. King, C.A.M. (1966): Techniques in Geomorphology. Edward Arnold, London.
11. Sharma, P. R. and Mishra, S.P. (eds.), (1993): Applied Geomorphology in Tropics. Rishi Publications, Varanasi.
12. Singh, M. B. (2002): Physical Geography. Tara Book Agency, Varanasi. (In Hindi).
13. Singh, S. (2004): Geomorphology. Prayag Pustak Bhawan, Allahabad.
14. Sparks, B.W. (1986): Geomorphology. Longmans, London.
15. Thornbury, W.D. (2005): Principles of Geomorphology. John Wiley and Sons, New York.

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**SEMESTER - I**  
**GRM 103: Theory**  
**Hydrology**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Bases of Hydrology:** Nature, scope and development of Hydrology; Hydrological cycle; Man's Influence on the hydrological cycle; Precipitation: formation process, types, characteristics and measurements.

**UNIT II**

**Water Losses:** Interception: factors affecting interception loss; Evaporation: process of evaporation, factors affecting evaporation from free water surface and soil, estimation of evaporation; Evapotranspiration: estimation and its control.

**UNIT III**

**Water Disposition:** Infiltration: infiltration process and factors controlling infiltration; Soil moisture and its zones: storage of soil moisture, factors affecting soil moisture storage; Runoff: its sources and components, factors affecting runoff; River regimes.

**UNIT IV**

**Assessment and Conservation:** Stream flow measurement: interpretation of stream flow data, Hydrograph: components and separation; Groundwater: occurrence, storage, recharge and discharge; Floods: estimation and control; Appraisal of water resources; Water policies and conservation in India.

**Books Recommended**

1. Chow, V. T., D. R. Maidment and L. W. Mays (1988): Applied Hydrology. McGraw-Hill Inc., New York.
2. Dingman L. S. (2002): Physical Hydrology. 2nd ed. Waveland Press Inc., USA.
3. Rai, V.K.(1993): Water Resource Planning and Development, Deep and Deep Publication, New Delhi
4. Bilas, R. (1988): Rural Water Resource Utilization and Planning. Concept Publishing Company, New Delhi.
5. Hann C.T. (1995): Statistical Methods in Hydrology. First East-West Press Edition, New Delhi.
6. Reddy, J. P. (1988): A Textbook of Hydrology. Laxmi Publication., New Delhi. 4<sup>th</sup> edition.
7. Singh, M. B. (1999): Climatology and Hydrology. Tara Book Agency, Varanasi. (In Hindi).
8. Ward, R.C. and Robinson, M. (2000): Principles of Hydrology. McGraw Hill, New York.
9. Longmans, G. and Chow, V.T. (1988): Applied Hydrology. Tata McGraw Hill Publishing Co., New York.
10. Patra K.C. (2011): Hydrology and Water Resource Engineering. Narosa Publishing House, New Delhi.
11. Subramanya K. (2004): Engineering Hydrology. Tata McGraw-Hill, New Delhi.
12. Black P.E. (1996): Watershed Hydrology. Lewis Publishers, New York.
13. Jain S.K., Agarwal P.K. and Singh V.P. (2007): Hydrology and Water Resources of India. Springer, The Netherlands.
14. Raghunath H.M. (2006): Hydrology. New Age International (P) Ltd., New Delhi.
15. Shaw E.M (2004): Hydrology in Practice. 3rd ed, Routledge Publishers, London.
16. Singh G., Venkataraman C., Sastry G. and Joshi B.P. (1990): Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
17. Singh V.P. (1993): Elementary Hydrology. Prentice Hall, Englewood, New Jersey.
18. Suresh R. (2005): Watershed Hydrology. Standard Publishers Distributors, New Delhi.
19. Ward A.D. and Elliot W.J. (eds.) (1995): Environmental Hydrology. Lewis Publishers, New York.
20. Viessman, W. Jr. and G. L. Lewis (2003): Introduction to Hydrology. 5th edition, Pearson Education, Inc., New Jersey.
21. Ward, R.C. and Robinson, M. (2000): Principles of Hydrology. McGraw Hill, New York.
22. Ward, Roy (1978): Floods: A Geographical Perspective, The Macmillan Press Ltd., London. First ed.
23. Sharma, R.K.(1983): A Text Book of Hydrology & Water Resources, Dhanpat Rai & Sons, Delhi
24. Prasad, Govind (1998): Hydrology, Chadra Prakashan, Gorakhpur. (in Hindi).
25. Rao, K.L. (1979): India's Water Wealth: Its assessment, Uses and Projection, Orient Longman, New Delhi.
26. Todd, D.K. (1959): Ground Water Hydrology, Toppan Company Ltd., Tokyo, Japan.

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**SEMESTER - I**  
**GRM104: Practical**  
**Basin Morphometry, Geological Map and Hydrological Analysis**

Credits: 2

**Drainage Basin Morphometry:** Delineation of basin; Linear aspects: stream ordering, bifurcation ratio, law of stream numbers, length ratio, law of Stream length, areal aspects: stream frequency, drainage density, circularity ratio; Relief aspects: hypsometric curve, hypsometric integral curve, clinographic curve; Advance exercises on geological maps: fold, fault and unconformable rock series.

**Hydrological Analysis:** Water balance graph and determination of the components; Calculation of climatic indices: rainfall-runoff relationship; Hydro-graphs: components and separation; Unit hydrograph; Flood: frequency and flood peak estimation.

**SEMESTER - I**  
**GRM105: Practical**  
**Statistical Methods and Data Processing**

Credits: 2

**Statistical Methods:** The normal frequency distribution curve and its characteristics; Curve fitting; Test of significance: chi-square test, student's t-test, F-test, analysis of variance; Analysis of time series.

**Data Processing and Analysis:** Collection of data: methods, sources and types; Sampling procedures: random, stratified random, systematic and cluster; Classification and tabulation of data; Data input in computer and analysis through Excel application and SPSS software.

**SEMESTER - I**  
**GRM106: Practical**  
**Spatial Analysis: Locational and Network**

Credits: 2

**Locational Analysis:** Absolute and relative location: spacing, indices of randomness, deviation and nature of dispersion; Nodes-population clusters: the size continuum, size and shape; Hierarchies: functional hierarchy of settlements and ordering; Interaction: movement and distance models; Service area and territory: serial polygons, interactions zones; Case of agricultural and industrial location.

**Network Analysis:** Topologic structures: branching, circuit and barrier networks; Geometric structures: networks shape and density, pattern and order; Matrix analysis: concept of connectivity, accessibility, symmetrical & asymmetrical matrix, diameter, powered matrix, path, matrix multiplication and addition; Derivation of connectivity matrix, second & third order connectivity matrix, accessibility matrix; Calculation of nodal degree, accessibility of a node, total possible paths.

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**SEMESTER -II**  
**GRM201: Theory**  
**Research Methodology**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Basic Concepts:** Concept and significance of research in geography; Production of geographical knowledge; Philosophy and methods: naturalism and anti-naturalism, realism and idealism.

**UNIT II**

**Qualitative Research:** Participant's observation, ethnography, case study, phenomenology, participatory research.

**UNIT III**

**Research Process:** Formulation of research problem; Development of hypothesis, objectives and methods of research; Selection of sample; Tools and techniques of data collection; Processing, analysis and representing data.

**UNIT IV**

**Report Writing:** Framing a project proposal; Writing thesis; Project report; Research paper; Citation and referencing.

**Books Recommended**

1. Ahuja, R. (2001): Research Methods. Rawat Publications, Jaipur and New Delhi.
2. Bhattacharyya, D. K. (2005): Research Methodology. Excel Books, New Delhi
3. Blaxter, L.; Hughes, C. and Tight, M. (1996): How to Research. Open University Press, Buckingham.
4. Denzin, N. K. and Lincoln, Y.S., (eds.) (2000): Handbook of Qualitative Research. Thousand Oaks CA. Sage Publications.
5. Dikshit, R. D. (2003): The Art and Science of Geography: Integrated Readings. Prentice-Hall of India, New Delhi.
6. Flowerdew, R. and Martin, D. (eds.) (1997): Methods in Human Geography. A Guide for Students Doing a Research Project. Longman, Harlow.
7. Hay, I. (ed.) (2000): Qualitative Research Methods in Human Geography. Oxford University Press, New York.
8. Henn, M., Mark W., and Nick F. (2006): A Short Introduction to Social Research. Vistaar Publications, New Delhi
9. Eyles J. and Smith D. M. (1988): Qualitative Methods in Human Geography. Polity Press, Dales Brewer Cambridge.
10. Kitchin, R. and Tate, N., (2001): Conducting Research into Human Geography: Theory. Methodology and Practice. Prentice-Hall, London.
11. Limb, M. (2001): Qualitative Methodologies for Geographers: Issue and Debates. Edward Arnold, London.
12. Mikkelsen, B. (2005): Methods for Development Work and Research: A New Guide for Practitioners. Sage Publications, London.
13. Mukherjee, N. (2002): Participatory Learning and Action: with 100 Field Methods. Concept Publishing Company, New Delhi.
14. O' Leary, Z. (2005): The Essential Guide in Doing Research, Vistaar Publications, New Delhi
15. Patrick M. and Chapman S. (1990): Research Methods(Third Edition), Routledge, London
16. Peet, R. and Thrift, N. (ed.) (1989/ 2002): New Models in Geography (2 vols.). Rawat Publishers., Jaipur and New Delhi.
17. Robson, C. (1993): Real World Research. A Resource for Social Scientists and Practitioners-Researchers. Blackwell Publishers, Oxford.
18. Rogers, A. and Viles, H. A. (2003): The Student's Companion to Geography. Blackwell Publishers, Oxford. Indian reprint available.
19. Sharma, P.R., Yadava, R.S. and Sharma, V.N., (2011): Interdisciplinary Research Methods: Concepts and Studies. R.K. Books, New Delhi.
20. Sheskin, Ira, M. (1987): Survey Research for Geographers. Scientific Publishers, Jodhpur.
21. Silverman, D. (1993): Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction. Sage Publications, London.
22. Wolcott, H. (1995): The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA.
23. Wright, D.B. (1997): Understanding Statistics. An Introduction for the Social Sciences. Sage Publications, London.

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**SEMESTER - II**  
**GRM 202: Theory**  
**Geography of Resources**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Basic concepts:** Nature and scope of Resource Geography; Concept and classification of resources; Distribution and pattern of resources: Land, water, minerals (Iron ore, Bauxite, Copper) and power resources; Non-conventional sources of energy, Scientific and technological innovation and resources.

**UNIT II**

**Human Resource and Locational Aspects:** Human Resource: concept, classification, determinants and problems; Theories of agricultural and industrial location: Von Thunen, Weber, Losch and Hoover.

**UNIT III**

**Problems and Conservation of Resource:** Nature and Production of Resources; Resource Scarcity; World energy utilization and its crisis; Sustainable development, climate change, biodiversity and resource conservation; National Policies and Programmes on Natural Resources in India: Land, Forest and Water

**UNIT IV**

**Regional Perspectives:** World economic development; Concept of developed and developing nations; Concepts of North-South and First, Second, Third and Fourth Worlds.

**Books Recommended**

1. Burton, I. and Kates, R.W. (1978): Readings in Resource Management and Conservation. McGraw Hills, New York
2. Clark, G. L., Feldman, M.P. and Gertler, M.S. (eds.) (2000): The Oxford Handbook of Economic Geography. Oxford University Press, Oxford and New York.
3. Ehrlich, P.R., Ehrlich, R.H. and Holdren, J.P. (1998): Ecoscience: Population, Resources and Development. 2<sup>nd</sup> edition. Freeman and Company, San Francisco.
4. Sheppard E. and Treror I. B. (ed.) (2003): A Companion to Economic Geography, Blackwell Publication, U.K. and USA.
5. McCarty, H.M. and James B.L. (1976): A Preface to Economic Geography. Prentice Hall, New Jersey.
6. Mitra, A. (2000): Resource Studies; Shridhar Publishers., Kolkata.
7. Ramesh, A. (ed.) (1984): Resource Geography. Heritage Publishers, New Delhi.
8. Singh, J. (2000): *Sansadhan Bhoogol*, Gyanodaya Prakashan, Gorakhpur
9. Singh, K.N. and Singh, J. (2003): *Arthik Bhoogol Ke Mool Tatva*, Gyanodaya Prakashan, Gorakhpur.
10. Todaro M.P. and Smith S.C. (2004): Economic Development, Pearson Education, (Singapore) Private Ltd. Singapore
11. Michael T. Klare (2001) Resource Wars: The new Landscape of Global Conflict, Holt McDougal, USA.



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**SEMESTER -II**  
**GRM 203: Practical**  
**Village Survey: Instrumental and Socio-economic**

Credits: 4

**Instrumental Survey:** Surveying with the help of theodolite and levelling by dumpy level; Use of GPS and total stations for collection of data and mapping.

**Household Survey:** Making interview schedule; Conducting household survey and report writing; Resource mapping; Infrastructure mapping; Social mapping.

**Books Recommended**

1. Archer, J.E. and Dalton, T.H. (1968): *Field Work in Geography*. William Clowes and Sons Ltd., London and Beccles.
2. Bolton, T. and Newbury, P.A. (1968): *Geography through Fieldwork*. Blandford Press, London.
3. Jones, P. A. (1968): *Field Work in Geography*. Longmans, Green and Company Ltd., London and Harlow.
4. Lousenbury, J. F. and Aldrich, F.T. (1986): *Introduction to Geographic Field Methods and Techniques*. Charles E. Merrill Publishing Company, Columbus.
5. Pugh, J.C. (1975): *Surveying for Field Scientists*. Methuen and Company Ltd., London.
6. Knight, Peter G. and Parsons, Tony (2003): *How to do your Essays Exams & Coursework in Geography and Related Disciplines*. Nelson Thornes, Cheltenham, U.K.
7. Parsons, Tony and Knight, Peter G. (2005): *How to do your Dissertation in Geography and Related Disciplines*. 2<sup>nd</sup> ed., Routledge, London.
8. Kitchen, Rob and Tate, Nicholas J. (2009): *Conducting Research into Human Geography: Theory, Methodology & Practice*. 2<sup>nd</sup> ed., Prentice Hall-Pearson, Harlow, U.K.
9. Kitchen, Rob and Fuller, Duncan (2005): *The Academic's Guide to Publishing*. Vistaar Publications (Sage), New Delhi.
10. Stoddard, Robert H. (1982): *Field Techniques and Research Methods in Geography*. Kendall/Hunt Publication, Dubuque, Iowa, U.S.A.

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**SEMESTER -II**  
**Optional Paper**  
**GRM 204 A: Theory**  
**Population Geography**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Conceptual Aspects:** Nature and scope of population geography; methodology in studying population geography; sources and types of population data; population processes: fertility, mortality and migration; Human development.

**UNIT II**

**Population Theories:** Theories of Population Growth: Malthus, Marx, Optimum and Population Transition; Migration Theories: Ravenstien and Everetts Lee.

**UNIT III**

**Population Problems:** Problems of under, over, declining and zero population; Population resource regions of the world and India; Concept of ageing, young, stationary and stable population.

**UNIT IV**

**Population Structure in India:** Population characteristics: population distribution, growth and density; Ethnicity, age-sex structure, rural-urban variation, literacy and literacy differential, occupational structure and work force; National population policy.

**Books Recommended**

1. Bhende, A. A. and Kanetkar T. (2003): *Principles of Population Studies*. Himalaya Publishing House, Mumbai.
2. Champion, T. (ed.) (1993): *Population Matters*. Paul Chapman, London.
3. Chandna, R. C. (2006): *Geography of Population*. Kalyani Publishers, New Delhi.
4. Clark, J. I. (1972): *Population Geography*. Pergamon Press, Oxford.
5. Dube, K.K. and Singh, M.B. (1994): *Jansankhya Bhoogol*. Rawat Publications, Jaipur and New Delhi.
6. Ehrlich, P.R. and Ehrlich, A.H. (1996): *Ecoscience: Population, Resources, Environment*. 6<sup>th</sup> ed. W.H. Freeman and Company, San Francisco.
7. Garnier, B.J. (1993): *Geography of Population*. 3<sup>rd</sup> edition. Longman, London.
8. Jones, H. R. (2000): *Population Geography*. 3<sup>rd</sup> edition. Paul Chapman, London.
9. Pathak, L. P. (ed.) (1998): *Population Studies*. Rawat Publications, Jaipur and New Delhi.
10. Peters, G. L. and Larkin, R.P. (1983): *Population Geography. Problems, Concepts and Prospects*. Kendall/Hunt, Dubuque, Iowa, U.S.A.
11. Poston, D. L. and Michael, M. (2005): *Handbook of Population*. Springer Heidelberg, Germany.
12. Ross, John A. (ed.) (1982): *International Encyclopaedia of Population*. Free Press, New York.
13. Singh, K.N. and Singh, D.N. (eds.) (1992): *Population Growth, Environment and Development*. EDSC, Varanasi.
14. Srinivasan, K, and Vlassoff, M. (2001): *Population Development Nexus in India: Challenges for the New Millennium*. Tata McGraw Hill, New Delhi.
15. Trewartha, G.T. (1985): *A Geography of Population: World Patterns*. John Wiley and Sons, New York.
16. Woods, R. (1979): *Population Analysis in Geography*. Longman, London.
17. Zelinsky, W., Kosinski, L. A. and Prothero M. R. (eds.) (1970): *Geography and a Crowding World*. Oxford University Press, New York and Oxford.
18. Zelinsky, W. (1966): *A Prologue to Population Geography*. Prentice Hall, Englewood Cliffs, New Jersey.

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**SEMESTER - II**  
**Optional Paper**  
**GRM 204 B: Theory**  
**Resource Planning**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Basic Framework:** Nature and scope of resource planning; Methods and techniques of resource appraisal; Concept and approaches of sustainable development; Human resource development.

**UNIT II**

**Resource Conservation:** Principles of resource conservation; Resource management; Planning for conservation of resources: land, water, forest, and minerals (with special reference to India).

**UNIT III**

**Indian Perspective:** Resource utilisation and development; Impact of resource utilisation on environment; Environmental planning and policies in India; Resource potentials and resource regions.

**UNIT IV**

**Resource Perspective:** Agriculture regions; Population-resource regions; Resource planning units and development strategies: Damodar Valley and National Capital Region (NCR).

**Books Recommended**

1. Adam, M.G.(2000a): *Kumasi Natural Resources Management, Final Technical Report*. Natural Resources Institute, University of Greenwich, U.K.
2. Adams, W. M. (1990): *Green Development: Environment and Sustainability in the Third World*. Routledge and Chapman Hall, London.
3. Alam, S. Manzoor and Kidwai, Atiya Habeeb (eds.) (1987): *Regional Imperatives in Utilization and Management of Resources: India and the U.S.S.R.* Concept Publishing Company, New Delhi.
4. Burton, I. and Kates, R.W. (1978): *Readings in Resource Management and Conservation*. McGraw Hills, New York.
5. Corbridge, S., (ed.) (1995): *Development Studies: A Reader*. Arnold, London.
6. Ehrlich, P.R., Ehrlich, R.H. and Holdren, J.P. (1998): *Ecoscience: Population, Resources and Development*. 2<sup>nd</sup> ed. Freeman and Company, San Francisco.
7. Freeman, T.W. (1972): *Geography and Planning*. Freeman and Company, New York.
8. Holechek, J. L., Cole, R., Fisher, J., and Valdez, R. (2000): *Natural Resources: Ecology, Economics and Policy*. Prentice-Hall, New Jersey.
9. Mitchell, B. (1979): *Geography and Resource Analysis*. Longman, London.
10. Mitra, A. (1999): *Resource Studies*. Shridhar Publications, Calcutta.
11. Prasad, H. et al. (eds.) (2005): *Sustainable Management of Water Resources*, Tara Book Agency, Varanasi
12. Rao, P. K. (2001): *Sustainable Development: Economics and Policy*. Blackwell Publications, Oxford.
13. Raza, M. (ed.) (1989): *Renewable Resources for Regional Development: The Indian and the Soviet Experience*. Concept Publishing Company, New Delhi.
14. Reid, S. (2000): *Global Environmental Outlook*. Earthscan, London.
15. Reid, S. (1995): *Sustainable Development*. Earthscan, London.
16. Simon, D. and Nörman, A. (eds.) (1999): *Development Theory and Practice*. Longman.
17. Simon, D. (ed.) (2005): *Fifty Key Thinkers on Development*. Routledge, London.
18. Singh, M. B. et. al. (eds.) (2005): *Sustainable Management of Natural Resources*. Tara Book Agency, Varanasi.
19. Sundaram, K.V.; Mani, M. and Jha, M.M. (eds.) (2004): *Natural Resource Management and Livelihood Security*. Concept Publishing Company, New Delhi.
20. Thakur, B., (ed.) (2003): *Perspectives in Resource Management in Developing Countries, Vol. I: Resource Management: Theory and Techniques*. Concept Publishing Company, New Delhi.
21. UNDP (2001-04): *UNDEP Human Development Report*. Oxford University Press.
22. Valdiya, K. S. (1987): *Environmental Geology: Indian Context*. Tata McGraw Hill Publishing Company. Ltd., New Delhi
23. World Bank (2001-05): *World Development Report*. Oxford University Press, New York.

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**SEMESTER - II**  
**Optional Paper**  
**GRM 204 C: Theory**  
**Advance Cartography**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Science of Cartography:** History and development of cartography; Science of cartography and communication theory; Sources of cartographic data; Cartographic techniques and methods in preparation of diagrams and maps.

**UNIT II**

**Measuring the Earth:** Properties of sphere; The earth: its shape and size; Coordinate reference system on the sphere; Celestial coordinates: equatorial system, horizon system; Geographical co-ordinates and grid system; UTM grids.

**UNIT III**

**Survey Methods:** Curvature of earth and its effect on survey and leveling; Geographical Positioning System (GPS); Trigonometrical surveying; Calculation of height by leveling.

**UNIT IV**

**Thematic Mapping:** Soil and vegetation maps, Environmental maps and population maps (rural and urban); Atlas mapping; Pre and post census mapping; Automation and computer aided cartography.

**Books Recommended**

1. Bailey, T. and Gatrell, A. C. (1995): *Interactive Spatial Data Analysis*. Longman, Harlow.
2. Dorling, D. and Fairborn, D. (1997): *Mapping. Ways of Representing the World*. Longman, Harlow.
3. Fraser Taylor, D.R. (1980): *The Computer in Contemporary Cartography*. John Wiley and Sons, New York.
4. Fraser Taylor, D.R. (ed.) (1983): *Graphic Communication and Design in Contemporary Cartography*. John Wiley and Sons, New York.
5. Griffith, D. A. and Amehin (1997): *Statistical Analysis for Geographers*. Prentice Hall, Englewood Cliffs, New Jersey.
6. Kanetkar, T.P. and Kulkarni, S.V. (1967): *Surveying and Levelling, Part II*. A.V.G. Prakashan, Poona.
7. Keates, J.S. (1973): *Cartographic Design and Production*. Longman Group Ltd.
8. Mailing, D.H. (1973): *Co-ordinate Systems and Map Projections*. George Philip and Sons Ltd.,
9. Monkhouse, F.J. and Wilkinson, H. R (1962): *Maps and Diagrams*. Methuen and Company Ltd. and Company Ltd., London.
10. Nag, P. (ed.) (1984): *Census Mapping Survey*. Concept Publishing Company, New Delhi.
11. Nair, N. B. (1996): *Encyclopaedia of Surveying, Mapping and Remote Sensing*. Rawat Publications, Jaipur and New Delhi.
12. Raisz, E. (1962): *Principles of Cartography*. McGraw Hill Books Company Inc., New York.
13. Misra, R.P. and Ramesh, A. (1999): *Fundamentals of Cartography*. Concept Publishing Company, New Delhi.
14. Rhind, B. and Adams, T. (ed.) (1983): *Computers in Cartography*. British Cartographic Society, London.
15. Robinson, A. H. H., Sale R., Morrison J. and Muehrcke, P. C (1984): *Elements of Cartography*. 6<sup>th</sup> edition, John Wiley and Sons, New York.
16. Shaw, G. and Wheeler, D. (1994): *Statistical Techniques in Geographical Analysis*. Prentice Hall, Englewood Cliffs, New Jersey.
17. Singh, R. L. and Singh, Rana P. B. (1993): *Elements of Practical Geography*. Kalyani Publishers, Ludhiana and New Delhi.
18. Thrower, N. (1996): *Maps and Civilisation Cartography, Culture and Society*. University of Chicago Press, Chicago.
19. Unwin, D. (1982): *Introductory Spatial Analysis*. Methuen and Company Ltd., London.
20. Walford, N. (1995): *Geographical Data Analysis*. John Wiley and Sons, Chichester.

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**SEMESTER - II**  
**Optional Paper**  
**GRM 205 A: Practical**  
**Representation of Population Data**

Credits: 2

**Unit I:** Population growth of India and the world using arithmetic and semi-log scales; Population distribution map of India using dot and sphere/circle, cubes, combined; Density map of India by choropleth; compound and superimposed pyramid of population data; Occupational structure of India by divided rectangle; Fertility, mortality and natural growth of population by polygraph.

**Unit II:** Population potential map by Isopleth; Scatter diagram; Life table calculation; Computation of HDI for India; Migration by flow diagram; Centographic analysis of population growth; Measurement of population concentration by cumulative curve.

**SEMESTER - II**  
**Optional Paper**  
**GRM 205 B: Practical**  
**Techniques of Resource Planning**

Credits: 2

**Human resource mapping:** Population Resource region: a case study; Computation of Human Development Index: a case study; Demographic transition model: a case study; Relationship between energy, human resource and economic development.

**Resource mapping:** Agricultural productivity; Agricultural efficiency; Delineation of crop combination regions; Resource appraisal planning of National Capital Region; Resource mapping.

**SEMESTER - II**  
**Optional Paper**  
**GRM 205 C: Practical**  
**Advanced Surveying and Mapping Methods**

Credits: 2

**Geospatial survey and Map Projection:** Calculation of height by levelling and Theodolite; Total Station; Contour planning; Survey by GPS: Urban facility mapping; Construction of map projections (mathematical method): Conical equal area with one and two standard parallels (Lambert's and Alber's), International and Gnomonic Equatorial.

**Mapping methods:** Computer aided cartography; Designing and preparation of a map on various scales; Representation of statistical data by various cartographic methods; Preparation of thematic maps: Vegetation, environmental and population maps.

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**SEMESTER – II**  
**Swayam Course**  
**GRM 206 S: Theory**  
**Fundamentals of Remote Sensing**

Credits: 2  
Number of Lectures: 52

**UNIT I**

**Fundamentals:** Remote sensing: definition and scope; Electro-magnetic radiation: characteristics, interaction with atmosphere, Remote sensing regions and bands; Spectral signature; Types of remote sensing.

**UNIT II**

**Aerial Photographs:** Aerial photos: types, scale, resolution; Geometric properties of aerial photos; Stereoscopy; Stereoscopic parallax; Relief displacement.

**UNIT III**

**Satellite Imagery:** General and orbital characteristics of remote sensing satellites; General characteristics of remote sensing sensors: MSS and LISS; Characteristics of raw remote sensing data.

**UNIT IV**

**Interpretation and Application:** Image processing techniques: Visual and digital; Elements of image interpretation: pre-processing operations, enhancements and classifications; Remote sensing in Land use/Land cover mapping and environmental monitoring.

**Books Recommended**

1. Campbell, J. B. (2002): Introduction to Remote Sensing. 5<sup>th</sup> edition. Taylor and Francis, London.
2. Cracknell, A and Hayes, L. (1990): Remote Sensing Year Book, Taylor and Francis, London.
3. Curran, P.J. (1985): Principles of Remote Sensing, Longman, London.
4. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science, Bangalore.
5. Floyd, F. and Sabins, Jr. (1986): Remote Sensing: Principles and Interpretation, W.H. Freeman, New York.
6. Guham, P. K. (2003): Remote Sensing for Beginners. Affiliated East-West Press Private Ltd., New Delhi.
7. Hallert, B. (1960): Photogrammetry, McGraw Hill Book Company Inc., New York
8. Harry, C.A. (ed.) (1978): Digital Image Processing, IEEE Computer Society, California
9. Hord, R.M. (1982): Digital Image Processing of Remotely Sensed Data, Academic Press, New York.
10. Leuder, D.R. (1959): Aerial Photographic Interpretation: Principles and Application. McGraw Hill, New York.
11. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. 4<sup>th</sup> edition. John Wiley and Sons, New York.
12. Nag, P. (ed.) 1992: Thematic Cartography and Remote Sensing, Concept Publishing. Company, New Delhi.
13. Reeves, R.G. (ed.) (1983): Manual of Remote Sensing, Vols. 1 and 2, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia.
14. Siegel, B.S. and Gillespie, R. (1985): Remote Sensing in Geology, John Wiley and Sons, New York.
15. Silver, M. and Balmori, D. (eds.) (2003): Mapping in an Age of Digital Media. Wiley-Academy, New York and Chichester.
16. Spurr, R. (1960): Photogrammetry and Photo Interpretation, The Roland Press Company, London.
17. Survey of India, (1973): Photogrammetry, Survey of India, Dehradun.
18. Swain, P.H. and Davis, S.M. (ed.), (1978): Remote Sensing: The Quantitative Approach. McGraw Hill, New York.

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**SEMESTER - III**  
**GRM 301: Theory**  
**Geographical Information System and Its Application**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Basics of GIS:** Definition and Evolution of GIS; Components of GIS; Issues in GIS: User, Technology, data and application, recent advances in GIS; Mobile GIS.

**UNIT II**

**Nature of geospatial data:** Spherical and plane coordinate systems; Earth's shape and datum; Types and characteristics of map, contents and layout of map.

**UNIT III**

**Representation of geographic data:** Types and characteristics of geographical data; Raster and vector data models; DBMS; Procedures of GIS: data input, geo-referencing, data editing and output; Characteristics and applications of Digital Elevation Model (DEM).

**UNIT IV**

**GIS implementation:** Integration of Remote sensing, GPS and GIS; Geo-spatial information Products; GIS project design, planning and management; Web-GIS applications; Applications of GIS in land management, disaster management and urban development.

**Books Recommended**

1. Burrough, P.A. and McDonnell, R. (1998): Principles of Geographic Information Systems. Oxford University Press, Oxford.
2. Chang, K.T. (2003): Introduction to Geographic Information Systems. Tata McGraw Hill Publications Company, New Delhi.
3. Chauniyal, D. D. (2004): Remote Sensing and Geographic Information Systems. (in Hindi). Sharda Pustak Bhawan, Allahabad.
4. Demers, M. N. (2000): Fundamentals of Geographic Information Systems. John Wiley and Sons, Singapore.
5. Fraser Taylor, D.R. (1991): Geographic Information Systems. Pergamon Press, Oxford.
6. Goodchild, M.F.; Park, B. O. and Steyaert, L. T. (eds.) (1993): Environmental Modelling with GIS. Oxford University Press, Oxford.
7. Heywood, I. (2003): An Introduction to Geographical Information Systems. 2<sup>nd</sup> edition, Pearson Publishing Company, Singapore.
8. Korte, G. M. (2002): The GIS Book. On Word Press: Thomson Learning, New York and Singapore.
9. Lo, C.P. and Yeung, A. K. W. (2002): Concepts and Techniques of Geographic Information Systems. Prentice Hall of India, New Delhi.
10. Longley, P., Goodchild, M.F., Maguire, D. and Rhind, D. (1999): Geographic Information Systems. Principles, Techniques, Management, Applications. John Wiley and Sons, New York.
11. Maguirre, D. J.; Michael F. G. and David W. R. (1999): Geographical Information Systems: Principles and Application. Geo Information International, Vol.2, Longman Publication., New York.
12. Martin, D. (1996): Geographic Information Systems: Socioeconomic Implications. Routledge, London.
13. Michael F. G. and Karan K. K. (ed.) (1990): Introduction to GIS. NCGIA, Santa Barbara, California.
14. Reddy, M. A. (2001): Textbook of Remote Sensing and Geographic Information Systems. B. S. Publications., Hyderabad.
15. Ripple, W. J. (ed.) (1989): Fundamentals of Geographic Information Systems: A Compendium. ASPRS/ ACSM, Falls Church.
16. Siddiqui, M.A. (2005): Introduction to Geographical Information Systems, Sharda Pustak Bhawan, Allahabad.
17. Star, J. and Estes, J. (1990): Geographic Information Systems – An Introduction. Prentice-Hall, Englewood Cliffs, New Jersey.
18. Worboys, M. F. (1995): GIS: A Computing Perspective. Taylor and Francis, London.

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**SEMESTER - III**  
**GRM 302: Theory**  
**Advanced Geography of India**

**UNIT I**

**Physical aspects:** Location and Space relations; Geological evolution and structure; physiographic divisions; climate: seasons and types; Soil types; Drainage systems; Natural vegetation.

**UNIT II**

**Human aspects:** Peopling of India; distribution of racial groups, language, religion and tribes; Population distribution and growth; Migration; Urban and rural settlements: characteristics and types.

**UNIT III**

**Economic aspects:** Resource base: land, water, mineral and energy; Agriculture: characteristics and types; Industries: types and industrial clusters; Surface and water transport.

**UNIT IV**

**Regional aspects:** Physiographic and socio cultural bases of region formation in India; Geographical regionalization of India: M.B. Pithawala, Kazi S. Ahmad, O.H.K. Spate and R.L.Singh; Studies of selected regions: Karnataka Plateau, Thar Desert, Middle Ganga Plain, Garhwal Himalaya, Konkan Plain and Utkal Plain.

**Books Recommended**

1. Ahmad, A. (2009): Geography of the South Asian Sub-continent: A Critical Approach. Concept Publishing Company, New Delhi.
2. Brammer, H. (2012): The Physical Geography of Bangladesh, University Press, Dhaka.
3. Chapman, G. and Baker, K.M. (eds.) (1992): The Changing Geography of Asia. Routledge, London.
4. Deshpande C. D., (1992): India: A Regional Interpretation, ICSSR, New Delhi.
5. Dutt, A.K. and Geib, M.M. (1998): Atlas of South Asia: A Geographic Analysis by Countries, New Delhi: Oxford and IBH Publishing.
6. Farmer, B.H. (1983): Introduction to South Asia. Methuen and Company Ltd. and Company Ltd., London.
7. Fraser, Neil, Bhattacharya, A. And Bhattacharya, B. (ed.) (2001): Geography of Himalayan Kingdom Bhutan. New Delhi, Concept Publishing House.
8. Gopalakrishnan, R. (1982): The Geography and Politics of Afghanistan. Concept Publishing House. New Delhi.
9. Haq, M. (1997) Human Development in South Asia, Karachi: Oxford University Press, Karachi.
10. Johnson, B.L.C. (1983): Development in South Asia. Penguin Books, Harmondsworth.
11. Khullar, D. R. (2006): India: A Comprehensive Geography. Kalyani Publishers., New Delhi.
12. Krishnan, M. S. (1968): Geology of India and Burma. 4th edition. Higgin Bothams Private. Ltd., Madras.
13. Panditharatne, Bernard Leslie (2010): A Concise Geography of Sri Lanka. Colombo, Godage International Publishers.
14. Rasheed, K. B. S. (2008). Bangladesh: Resource and Environmental Profile (Dhaka: AH Development Publishing House).
15. Rashid, Haroun (1977): Geography of Bangladesh, University Press, Dhaka.
16. Schwartzberg, J. E. (1978). A Historical Atlas of South Asia, (Chicago: University of Chicago Press).
17. Shafi, M. (2000): Agricultural Geography of South Asia, New Delhi, Macmillan.
18. Shrestha, S.H. (2004): Economic Geography of Nepal, Educational Publishing House, Kathmandu
19. Singh, J. (2003): India: A Comprehensive and Systematic Geography. Gyanodaya Prakashan, Gorakhpur.
20. Singh, R. L. ed. (1971): India: A Regional Geography. National Geographical Society of India, Varanasi.
21. Spate O. H. K. and Learmonth A.T.A. (1967): India and Pakistan: A General and Regional Geography, Methuen, London.
22. Spate, O.H. K., Learmonth A. T. A. and Farmer, B. H. (1996): India, Pakistan and Sri Lanka. Methuen, London, 7<sup>th</sup> edition.
23. Subbarao, B. (1959): The Personality of India. University of Baroda Press, Baroda.
24. Tirtha, R. (2002): Geography of India. Rawat Publications., Jaipur and New Delhi.
25. Tiwari, R. C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad



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**SEMESTER - III**  
**GRM 303: Practical**  
**Remote Sensing and GIS**

Credits: 2

**Remote Sensing:** Stereoscopic vision test, visual interpretation of stereogram/ stereopairs and satellite images; preparation of land use/land cover maps; Geomorphic and Drainage maps; Determination of scale.

**GIS:** Scanning of a map, geo-referencing; creation of shape files; on-screen digitization of polygons, points and lines, adding attributes, map creation and export;

**Books Recommended:**

1. Bhatta, B. (2010): Remote Sensing and GIS, Oxford University Press, New Delhi.
2. Campbell, J.B. (2002): Introduction to Remote Sensing. 5<sup>th</sup> edition, Taylor and Francis, London
3. Chauniyal, D. D. (2004): Remote Sensing and Geographic Information Systems. (in Hindi). Sharda Pustak Bhawan, Allahabad.
4. Curran, P.J. (1985): Principles of Remote Sensing, Longman, London
5. ESRI (1993): Understanding GIS. Redlands, USA
6. Glen, E. M. and Harold, C. S. (1993): GIS Data Conversion Handbook. Fort Collins, Colorado, GIS Word Inc.
7. Goodchild, M.F.; Park, B. O. and Steyaert, L. T. (eds.) (1993): Environmental Modelling with GIS. Oxford University Press, Oxford.
8. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. 4<sup>th</sup> edition. John Wiley and Sons, New York
9. Longley, P. and Batty, M. (eds.) (1996): Spatial Analysis: Modelling in a GIS Environment. GeoInformation International, Cambridge.
10. Longley, P., Goodchild, M.F., Maguire, D. and Rhind, D. (1999): Geographic Information Systems. Principles, Techniques, Management, Applications. John Wiley and Sons, New York.
11. Maguirre, D. J.; Michael F. G. and David W. R. (1999): Geographical Information Systems: Principles and Application. Geo Information International, Vol.2, Longman Publication., New York.
12. Martin, D. (1996): Geographic Information Systems: Socioeconomic Implications. Routledge, London.
13. Ralston, B. A. (2002): Developing GIS Solutions with Map Objects and Visual Basic. OnWord Press: Thompson Learning, New York and Singapore.
14. Worboys, M. F. (1995): GIS: A Computing Perspective. Taylor and Francis, London.

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**SEMESTER - III**  
**GRM 304: Practical**  
**Geographical Field Training**

Credits: 2

**Principles of field training:** Meaning and objectives; Field as laboratory of geography; Contents of field training: physical, social, economic and cultural; Field training techniques; Field training based report writing.

**Field Visit:** Students will undertake field training for 2 to 3 weeks duration in any region of India having geographical importance.

**Books Recommended**

1. Archer, J.E. and Dalton, T.H. (1968): *Field Work in Geography*. William Clowes and Sons Ltd. London and Beccles.
2. Bolton, T. and Newbury, P.A. (1968): *Geography through Fieldwork*. Blandford Press, London.
3. Jones, P. A. (1968): *Field Work in Geography*. Longmans, Green and Company Ltd., London and Harlow.
4. Lousenbury, J. F. and Aldrich, F.T. (1986): *Introduction to Geographic Field Methods and Techniques*. Charles E. Merrill Publishing. Company, Columbus.
5. Pugh, J.C. (1975): *Surveying for Field Scientists*. Methuen and Company Ltd. London.
6. Parsons, Tony and Knight, Peter G. (2005): *How to do your Dissertation in Geography and Related Disciplines*. Routledge, London. 2<sup>nd</sup> Ed.
7. Kitchen, Rob and Tate, Nicholas J. (2009): *Conducting Research into Human Geography: Theory, Methodology & Practice*. Prentice Hall-Pearson, Harlow U.K. 2<sup>nd</sup> Ed.
8. Kitchen, Rob and Fuller, Duncan (2005): *The Academic's Guide to Publishing*. Vistaar Publs. (Sage), New Delhi.
9. Hay, Iain (ed.) (2005): *Qualitative Research Methods in Human Geography*. Oxford University Press, Melbourne. 2<sup>nd</sup> Ed.
10. Hay, Iain (ed.) (2004): *Communicating in Geography and the Environmental Sciences*. Oxford University Press, Melbourne. 2<sup>nd</sup> Ed.
11. Stoddard, Robert H. (1982): *Field Techniques and Research Methods in Geography*. Kendall/Hunt Pub. Dubuque IO.

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**SEMESTER – III**  
**Optional Paper**  
**GRM 305 A: Theory**  
**Geography of Rural Settlements**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Conceptual framework:** Nature, scope and significance of rural settlement geography; Human settlement as a system; Characteristics of rural settlements; Theories and models of settlement diffusion: Eric Bylund (Sweden), Gunnar Olsson (Sweden), David Grossman (Nigeria), John Hudson (USA); Contributions of Banaras School.

**UNIT II**

**Spatiality and Histogenesis:** Evolution and growth of rural settlements; Site and location of rural settlements; Distribution, spacing, and nature of dispersion; Types and patterns; Morphology of village: examples from India, Germany, Japan, Israel, African countries; Rural-service centres: nature, hierarchy, service area and interaction.

**UNIT III**

**Rural Dwellings:** Origin, evolution and characteristics of rural folk houses and its cultural landscape; House types and their characteristics in different geographical environments; patterns of pre-colonial and post independence settlements.

**UNIT IV**

**Characteristics of Indian Village:** Indian village as a system; Evolution and multiplicity; Pressure and constraints of village settlement; religio-ritual, secular-economic and secular-economic interlocking system; Transformation of Indian village: livelihood risk, food security and planning; Ideas of village and settlement: Mahatma Gandhi and B.R. Ambedkar.

**Books Recommended**

1. Desai, A.R. (...): Rural Sociology, Popular Prakashan, Bombay.
2. Bahskar, G. and Reddy, A.V. (2005): Rural Transformation in India: The impact of Globalization, New Century Publication, New Delhi.
3. Jha, H. P. and Rodger G. (2018): The changing village in India, Oxford University Press, New Delhi.
4. Bhattacharya, S. (2012): Challenges of Livelihood and Inclusive Rural Development in Era of Globalization, Raj Publisher, Jalandhar, Punjab.
5. Fraster, T.G. (2013): Indians Rurasl Transformation and Development, D.K.Printworld, Delhi.
6. Daniel, P. (2002): Geography of Settlement. Rawat Publications., Jaipur and New Delhi.
7. Eidt, R. C., Singh, K. N. and Singh, Rana, P.B., (eds.) (1977): Man, Culture and Settlement. Kalyani Publishers., New Delhi.
8. Ghosh, S. (1999): A Geography of Settlements. Orient Longman, Kolkata.
9. Hudson, F. S. (1976): A Geography of Settlements. MacDonald and Evans, New York.
10. Mitra, A. (1960): Report on House Types and Village Settlement Patterns in India. Publication Division, Govt. of India, New Delhi.
11. Oliver, P. (1987): Dwellings. The House across the World. University of Texas Press, Austin.
12. Rapoport, A. (1969): House, Form and Culture. Prentice-Hall, Inc., Englewood Cliffs, NJ.
13. Rykwert, J. (ed.) (2004): Settlements. University of Pennsylvania Press, University Park, USA.
14. Singh, R.L. (eds.) (1973): Rural Settlements in Monsoon Asia, National Geographical Society of India, Varanasi.
15. Singh, R. L., Singh, K.N. and Singh, Rana P.B., (eds.) (1975): Readings in Rural Settlement Geography, National Geographical Society of India, Varanasi.
16. Singh, R. L. and Singh, Rana P. B. (eds.) (1978): Transformation of Rural Habitat in Indian Perspective, National Geographical Society of India, Varanasi, Pub. 19.
17. Singh, R.L., Singh, K.N and Singh Rana P.B., (eds.) (1976): Geographic Dimensions of Rural Settlements. National Geographical Society of India, Varanasi,

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18. Singh, Rana P.B. and Singh, R.B. (1981): Changing Frontiers of Indian Village Ecology. National Geographical Society of India, Varanasi, Pub. 27.
19. Singh, R.Y. (2005): Geography of Settlements. Rawat Publications, Jaipur and New Delhi.
20. Singh, S.B. (1977): Rural Settlement Geography. U.B.B.P., Publications, Gorakhpur.
21. Tiwari, R. C. (2000): Settlement Geography; in Hindi. Prayag Pustak Bhawan Allahabad.
22. Wanmali, S. (1983): Service Centres in Rural India. B.R. Publications Corporation, New Delhi
23. Wood, M. (2005): Rural Geography: Processes, Responses and Experiences of Rural Restructuring. Sage Publication, London.

**SEMESTER – III**  
**Optional Paper**  
**GRM 305 B: Theory**  
**Regional Planning**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Fundamental concepts:** Concept, nature and scope of regional planning; Approaches to regional planning; Planning regions: concept and types; Planning regions of India; Regional policies in India; Changing paradigm of planning in India.

**UNIT II**

**Regional Development:** Regional planning and national development; Economic development and regional development; Regional economic complexes; Inter-regional and intra-regional functional interactions; Survey for planning: diagnostic, techno-economic and regional; Regional disparities in India.

**UNIT III**

**Approaches to planning:** Approaches to integrated regional planning at different levels: local, regional and national; Constitutional framework of multi-level planning in India Financial resource distribution: state, district and block level planning; Planning for tribal, agricultural, industrial and urban (metropolitan) regions.

**UNIT IV**

**Regional planning in India:** Service and market centres planning; Growth centre and regional development with reference to India and France; Decentralised planning: themes and issues; Regional planning: development strategies in the 21<sup>st</sup> century; NITI AAYOG; Role of remote sensing and GIS in regional planning.

**Books Recommended**

1. Chandna, R. C. (2000): Regional Planning: A Comprehensive Text. Kalyani Publishers., New Delhi.
2. Chaudhuri, J. R. (2001): An Introduction to Development and Regional Planning with special reference to India. Orient Longman, Hyderabad.
3. Cowen, M.P. and Shenton, R.W. (1996): Doctrines of Development. Routledge, London.
4. Doyle, T. and McEachern, D. (1998): Environment and Politics. Routledge, London.
5. Friedmann, J. (1992): Empowerment: The Politics of Alternative Development. Blackwell, Cambridge MA and Oxford.
6. Friedmann, J. and Alonso, W. (ed.) (1973): Regional Development and Planning. The MIT Press, Mass.
7. Hettne, B.; Inotai, A. and Sunkel, O. (eds.) (1999 – 2000): Studies in the New Regionalism. Vol. I-V. Macmillan Press, London.
8. Isard, W. (1960): Methods of Regional Analysis. MIT Press, Cambridge, MA.
9. Kuklinski, A. R. (1972): Growth Poles and Growth Centres in Regional Planning. Mouton and Co., Paris.
10. Kuklinski, A.R. (ed.) (1975): Regional Development and Planning: International Perspective, Sijthoff-Leydor.
11. Leys, C. (1996): The Rise and Fall of Development Theory. Indian University Press, Bloomington, and James Curry, Oxford.
12. Mahapatra, A.C. and Pathak, C. R. (eds.) (2003): Economic liberalisation and Regional Disparities in India. Special Focus on the North Eastern Region. Star Publishing House, Shillong.
13. Kane, M. and William M.K.T.(2007): Concept Mapping for Planning and Evaluation, Sage Publications, London.
14. Misra, R. P. (ed.) (1992): Regional Planning: Concepts, Techniques, Policies and Case Studies. 2<sup>nd</sup> edition. Concept Publishing Company., New Delhi.
15. Misra, R.P. and Natraj, V.K. (1978): Regional Planning and National Development. Vikas, New Delhi.
16. Misra, R.P., Sundaram, K. V. Pradasa Rao, V. L. S. (1976): Regional Development Planning in India. Vikas Publishers, New Delhi.
17. Moseley, M.J., (1974): Growth Centres in Spatial Planning. Pergamon Press, Oxford.
18. Norgaard, R. B. (1994): Development Betrayed. The End of Progress and a Coevolutionary Revisioning of the Future. Routledge, London.
19. Pathak, C. R. (2003): Spatial Structure and Processes of Development in India. Regional Science Association., Kolkata.

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20. Sanyal, B. M. (2001): Decentralised Planning: Themes and Issues. Concept Publishing Company, New Delhi.
21. Sharma, P. V., Rao, V. L., and Pathak, C. R. (eds.) (2000): Sustainable Regional Development (with special reference to Andhra Pradesh). Regional Science Association, Kolkata and School of Economics, Andhra University, Vishakhapatnam.
22. Sen, A. (1999): Development as Freedom. Oxford University Press, Oxford.
23. Sen, A. and Dreze, J. (eds.) (1996): Indian Development: Selected Regional Perspectives. Oxford University Press, Oxford.
24. Smith, D. and Nârman, A. (eds.) (1999): Development Theory and Practice: Current Perspectives on Development and Development Co-operation. Longman, London.
25. Stöhr, W. B. and Taylor, D.F.R. (eds.) (1981): Development from Above and Below? The Dialectics of Regional Planning in Developing Countries. John Wiley and Sons, Chichester.
26. Sundaram, K. V. (1997): Decentralized Multilevel Planning: Principles and Practice (Asian and African Experiences). Concept Publishing Company, New Delhi.
27. Sundaram, K. V. (2004): The Trodden Path: Essays on Regional and Micro Level Planning. Anaanya Publications., New Delhi.
28. Verhelst, T. (1990): No Life Without Roots – Culture and Development. Zed Books, London.

**SEMESTER – III**

**Optional Paper**

**GRM 305 C: Theory**

**Remote Sensing-I: Aerial Remote Sensing**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Conceptual background:** Types and geometry of aerial photograph; Relief displacement; Stereoscopic parallax; Parallax equation and its approximation; Digital photogrammetry and orthophotos.

**UNIT II**

**Elements of aerial photograph:** Qualitative information, philosophy and sequence in air photo interpretation; Elements of air photo pattern: landforms, drainage, erosion details, gray-tones, vegetation; Elements of image interpretation.

**UNIT III**

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

**UNIT IV**

**Geospatial mapping:** Aerial photo interpretation in general resource evaluation; Geomorphic studies; land use/land cover; hydro-geomorphic studies; environmental monitoring.

**Books Recommended**

1. Cracknell, A. and Ladson, H (1990): Remote Sensing Year Book. Taylor and Francis, London.
2. Curran, P.J. (1988): Principles of Remote Sensing. ELBS Longman, Essex, U.K.
3. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science, Bangalore.
4. Floyd, F. S. Jr. (1997): Remote Sensing: Principles and Interpretation. W.H. Freeman, New York.
5. Hallert, B. (1960): Photogrammetry. McGraw Hill Book Company. Inc. New York
6. Leuder, D.R. (1959): Aerial Photographic Interpretation: Principles and Application, McGraw Hill, New York.
7. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. 4<sup>th</sup> ed. John Wiley and Sons, New York.
8. Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation. Concept Publishing. Company, New Delhi.
9. Reeves, R.G. (ed.) (1983): Manual of Remote Sensing. Vols. 1 and 2, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia.
10. Siegel, B.S. and Gillespie, R. (1985): Remote Sensing in Geology. John Wiley and Sons, New York.

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11. Spurr, R. (1960): Photogrammetry and Photo Interpretation. The Roland Press Company, London.
12. Survey of India, (1973): Photogrammetry. Survey of India, Dehradun.
13. Swain, P.H. and Davis, S.M. (ed.) (1978): Remote Sensing: The Quantitative Approach. McGraw-Hill, New York.
14. Wolf P.R. and Dewitt, B. A. (2000): Elements of Photogrammetry with Applications in GIS. McGraw-Hill, New York.

**SEMESTER – III**  
**Optional Paper**  
**GRM 306 A: Practical**  
**Geography of Rural Settlements**

Credits: 2

**Spatial Systems:** Rural settlement: types and patterns; Typological classification of rural settlements from maps; Analysis of spatial pattern of rural settlements: randomness and spacing indices; Testing of Christaller's theory; Size classification of rural settlements by scatter diagrams;

**Indian context:** Rural service centres: identification, indices, hierarchy, classification and ordering; Field-based mapping of village: social morphology, house types and facilities; Planning of Indian village.

**SEMESTER – III**  
**Optional Paper**  
**GRM 306 B: Practical**  
**Techniques of Regional Planning**

Credits: 2

**Regional planning methods:** Regional planning of a given area: district planning; service centre planning; micro level planning; central place hierarchy and growth centre in regional development.

**Delineation of planning regions:** Delineation of city region/ Umland: a case study; Identification and demarcation of axial growth: a case study.

**SEMESTER – III**  
**Optional Paper**  
**GRM 306 C: Practical**  
**Aerial Photo-interpretation**

Credits: 2

**Interpretation:** Identification of objects and features; Determination of height of objects from single photographs; preparation of base map.

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**Map work:** Preparation of thematic maps: lithology and structure, land use/ land cover, forest types, soil and soil erosion; hydro-geomorphic mapping.

**SEMESTER – III**  
**Optional Paper**  
**GRM 307 (SWAYAM Course): Theory**  
**Population and Development**

Credits: 2  
Number of Lectures: 26

**UNIT I**

**Conceptual Framework:** Population as resource; Population and development; Population and ecosystem; Malthusian and Neo-Malthusian theory; Demographic transition.

**UNIT II**

**Population Trends:** History of human population; Population characteristics of the world; Optimum population; Population policies in developed and developing countries; Demographic dividend.

**UNIT III**

**Development trends:** Relationship between population, food and energy; Limits to Growth; Concept of rich and poor world and their global perspectives; Population decline and economic development.

**UNIT IV**

**Population and Development in India:** Population growth scenario and relationship with development; population policies; family welfare and planning.

**Books Recommended**

1. Champion, T. (ed.) (1993): Population Matters. Paul Chapman, London.
2. Ehrlich, P.R. and Ehrlich, A.H. (1996): Ecoscience: Population, Resources, Environment. 6<sup>th</sup> edition, W.H. Freeman and Company, San Francisco.
3. Firor, J. and Jacobsen, J. E. (2003): The Crowded Greenhouse: Population, Climatic Change and Creating a Sustainable World. Universities Press (India) Private. Ltd., Hyderabad.
4. Haggett, P. (2001): Geography, A Modern Synthesis. 5<sup>th</sup> edition, Harper and Row, New York.
5. Hammett, C. (eds.) (1996): Social Geography: A Reader. Arnold, London.
6. Meadow, D.H., Meadows D.L., Randers J., and Behrens W.W. III.(1973): The Limits to Growth: I Report of the Club of Rome. The New American Library, New York.
7. Meadows, D.H., Meadows, D.L. and Randers, J. (1992): Beyond the Limits. Confronting Global Collapse, Envisioning a Sustainable Future. (A sequel to The Limits to Growth). Chelsea Green Publishers, Post Mills VT, USA.
8. Mesarovic, M. and Pester, E. (1974): Mankind at the Turning Point: II Report of the Club of Rome. The New American Library, New York.
9. Middleton, N. and O'Keefe, P. (2001): Redefining Sustainable Development. Pluto Press, London.
10. Ross, J. A. (ed.) (1982): International Encyclopaedia of Population. Free Press, New York.
11. Sharma, P. R. (ed.) (1991): Perspectives on the Third World Development. Rishi Publications., Varanasi.
12. Sharma, P. R. (ed.) (1994): Regional Policies and Development in the Third World. Rishi Publications, Varanasi.
13. Simon, J. L. (1977): The Economics of Population Growth. Princeton University. Press, Princeton.
14. Thakur, B. (ed.) (2004): Population, Resources and Development. Vol. II, Perspectives in Resource Management in Developing Countries. Concept Publishing. Company, New Delhi.
15. Tinbergen, J. (1976): RIO. Reshaping the International Order: III Report of the Club of Rome. The New American Library, New York.

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York.

16. U.N.C.E.D. (1987): Our Common Future. UNCED The Centre for Our Common Future, Geneva.

**SEMESTER - IV**  
**GRM401: Theory**  
**Environmental Studies**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Basic concepts:** Meaning, types and components of environment; Principles and approaches to environmental studies; sustainable development; Biodiversity: concept, extinction and conservation.

**UNIT II**

**Ecosystem:** Concept, classification and components of ecosystem; Energy flow in ecosystem: food chain, food web and ecological succession; Geo-biochemical cycles: carbon, nitrogen and phosphorus; Biomes of the world.

**UNIT III**

**Environmental Problems:** Types and causes of environmental degradation; Pollution: air, water, and solid waste; Hazards: natural (flood, earthquake) and anthropogenic; green house effect; ozone depletion.

**UNIT IV**

**Environmental Management:** Concept of environmental management; environmental monitoring and standards; Environmental Impact Assessment (EIA); Environmental policies and legislations in India: Environmental Protection Act, 1986, Biological Diversity Act, 2002.

**Books Recommended**

1. Anjuneyulu, Y. (2004): Introduction to Environmental Science. B. S. Publications, Hyderabad.
2. Blaikie, P., Cannon, T. and Davis, I. (eds.) (2004): At Risk: Natural Hazards, Peoples Vulnerability and Disasters. Routledge, London.
3. Clarke, J. I., Curson, P., Kayastha S. L. and Nag P. (eds.) (1991): Population and Disaster. Basil Blackwell, USA
4. Gautam, A. (2007): Environmental Geography, Sharda Pustak Bhawan, Allahabad
5. Huggett, R. J. (1998): Fundamental of Biogeography. Routledge, London.
6. Kayastha, S.L. and Kumra V.K. (1986): Environmental Studies. Tara Book Agency, Varanasi.
7. Kumra, V.K. (1982): Kanpur City. A Study in Environmental Pollution. Tara Book Agency, Varanasi.
8. Mathur, H. S. (2003): Essentials of Biogeography. Pointer Publication, Jaipur.
9. Nag, P., Kumra, V.K. and Singh, J. (1990): Geography and Environmental Issues at Local, Regional and National Levels. (in 3 vols.), Concept Publishing Company, New Delhi.
10. Odum, E.P. (1975): Ecology. Rowman and Littlefield, Lanham USA.
11. Rajagopalan, R. (2005): Environmental Studies: From Crisis to Cure, Oxford University Press, New Delhi.
12. Saxena, K.K. (2004): Environmental Studies. University Book House Private Ltd., Jaipur
13. Saxena, H. M. (1999): Environmental Geography. Rawat Publications., Jaipur and New Delhi.
14. Sharma, P.R., Yadava, R.S. and Sharma, V.N. (ed.) (2013): Interdisciplinary Advances in Environmental and Earth System Studies, R.K. Books, New Delhi.
15. Singh, A.K., Kumra, V.K. and Singh, J. (1986): Forest Resource, Economy and Environment. Concept Publishing Company, New Delhi.
16. Singh, D.N., Singh, J. and Raju, K.N.P. (eds.) (2003): Water Crisis and Sustainable Management. Tara Book Agency,



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Varanasi.

17. Singh, J. (2001): *Paryavaran Evam Samvikas*. Gyanodaya Prakashan, Gorakhpur.
18. Singh, O., Nag P., Kumra V.K. and Singh J. (eds.) (1993): *Frontier in Environmental Geography*. Concept Publishing Company, New Delhi.
19. Singh, O., Kumra V.K. and Singh J. (1988): *India's Urban Environment: Pollution, Perception and Management*. Tara Book Agency, Varanasi.
20. Singh, R. B. (ed.) (1995): *Studies in Environment and Development*. Rakesh Prakashan, Varanasi.
21. Singh, Rana P.B. (ed.) (1993): *Environmental Ethics: Discourses and Cultural Traditions*. National Geographical Society of India, BHU, Varanasi.
22. Singh, S. (2006): *Environmental Geography*. Prayag Pustak Bhawan, Allahabad.
23. Sinha, B.R.K. (2009): *Population, Environment and Development*, New Century Publication, New Delhi.

**SEMESTER - IV**

**GRM 402: Theory**  
**Oceanography**

Credits: 4  
Number of Lectures: 52

**Unit I**

**Basic concept and formation of ocean basins:** Nature, scope and evolution of Oceanography; Importance of oceans in global systems; Origin of oceans; Ocean basins; Continental shelf, continental slope, deep sea plain, ocean deeps, submarine canyons; Bottom relief of Indian Ocean.

**Unit II**

**Properties and circulation of ocean water:** Physical and chemical properties of sea water, temperature, density, salinity; Circulation of ocean water: tides, waves and currents.

**Unit III**

**Marine Life and deposits:** Phytoplankton, Zooplankton and nekton; Coral reefs; Fisheries; Classification sources and texture of marine deposits; Marine sediments: organic and carbonic deposits, distribution of pelagic sediments; Oceanic coast.

**Unit IV**

**Human Ocean Relation:** Mineral, energy and food resources; Geo-politics of oceans with reference to Indian ocean; Indian ocean realm; Sea-routes and maritime security; geostrategic significance of oceanic routes; Global warming and sea level change.

**Books Recommended**

1. Sverdrup, Keith A., Duxbury, Alison B. and Duxbury, Alyn C. (2006): *Fundamentals of Oceanography*, fifth edition. McGraw Hill Higher Education, New York.
2. Sverdrup, Harald Ulrik, Johnson, Martin Wiggo, Fleming, Richard H. (1942): *The Ocean, Their Physics, Chemistry, and General Biology*. Prentice Hall, New York.
3. King, Cuchlaine A.M. (1962): *Oceanography for Geographers*. Edward Arnold Ltd, London.
4. Neuman, Gerhard, and Piersons Jr., William J (1966): *Principles of Physical Oceanography*. Prentice-Hall Inc. Eaglewood Cliffs, N.J.
5. Lal, D. S. (2009): *Climate and Oceanography*. Sharda Pustak Bhawan, Allahabad.
6. Singh, S. (2008): *Oceanography*. Prayag Pushtak Bhawan, Allahabad.
7. Thurman, G.T. (1994): *Introduction to Oceanography*, 7<sup>th</sup> ediction, Macmillan, New York.
8. Trujillo, A. P. And Thruman, H.V. (2012): *Essentials of Oceanography*. PHI Learning Pvt. Ltd., New Delhi.

**SEMESTER - IV**

**GRM 403: Practical**  
**Environmental and Soil Analysis**

Credits: 2

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**Environmental analysis:** Environmental Impact Assessment of a waste disposal site; Water analysis: physical and chemical characteristics; Air analysis: estimation of SPM.

**Soil Analysis:** Soil analysis: physical and chemical; soil profile.

**SEMESTER – IV**  
**Optional Paper**  
**GRM 404 A: Theory**  
**Urban Geography**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Bases:** Nature, scope and recent trends in urban geography; Urban population: characteristics, processes and trends; Methodology in urban studies; Origin and evolution of urban settlements: *bazaar-based* and colonial based; Distribution of urban centres.

**UNIT II**

**Characteristics:** Characteristics of cities in different historical periods: pre-industrial, industrial and post-industrial; Functional classification of urban centres; urban transportation; National Urban Information System.

**UNIT III**

**Spatiality and Models:** Size and spacing of cities: rank-size rule; law of the primate city; Urban hierarchies; Central place theory (Christaller and Lössch); Urban land use and functional morphology: functional areas and peri-urban areas; Theories of urban structure: Burgess, Hoyt, Harris and Ullman, Mann, White.

**UNIT IV**

**Issues and Planning:** Urban sprawl; Urban problems: environmental, poverty, inequality, slums, transportation, housing, segregation and crime; Planned cities: Chandigarh and Jaipur; smart cities in India; National Urban Policy; Master Plans: A case study of Varanasi.

**Books Recommended**

1. Bridge, B. and Watson, S. (eds.) (2000): A Companion to the City. Blackwell, Oxford.
2. Carter, H. (1995): The Study of Urban Geography. 4<sup>th</sup> ed. Reprinted in 2002 by Rawat Publications, Jaipur and New Delhi.
3. Dubey, K.K. (1976): Use and Misuse of Land in KAVAL Towns. National Geographical Society of India, Varanasi.
4. Dubey, K.K. and Singh, A.K. (1983): Urban Environment in India. Deep and Deep, New Delhi.
5. Dutt, A. Allen, K. Noble, G., Venugopal G. and Subbiah S. (eds.) (2003): Challenges to Asian Urbanisation in the 21<sup>st</sup> Century. Kluwer Academic Publishers, Dordrecht and London.
6. Hall, P. (1992): Urban and Regional Planning. Routledge, London.
7. Hall, T. (2001): Urban Geography. 2<sup>nd</sup> edition. Routledge, London.
8. Haughton, G and Hunter, C. (1994): Sustainable Cities. Jessica Kingsley, London.
9. Jacquemin, A. (1999): Urban Development and New Towns in the Third World: A Lesson from the New Bombay Experience. Ashgate, Aldershot, UK.
10. Johnson, J.H. (1981): Urban Geography, Pergamon Press, Oxford.
11. Mayer, H. and Cohn, C. F. (1959): Readings in Urban Geography, University of Chicago Press, Chicago.
12. Pacione, M. (2005): Urban Geography: A Global Perspective. Routledge, London and New York.
13. Paddison, R. (ed.) (2001): Handbook of Urban Studies. Sage, London.
14. Ramachandran, R., (1991): Urbanisation and Urban Systems in India. Oxford University Press, Delhi.
15. Rao, B. P. and Sharma, N. (2007): *Nagariya Bhoogol*. Vasundhara Prakashan, Gorakhpur.
16. Singh, K. and Stainberg, F. (eds.) (1998): Urban India in Crisis. New Age International, New Delhi.
17. Singh, O. P. (1987): *Nagariya Bhoogol*. Tara Book Agency, Varanasi
18. Singh, R.L. (1955): Banaras. A Study in Urban Geography. Nand Kishore and Brothers, Banaras.
19. Singh, R.L. and Singh, Rana P.B., (eds.) (1979): Place of Small Towns in India. National Geographical Society of India, Varanasi,
20. Singh, Rana P.B. and Rana, P.S. (2002): Banaras Region. Indica Books, Varanasi.

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21. Singh, S. B. (ed.) (1996): New Perspectives in Urban Geography. M.D. Publications, New Delhi
22. Singh, T.D. (1985): Spatial Pattern of Population in the Cities of U.P. Tara Book Agency, Varanasi
23. Singh, H. H. (1972): Kanpur: A Study in Urban Geography, Indrasini Publications, Varanasi
24. Stanley, B., Jack, W. and Donald, Z. (eds.) (2003): Cities of the World. Rowman and Littlefield, New York and Oxford.
25. Tripathi, V.K., Jha, D.K. and Harshwardhan R. (eds.) (2018): Advances in Urban Studies in India. R.K. Books, New Delhi

**SEMESTER – IV**  
**Optional Paper**  
**GRM 404 B: Theory**  
**Rural and Urban Planning**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Concepts of rural planning:** Concept and approaches of rural planning; Policies and paradigms of rural development programmes; Basic infrastructures for rural development; Social Impact Assessment Analysis and its significance in rural planning; Urban-rural linkage approach to planning.

**UNIT II**

**Approaches to rural planning:** Land use planning: concepts, principles and classification; carrying capacity of land; agricultural efficiency; rural land patterns and issues of land acquisition in India; rural industries; rural infrastructure.

**UNIT III**

**Concept of urban planning:** Concept of urban planning; Urban planning: methods and techniques; Urban land use: models and planning; Urban renewal and re-development of towns; Urban governance; Urban infrastructure: Transportation, energy, water supply and sanitation.

**UNIT IV**

**Approaches to urban planning:** Optimum city-size; New and satellite towns; city planning in India: principles and approaches; emerging concept of smart cities; urban planning: case studies of Chandigarh and Varanasi.

**Books Recommended**

1. Bhat, L.S. (1976): Micro Level Planning in India. K.B. Pub. New Delhi.
2. Bhat, L.S. (1988): Strategy for Integrated Area Development. Case Study of North Kanara District (Karnataka). Concept Publishing, Company, New Delhi.
3. Chisholm, M. (1962): Rural Settlement and Land Use. Hutchinson, London.
4. Desai, A. R. (1990): Rural Development. Popular Prakashan, Bombay.
5. Desai, V. and Potter, R. (eds.) (2002): The Arnold Companion of Development Studies. Arnold, London.
6. Found, W.C. (1982): Theoretical Approach to Rural Land Use Pattern. Methuen and Company Ltd., London.
7. Hall, P. (1992): Urban and Regional Planning. Routledge, London.
8. Jr. Chapin S. F., Kaiser, E. J. Godschalk, D. R. (1995): Rural and Urban Land-use Planning. University of Illinois Press Urbanq and Chicago
9. Krishnamurthy, J. (2000): Rural Development. Problems and Prospects. Rawat Publications, Jaipur.
10. Learmonth, A.T.A. (1962): Sample Villages in Mysore. Liverpool Univ. Press.
11. Lejonhud, K. (2003): Indian Villages in Transformation: A Longitudinal Study of Three Villages in Uttar Pradesh. Karlstad University Studies, Karlstad.
12. Misra, R. P. and Achyutha, R. N. (1998): Micro-Level Rural Planning: Principles, Methods and Case Studies. Concept Publishing, Company, New Delhi.
13. Misra, R. P. and Misra, K. (eds.) (1998): Million Cities of India: Sustainable Development Foundation, New Delhi.

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14. Sharma, P. R. (ed.) (1991): Perspectives on the Third World Development. Rishi Publications, Varanasi.
15. Sharma, P. R. (ed.) (1994): Regional Policies and Development in the Third World. Rishi Publications, Varanasi.
16. Singh, B. N. (1988): Integrated Rural Area Development and Planning. Anupama Publications., Delhi.
17. Singh, R. L. and Singh, Rana P. B. (eds.) (1980): Rural Habitat Transformation in World Frontiers. National Geographical Society of India, Varanasi, Pub. 30.
18. Sundaram, K.V. (1977): Urban and Regional Planning in India. Vikas, New Delhi.
19. Yugandhar, B. N. and Mukherjee, N. (eds.) (1991): Studies in Village India: Issues in Rural Development. Concept Publishing, Company, New Delhi.

**SEMESTER – IV**  
**Optional Paper**  
**GRM 404 C: Theory**  
**Satellite Remote Sensing**

Credits: 4  
Number of Lectures: 52

**UNIT I**

**Fundamentals:** Spectral characteristics of common natural objects; Atmospheric effects on remote sensing data; spectral signatures and spectral response patterns; Resolutions of remote sensing data.

**UNIT II**

**Sensors and Platforms:** Indian Remote Sensing satellites and sensors; microwave remote sensing-SLAR and geometric characteristics of SLAR imagery.

**UNIT III**

**Image Processing Techniques:** Visual (VIP) and Digital (DIP); Image rectification/pre-processing operations; Image enhancement (contrast enhancement, spatial filtering and band ratioing); Image classification: supervised and unsupervised.

**UNIT IV**

**Applications:** Satellite image interpretation in terrain and resource mapping and evaluation; Lithology and structure; land use/land cover and space use mapping; Forest types; Environmental monitoring; Remote sensing and GIS.

**Books Recommended:**

1. Campell, J. B. (2003): Introduction to Remote Sensing. 4<sup>th</sup> ed. Taylor and Francis, London.
2. Cracknell, A. and Ladson, H (1990): Remote Sensing Year Book. Taylor and Francis, London.
3. Curran, P.J. (1985): Principles of Remote Sensing. Longman, London.
4. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science, Bangalore.
5. Floyd, F. and Sabins, Jr. (1986): Remote Sensing: Principles and Interpretation. W.H. Freeman, New York.
6. Gautam, N.C. and Raghavswamy, V. (2004): Land Use/ Land Cover and Management Practices in India. B.S. Publications., Hyderabad.
7. Harry, C.A. (ed.) (1987): Digital Image Processing. IEEE Computer Society, California.
8. Hord, R.M. (1982): Digital Image Processing of Remotely Sensed Data. Academic Press, New York.
9. Jensen, J.R. (1986): Introductory Digital Image Processing: A Remote Sensing Perspective. Prentice-Hall, Englewood Cliffs, New Jersey.
10. Jensen, J.R. (2004): Remote Sensing of the Environment: An Earth Resource Perspective. Prentice-Hall, Englewood Cliffs, New Jersey.
11. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
12. Nag, P. (ed.) (2000): Thematic Cartography and Remote Sensing. Concept Publishing. Company, New Delhi.
13. Nag, P. and Kudrat, M (1998): Digital Image Processing. Concept Publishing Company, New Delhi.
14. Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation. Concept Publishing. Company, New Delhi.

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15. Reeves, R.G. (ed.) (1983): Manual of Remote Sensing, Vols. 1 and 2. American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia.
16. Renz, A.N. (ed.) (1999): Remote Sensing for the Earth Sciences: Manual of Remote Sensing. American Society of Photogrammetry and Remote Sensing, and John Wiley and Sons, New York.
17. Siegel, B.S. and Gillespie, R. (1985): Remote Sensing in Geology. John Wiley and Sons, New York.
18. Swain, P.H. and Davis, S.M. (ed.) (1978): Remote Sensing: The Quantitative Approach. McGraw Hill, New York.

**SEMESTER – IV**  
**Optional Paper**  
**GRM 405 A: Practical**  
**Methods and techniques of Urban Geography**

Credits: 4

**Global Perspective:** Theoretical models of urban growth: infrastructure, community zone based study of maps; Functional interpretation of urban morphology and town plan through the ages; Functional classification of towns based on occupational data, population size and centrality.

**Indian Perspective:** Structure and growth analysis of Indian cities and conurbations; Determination of urban hierarchy in Indian region; Determination of population density gradient in urban areas; Application of rank-size rule in selected regions of India.

**SEMESTER – IV**  
**Optional Paper**  
**GRM 405 B: Practical**  
**Methods and techniques of Rural and Urban Planning**

Credits: 4

**Rural Planning:** Rural land use mapping (India and UK); International colour scheme and its applicability in Indian context; Intensive rural planning; Social Impact Assessment Analysis for developmental projects in rural area; Land capability: its determination and mapping.

**Urban Planning:** Preparation of urban land use maps; Diagrammatic representation of internal structure of urban centres based on traditional theories; Examination of master plans of towns and cities; Planning a new town considering urban land use: neighbourhood, sector and community plans.

**SEMESTER – IV**  
**GRM 405 C: Practical**  
**Satellite Image Interpretation**

Credits: 4

**Thematic Mapping:** Preparation of keys from satellite images; Preparation of thematic maps on lithology and structure, geomorphology, land use/land cover, soils and soil erosion, forest types, hydro-geomorphologic mapping and ground water potential zones.

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**Digital Image Processing:** Image enhancements; Geo-referencing; Mosaic preparation; Image classification: supervised and unsupervised.

**SEMESTER - IV**  
**GRM 406: Practical**  
**Field work dissertation and Presentation**

Credits: 4

**Dissertation writing:** Students in consultation with their allotted supervisors have to select a thematic topic as per their specialization group, collect and analyse data and write a report (dissertation) and submit it to the office 15 days before the commencement of the semester examination.

The dissertation should be designed under the following heads:

- Topic
- Introduction
- Conceptual background
- Literature review
- Statement of problem
- Objectives
- Research questions
- Methodology
- Study area
- Analysis and interpretation of data
- Conclusion
- References

**Evaluation:** Students will have to appear in viva-voce examination along with their dissertation. Dissertation and viva-voce will be assessed for 50+50 marks respectively. Total Marks will be 100 only.

**Note:** Allotment of Supervisors to be made at the beginning of third semester.

**Books Recommended**

1. Archer, J.E. and Dalton, T.H. (1968): *Field Work in Geography*. William Clowes and Sons Ltd. London and Beccles.
2. Bolton, T. and Newbury, P.A. (1968): *Geography through Fieldwork*. Blandford Press, London.
3. Jones, P. A. (1968): *Field Work in Geography*. Longmans, Green and Company Ltd., London and Harlow.
4. Lousenbury, J. F. and Aldrich, F.T. (1986): *Introduction to Geographic Field Methods and Techniques*. Charles E. Merrill Publishing. Company, Columbus.
5. Pugh, J.C. (1975): *Surveying for Field Scientists*. Methuen and Company Ltd. London.
6. Knight, Peter G. and Parsons, Tony (2003): *How to do your Essays Exams & Coursework in Geography and Related Disciplines*. Nelson Thornes, Cheltenham U.K.
7. Parsons, Tony and Knight, Peter G. (2005): *How to do your Dissertation in Geography and Related Disciplines*. Routledge, London. 2<sup>nd</sup> Ed.

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8. Kitchen, Rob and Tate, Nicholas J. (2009): *Conducting Research into Human Geography: Theory, Methodology & Practice*. Prentice Hall-Pearson, Harlow U.K. 2<sup>nd</sup> Ed.
9. Kitchen, Rob and Fuller, Duncan (2005): *The Academic's Guide to Publishing*. Vistaar Publs. (Sage), New Delhi.
10. Stoddard, Robert H. (1982): *Field Techniques and Research Methods in Geography*. Kendall/Hunt Pub. Dubuque, Iowa, U.S.A.