

University of Kalyani



Directorate of Open and Distance Learning (DODL)
Department of Geography

SYLLABUS

M.A. / M.Sc. COURSE IN GEOGRAPHY

2 Year PG Course (Semester System with Credit and Course)

(With Effect From: 2021-2022)

University of Kalyani

Kalyani, Nadia-741235, West Bengal

**M.A. / M.Sc. COURSE IN GEOGRAPHY
SEMESTER IV**

Paper code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voice	Credit	Marks
GEO/DSE/AG/T-419/ GEO/DSE/EG/T-419/ GEO/DSE/UG/T-419/ GEO/DSE/FG/T-419	Agricultural Geography-II (Special Paper)/ Environmental Geography-II (Special Paper)/ Urban Geography-II (Special Paper)/ Fluvial Geomorphology-II (Special Paper)	Theory	10	40	4	50
GEO/DSE/AG/T-420/ GEO/DSE/EG/T-420/ GEO/DSE/UG/T-420/ GEO/DSE/FG/T-420	Agricultural Geography-III (Special Paper)/ Environmental Geography-III (Special Paper)/ Urban Geography-III (Special Paper)/ Fluvial Geomorphology-III (Special Paper)	Theory	10	40	4	50
GEO/DSE/AG/T-421/ GEO/DSE/EG/T-421/ GEO/DSE/UG/T-421/ GEO/DSE/FG/T-421	Agricultural Geography-IV (Special Paper)/ Environmental Geography-IV (Special Paper)/ Urban Geography-IV (Special Paper)/ Fluvial Geomorphology-IV (Special Paper)	Theory	10	40	4	50
GEO/DSE/AG/P-422/ GEO/DSE/EG/P-422/ GEO/DSE/UG/P-422/ GEO/DSE/FG/P-422	Agricultural Geography-V (Special Paper)/ Environmental Geography-V (Special Paper)/ Urban Geography-V (Special Paper)/ Fluvial Geomorphology-V (Special Paper)	Practical	15	60	6	75
GEO/DSE/AG/P-423/ GEO/DSE/EG/P-423/ GEO/DSE/UG/P-423/ GEO/DSE/FG/P-423	[Field Based Project Report/Dissertation] Agricultural Geography-VI (Special Paper)/ Environmental Geography-VI (Special Paper)/ Urban Geography-VI (Special Paper)/ Fluvial Geomorphology-VI (Special Paper)	Practical	15	60	6	75
	Total		60	240	24	300
	Grand Total		240	960	96	1200

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/AG/T-419	Agricultural Geography-II: EMERGING ISSUES IN AGRICULTURE (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Acquisition of arable land with reference to India: issues and challenges</p> <p>Unit-2: Impact of agriculture on environment</p> <p>Unit-3: Impact of climate change on agriculture</p> <p>Unit-4: Concept of agricultural carbon credits</p> <p>Unit-5: Concept of Climate Smart Agriculture (CSA)</p> <p>Unit-6: Genetically modified crops: issues and implications</p> <p>Unit-7: Use of chemical fertilizers and pesticides in agriculture: advantages and disadvantages</p> <p>Unit-8: Role of bio-fertilizers and bio-pesticides in agriculture</p> <p>Unit-9: Application of nanotechnology in agriculture: issues and prospects</p> <p>Unit-10: Child labour in agriculture: issues and challenges</p> <p>Unit-11: Gender issues in agriculture</p> <p>Unit-12: Global Hunger Index</p>						
Mode of Internal Evaluation: Class test						

References:

- Belavadi, B.B., Nataraja, Karaba, N. and Gangadharappa, N.R. (eds), 2017: Agriculture under Climate Change: Threats, Strategies and Policies, Allied Publishers Private Limited, New Delhi.
- FAO, 2009: Agriculture and Climate Change-Challenges and Opportunities at the global and local level- Collaboration on Climate Smart Agriculture, Food and Agriculture Organisation of the United Nations, Rome.
- FAO, 2020: FAO framework on ending child labour in agriculture, Food and Agriculture Organisation of the United Nations, Rome.
- Halford, N.G., 2012: Genetically Modified Crops, Second edition, Imperial College Press, London.
- Ingle, A. P., 2023: Nanotechnology in Agriculture and Agroecosystems, Elsevier, Amsterdam.
- von Grebmer, K., Bernstein, J., Resnick, D., Wiemers, M., Reiner, L., Bachmeier, M., Hanano, A., Towey, O., Ni Chéilleachair, R., Foley, C., Gitter, S., Larocque, G. and Fritschel, H., 2022. 2022 Global Hunger Index: Food Systems Transformation and Local Governance, Concern Worldwide, Dublin & Forthcoming issues.
- World Bank, FAO and IFAD, 2009: Gender in Agriculture Sourcebook, The World Bank, Food and Agriculture Organisation, and International Fund for Agricultural Development, Washington.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/EG/T-419	Environmental Geography-II: ENVIRONMENT AND DEVELOPMENT (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Environment, development and population</p> <p>Unit-2: The Tragedy of the Commons</p> <p>Unit-3: Earth summits: 1972, 1992 and 2012</p> <p>Unit-4: Montreal Protocol and Kyoto Protocol</p> <p>Unit-5: Conference of the Parties</p> <p>Unit-6: Concept and methods of alternative agriculture</p> <p>Unit-7: Use and misuse of forest resources and forest conservation</p> <p>Unit-8: Industry and environment: issues and challenges with special reference to tourism industry</p> <p>Unit-9: Environmental Impact Assessment</p> <p>Unit-10: Environmental impact of river valley projects - Narmada dispute with special reference to environmental movement</p> <p>Unit-11: Environmental Performance Index</p> <p>Unit-12: Environmental audit</p>						
Mode of Internal Evaluation: Class test						

References:

- Basu, R., and Bhaduri, S., 2006. Society Development and Environment, Progressive Publishers, Kolkata.
- Bhattacharyya, R. (ed), 2001. Environment and Development, The Geographical Society of India, Kolkata.
- Kumar, H.D., 2001. Forest Resources Conservation and Management, Affiliated East-West Press Pvt. Ltd., New Delhi.
- UNEP, 2007. Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme.
- Validya, K.S., 2004. Geology, Environment and Society, Universities Press, Hyderabad.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/UG/T-419	Urban Geography-II: URBAN MORPHOLOGY (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Contemporary city ecology
Unit-2: Planning region in Urban Arena – concept, delineation and significance
Unit-3: Delineation of functional region in Urban Arena
Unit-4: Urban hierarchy and spacing after Christaller
Unit-5: Urban hierarchy after Philbrick
Unit-6: Role of urban hierarchy in regional planning
Unit-7: Significance of urban hierarchy in India
Unit-8: Urban morphology: Different schools of thoughts
Unit-9: Urban morphology: Concentric model of Burgess and Sector model of Hoyt
Unit-10: Urban morphology: Multi nuclei model of Harris and Ullman
Unit-11: Social segregation in the city
Unit-12: Urban social area analysis after Shevky and Bell

Mode of Internal Evaluation: Class test

References:

- Dave, M., 1991. Urban Ecology and Levels of Development, Rawat Publications, Jaipur.
- Johnson, J., 1967. Urban Geography: An Introductory Analysis, Pergamon Press, Oxford.
- Knox, P. L. and Pinch, S., 2006. Urban Social Geography: An Introduction, Prentice-Hall.
- Mayor, H.M. and Kohn, C.F. (eds), 1959. Readings in Urban Geography, University of Chicago Press, Chicago.
- Mcdonnell, M. J., Halns, A. K. and Breste, J. H., 2009. Ecology of Cities and Towns, Cambridge University Press, Cambridge.
- Short, J. R., 1984. An Introduction to Urban Geography, Routledge and Keygen Paul, London.
- Smailes, A.E., 1966. The Geography of Towns, Hutchinson University Library, London.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/FG/T -419	Fluvial Geomorphology-II: CHANNEL MORPHOLOGY (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Hydrological properties of channels, concept of equilibrium

Unit-2: Channel form and controls on its adjustment

Unit-3: Channel shape: pools, riffles, and bars, channel asymmetry and bed asymmetry; Hydraulic geometry, bed configuration

Unit-4: Concept of most efficient channel: width, mean depth, maximum depth, channel form index

Unit-5: Channel pattern: straight, sinuous, meandering, braided, anabranching, anastomosing

Unit-6: Meander geometry

Unit-7: Channel longitudinal profile and gradient, causes of profile concavity

Unit-8: Formation of channel bars, alluvial fans, floodplains, deltas, and estuaries

Unit-9: Channel decay: causes and consequences

Unit-10: Channel change through time: causes and evidences of channel shifting

Unit-11: Construction of dams and barrages and their impact on the fluvial system

Unit-12: Stream corridor: strategies for management

Mode of Internal Evaluation: Class test

References:

- Charlton, R., 2016. Fundamentals of Fluvial Geomorphology, 2nd edition, Routledge, London.
- Garde, R.J., 2006. River Morphology, New Age International Ltd.
- Knighton, D., 1998. Fluvial forms and Processes: A New Perspective, Arnold, London.
- Leopold, L.B., Wolman, M.G. and Miller, J. P., 1964, 1992. Fluvial Processes in Geomorphology, Dover Publications, Inc. New York.
- Maiti, R., 2016. Modern Approaches to fluvial geomorphology, Primus Books.
- Morisawa, M., 1985. Rivers, Longman, London.
- Schumm et al., 1987. Introduction to Fluvial Processes, Wiley-Blackwell.
- Schumm, S. A., 2003. The Fluvial System, The Blackburn Press.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/AG/T-420	Agricultural Geography-III: AGRICULTURE IN INDIA (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Agricultural regions of India: types and salient features</p> <p>Unit-2: Agricultural policies of India since independence</p> <p>Unit-3: Green revolution in India</p> <p>Unit-4: White revolution in India</p> <p>Unit-5: WTO and its impact on Indian agriculture</p> <p>Unit-6: Impact of information technology on Indian agriculture</p> <p>Unit-7: Impact of MGNREGA on Indian agriculture</p> <p>Unit-8: Farmers' indebtedness and its fall out in India</p> <p>Unit-9: Food and nutrition security in India</p> <p>Unit-10: Role of Public Distribution System (PDS) in assuring food security in India</p> <p>Unit-11: Agrarian distress in India: causes and possible solutions</p> <p>Unit-12: Digital agriculture in India</p>						
<p>Mode of Internal Evaluation: Term paper based on emerging issue(s) in Indian agriculture</p>						

References:

- FAO and ICRISAT, 2022. Digital agriculture in action -selected case studies from India, FAO Investment Centre, Country Investment Highlights No.17, FAO, Rome.
- FAO, IFAD, UNICEF, WFP and WHO, 2019. The State of Food Security and Nutrition in the World 2019. Safeguarding against economic slowdowns and downturns, FAO, Rome.
- Ferroni, M.(ed), 2012. Transforming Indian Agriculture-India 2040: Productivity, Markets and Institutions, Sage Publications India Pvt. Ltd., New Delhi.
- ICAR, 2009. Handbook of Agriculture, sixth (revised) edition, Directorate of Knowledge Management in Agriculture, Indian Council of Agricultural Research, New Delhi.
- OECD, 2018. Agricultural Policies in India, Organisation for Economic Co-operation and Development, OECD Publishing, Paris, France.
- Pitale, R. L., 2007. India: Rich Agriculture: Poor Farmers, Income Policy and Farmers, Daya Publishing House, Delhi.
- Ramakumar, R., 2022. Distress in the Fields - Indian Agriculture after Economic Liberalization, Tulika Books, New Delhi.
- Rao, C.H.H., Bhattachraya, B.B. and Siddharthan, N.S. (eds), 2005. Indian Economy and Society in the Era of Globalisation and Liberalisation, Academic Foundation, New Delhi.
- Shrivastava, M.P. and Singh, J., 2008. Dairy Development in the New Millennium: The Second White Revolution, Deep & Deep Publications Pvt. Ltd., New Delhi
- Singh, J., and Dhillon, S.S., 1984. Agricultural Geography, Tata McGraw-Hill, New Delhi.
- Singh, Y., 2022. 75 Years of Agricultural and Rural Development in India: 1947-48 to 2021-22, New Century Publications, New Delhi.
- Swaminathan, M.S., 2017. 50 Years of Green Revolution: An Anthology of Research Papers, World Scientific Publishing Co. Pte. Ltd., Singapore.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/EG/T-420	Environmental Geography- III: ENVIRONMENTAL ISSUES (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Concept of the scale of environmental issues

Unit-2: Contemporary global issues in environment: deforestation and biodiversity loss

Unit-3: Contemporary global issues in environment: global warming and sea-level change

Unit-4: Contemporary global issues in environment: wetland and wasteland

Unit-5: Environmental migration and environmental refugee

Unit-6: Social pathology:crime

Unit-7: Social pathology:disease

Unit-8: Global resource scarcity with special reference to freshwater

Unit-9: Environmental pollution with reference to e-waste and other non-degradable waste products

Unit-10: Ground water contamination: Arsenic

Unit-11: Ground water contamination: Fluoride

Unit-12: Noise pollution

Mode of Internal Evaluation: Term paper based on emerging issue(s) in Environmental Geography

References:

- Basu, R., and Bhaduri, S., 2007. Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.
- Basu, S., 2002. Changing Environmental Scenario of the Indian Subcontinent, ACB Publications, Kolkata.
- Kamra, K.K., and Chand, M., 2009. Basics of Tourism: Theory, Operation and Practice, Kanishka Publishers, New Delhi.
- NDMA, 2009. National Policy on Disaster Management, NDMA, New Delhi.
- Sharma, V.K. (ed), 2000. Environmental Problems of Coastal Areas in India, Bookwell, New Delhi.
- Singh, R.B., 1998. Ecological Techniques and Approaches to Vulnerable Environment, Oxford and IBH Pub., New Delhi.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/UG/T-420	Urban Geography-III: URBAN PROCESSES, SOCIAL ANALYSIS AND LINKAGES (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

- Unit-1:** Urban space: CBD, neighbourhood and communities
Unit-2: Impact of migration on the socio-economic structure of a specific urban area
Unit-3: Urbanisation and economic marginalisation
Unit-4: Slums in Urban India
Unit-5: Formal and informal economy; Basic and non basic economy
Unit-6: Types of rural urban linkages
Unit-7: Migration-linkages in India during post-independence phase
Unit-8: Gentrification-Concept, theories and impact analysis
Unit-9: City's ecological footprint
Unit-10: Urban Livability Index with reference to India
Unit-11: Urban development and planning in India: AMRUT and Smart City
Unit-12: Application of Remote Sensing and GIS in urban planning and management in India

Mode of Internal Evaluation: Term paper on any aspect of Urban Geography

References:

- Knox, P., Pinch, S., 2000. Urban Social Geography, Pearson Education.
- Lillesand, T.M. and Kiefer, R. W., 1994. Remote Sensing and Image Interpretation. 3rd edition, John Wiley & Sons, New York.
- Markandey, K., & Simhadri, S., 2009. Urban Environment and Geoinformatics, Rawat Publications, Jaipur.
- Short, J. R., 1984. An Introduction to Urban Geography, Routledge and Keygen Paul, London.
- Taafee, E. J. and Gauthier, H. L., 1973. Geography of Transportation. Prentice, New Delhi.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/FG/T -420	Fluvial Geomorphology-III: ANALYSIS OF DRAINAGE BASIN AND CHANNEL (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Fluvial hydrosystem approach: drainage basin perspective

Unit-2: Drainage basin as a unit of geomorphic study

Unit-3: Hypsometric analysis of drainage basin and its significance

Unit-4: Classification of channel links, Shreve's formula of link counting

Unit-5: Computation of topologically distinct channel network and topologically integrated channel network

Unit-6: Quantitative analysis of channel planforms and indices

Unit-7: Meander indices: shape, form, and tightness

Unit-8: Channel bed topography: identification and analysis of channel geomorphic units

Unit-9: Efficiency of channel cross-section: concept and characteristics

Unit-10: Hydrograph analysis and computation of unit hydrographs

Unit-11: Textural analysis of river sediments and pebbles

Unit-12: Vulnerability analysis of floods and riverbank erosion

Mode of Internal Evaluation: Term paper based on any emerging issue (s) in Fluvial Geomorphology

References:

- Charlton, R., 2016. Fundamentals of Fluvial Geomorphology, 2nd edition, Routledge, London.
- Chorley, Richard J., 1969. Introduction to Fluvial Processes, Routledge.
- Goudie, A.S. (ed), 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge, London.
- Knigton, D., 1998. Fluvial forms and Processes: A New Perspective, Arnold, London.
- Leopold, L.B., Wolman, M.G. and Miller, J. P., 1992. Fluvial Processes in Geomorphology, Dover Publications Inc., New York.
- Mitchel, C. W., 1992. Terrain Evaluation, Routledge, London.
- Morisawa, M., 1985. Rivers, Longman, London.
- Petts, G.E. and Amoros, C. (eds), 1996. Fluvial Hydrosystem, Chapman and Hall, London.
- Schumm, S. A., 2003. The Fluvial System, The Blackburn Press.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/AG/T -421	Agricultural Geography-IV: AGRICULTURE IN WEST BENGAL (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Agro-climatic regions of West Bengal: types and characteristics

Unit-2: Broad pattern of land utilisation in West Bengal

Unit-3: Implications of land reforms in West Bengal

Unit-4: Trends of crop diversification in West Bengal

Unit-5: Trends of crop productivity in West Bengal

Unit-6: Dairy development in West Bengal

Unit-7: Sericulture in West Bengal: problems and prospects

Unit-8: Floriculture in West Bengal: opportunities and challenges

Unit-9: Prospects of integrated farming system in West Bengal

Unit-10: Crop insurance and agricultural marketing in West Bengal

Unit-11: Food processing industry in West Bengal: scope and development

Unit-12: Agrarian crisis in West Bengal

Mode of Internal Evaluation: Seminar presentation on any aspect of Agricultural Geography in West Bengal

References:

- Bose, S., 2007. Agrarian Bengal: Economy, Social Structure and Politics, 1919-1947, Cambridge University Press, Cambridge.
- Boyce, J.K., 1987. Agrarian Impasse in Bengal: Institutional Constraints to Technological Change, Oxford University Press, Oxford.
- Government of West Bengal, 2004. West Bengal Human Development Report 2004, Development & Planning Department, Government of West Bengal, Kolkata.
- Harriss-White, B., 2007. Rural Commercial Capital: Agricultural Markets in West Bengal, Oxford University Press, New Delhi.
- Raychaudhuri, A. and Das, T.K. (eds), 2005. West Bengal Economy: Some Contemporary Issues, Allied Publishers Pvt. Ltd., Delhi.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/EG/T -421	Environmental Geography-IV: Environmental Management (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Environmental Management Planning: purpose and framework

Unit-2: Natural and quasi-natural hazards - case studies from littoral West Bengal: causes, consequences and management

Unit-3: Concept of urban forestry

Unit-4: Concept of sustainable transport

Unit-5: Concept of sustainable development and sustainable development goals

Unit-6: Eco-tourism: case studies from the Himalayan and coastal belts of West Bengal

Unit-7: Green technology

Unit-8: Green economy

Unit-9: Industrial pollution management with special reference to thermal power and sponge iron plants of West Bengal

Unit-10: Recycling of wastes

Unit-11: Renewable energy and green energy

Unit-12: Environmental ethics, policies and laws in India with special reference to air, water and forest

Mode of Internal Evaluation: Seminar presentation on any environmental issue and its management in India

References:

- Das, T.K. et al. (eds). 2011. Disasters in West Bengal: An Interdisciplinary Study. ACB Publications, Kolkata.
- Ghosh, N. et al. (eds), 2016. Nature, Economy and Society: Understanding the Linkages, Springer, New Delhi
- MoEF, 2006. National Environmental Policy-2006, Ministry of Environment and Forests, Government of India.
- Mukhopadhyay, P., Nawn, N., and Das, K. (eds), 2017. Global Change, Ecosystems, Sustainability: Theory, Methods, Practice, Sage Publications, New Delhi.
- Sen, R., 2009. Environmental Management: Economics and Technology, Levant Books, Kolkata.
- Shastri, S.C., 2022. Environmental law, Eastern Book Company.
- Singh, K. and Shishodia, A., 2007. Environmental Economics: Theory and Applications, Sage Publications, New Delhi.
- Welford, R., 2009. Corporate Environmental Management: Systems and Strategies, Universities Press, Hyderabad.
- Young, A., 2000. Land Resource: Now and Future, Cambridge University Press, Cambridge.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/UG/T-421	Urban Geography-IV: EMERGING URBAN ISSUES IN INDIA (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Air pollution in Indian metropolis Unit-2: Water pollution in Indian metropolis Unit-3: Noise pollution in Indian metropolis Unit-4: Soil contamination in metropolitan India Unit-5: Impact of pollutions on human health in metropolitan India Unit-6: Sanitation and sewerage related problems in Indian cities Unit-7: Poverty in urban India Unit-8: Crime in Indian metropolis Unit-9: Juvenile delinquency in Indian megacities Unit-10: Women trafficking in urban India Unit-11: Urban transport system and its associated problems in Indian megacities - solution-strategies Unit-12: Analysis on urban housing policies in India-its problems and prospects</p>						
Mode of Internal Evaluation: Seminar presentation on any emerging urban issue in India						

References:

- Das, A. K., 2007. Urban Planning in India, Rawat Publications, Jaipur.
- Flint, C, and Flint, D., 1999. Urbanisation Changing Environments, Collins, London.
- Garnier, B.J. and Chabot, G.,1969. Urban Geography, Longman, London.
- Herbert, D.T. and Jhonston, R.J., 1982. Geography and Urban Environment, John Willey & Sons.
- Ramachandran, R., 1989. Urbanisation and Urban Systems of India, Oxford University Press, New Delhi.
- Sharma, R.N. and K. Sita, 2001. Issues in Urban Development, Rawat Publications, Jaipur.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/UG/T-421	Fluvial Geomorphology-IV: HAZARDS, ISSUES AND MANAGEMENT (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Fluvial hazards: nature and types

Unit-2: Floods: types, causes, spatial nature, behaviour, effects, and risk analysis

Unit-3: Riverbank erosion: causes and effects

Unit-4: Riverbank erosion in West Bengal: problems and management

Unit-5: Channel modification: requirements, processes, and effects

Unit-6: Management of river discharge at Farakka Barrage and related issues

Unit-7: Rivers as a resource in West Bengal, their sustainable management

Unit-8: Floodplain management: strategies and principles

Unit-9: Watershed management: need and significance

Unit-10: Integrated River Basin Management: approaches and principles

Unit-11: Tista Megafan processes, landforms and hazards

Unit-12: Sundarban processes, landforms and hazards

Mode of Internal Evaluation: Seminar presentation on any aspect of Fluvial Geomorphology in West Bengal

References:

- Bandyopadhyay, S., and Kar, N.S., Das, S., and Sen, J.2014. River systems and water resources of West Bengal: a review. In: Vaidyanadhan R (ed) Rejuvenation of surface water resources of India: potential problems and prospects. Geological Society of India Special Publication 3, West Bengal, pp. 63-84.
- Knighton, D., 1998. Fluvial forms and Processes: A New Perspective, Arnold, London
- Kondolf, M.G. and Piégay, H., 2016. Tools in Fluvial Geomorphology, 2nd edition, Wiley-Blackwell, New Jersey.
- Maiti, R., 2016. Modern Approaches to fluvial geomorphology, Primus Books.
- Paul, A.K., 2002. Coastal Geomorphology and Environment, ACB Publications, Kolkata.
- Throne C.R., Hey, R.D., Newson, M. D. (eds), 1997. Applied Fluvial Geomorphology for River Engineering and Management, John Wiley & Sons, Chichester.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/AG/ P-422	Agricultural Geography-V: AGRICULTURAL DATA COLLECTION, ANALYSIS AND MAPPING (Special Paper)	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75

Unit-1: Crop calendar

Unit-2: Ergograph

Unit-3: Crop concentration index after Bhatia

Unit-4: Crop productivity index after Enyedi and Shafi

Unit-5: Crop diversification index after Simpson and Gibbs-Martin

Unit-6: Crop combination analysis after Weaver and Rafiullah

Unit-7: Determination of available N, P, K in soil; pH and organic carbon in soil

Unit-8: Measurement and mapping of land capability

Unit-9: Determination, mapping and analysis of soil nutrient indices and soil fertility

Unit-10: Preparation and analysis of agricultural maps using RS and GIS

Unit-11: Identification of seeds and crop plants

Unit-12: Application of statistical software in agricultural research

Mode of Internal Evaluation: Continuous assessment on performance in Agricultural Geography Laboratory and RS & GIS Laboratory.

References:

- Albert, D.P., 2012. Geospatial Technologies and Advancing Geographic Decision Making: Issues and Trends, Information Science Reference, IGI Global, Hershey.
- Bender, F.E., Douglass, L.W. and Kramer, A. (eds), 1989: Statistical Methods for Food and Agriculture, CRC Press, New York.
- Chuvieco, E., 2020. Fundamentals of Satellite Remote Sensing: An Environmental Approach, 3rd edition, CRC Press, Taylor & Francis Group, Florida.
- Di, L. and Ustundag, B.(eds), 2021. Agro-geoinformatics: Theory and Practice, Springer Nature, Switzerland.
- Green, K., Congalton, R.G. and Tukman, M.,2017. Imagery and GIS: Best Practices for Extracting Information from Imagery, Esri Press, California.
- Gregor, H.F., 1970: Geography of Agriculture: Themes in Research, Prentice-Hall, New Jersey.
- Ireland, C., 2010: Experimental Statistics for Agriculture and Horticulture, CABI, Wallingford.
- Rangaswamy, R., A Text Book of Agricultural Statistics, New Age International (P) Limited Publishers, New Delhi.
- Robinson, G.M., 1998: Methods and Techniques in Human Geography, John Wiley and Sons Ltd., New Jersey.
- Tan, K.H., 2005. Soil Sampling, Preparation, and Analysis, CRC Press, Florida.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/EG/ P-422	Environmental Geography-V: Environmental Survey, Mapping and Assessment of Environmental Quality (Special Paper)	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75

Unit-1: Identification and study of an environmental problem in field; Environmental rating

Unit-2: Preparation of survey schedule/questionnaires for perception survey of natural and social environment; Preparation of the Environmental Management Plan in any hazard prone area

Unit-3: Floral species survey using grid method

Unit-4: Cartographic presentation of primary/secondary data and collation of environmental maps

Unit-5: Preparation and interpretation of environmental maps using RS and GIS

Unit-6: Mapping of spatial and temporal variations of environmental parameters applying Geoinformatics

Unit-7: Measurement of air pollutants

Unit-8: Measurement of noise pollution

Unit-9: Determination of available N, P, K in soil; pH and organic carbon in soil

Unit-10: Determination of Acidity and Alkalinity of water; TSS and TDS in water; BOD and Total Hardness of water

Unit-11: Correlation and Regression Analysis (bi-variate), Time Series Analysis of environmental data; Application of Lorenz Curve and Location Quotient for environmental data analysis and interpretation

Unit-12: Application of statistical software for environmental data analysis

Mode of Internal Evaluation: Continuous assessment on performance in GIS Laboratory and Environmental Geography Laboratory

References:

- Das, N. G., 2017. Statical Methods (combined volumes), Mc.Grew Hill Education.
- Jensen, J.R., 2003. Remote Sensing of the Environment: An Earth Resource Perspective, Pearson Education.
- Pal, S. K., 1998. Statistics for Geoscientists, Tata McGraw Hill, New Delhi
- Santra, S.C., 2001. Environmental Science, 1st edition, New Central Book Agency, Calcutta.
- Singh, R. B. and Murai, S. (eds), 1998. Space-informatics for Sustainable Development, Oxford and IBH Pub.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/UG/P-422	Urban Geography-V:URBAN GROWTH, CONCENTRATION, TRANSPORT NETWORK ANALYS&PERCEPTION STUDIES (Special Paper)	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75

Unit-1: Urban growth analysis by Least squares method; Decadal Growth Rate

Unit-2: Index of urbanization, Quality of Life Index for Urban Residential Areas

Unit-3: Delineation of sphere of influence: Break-point analysis, Population potential surface

Unit-4: Analysis of regional disparity after Sopher

Unit-5: Rank-size distribution of towns after Zipf and Pareto (Normal and Log/log)

Unit-6: Bivariate Regression and Residual mapping

Unit-7: Measurement of inequality and concentration: Lorenz curve, Gini coefficient and Location quotient

Unit-8: Network analysis: Cyclomatic Number, Alpha, Beta, Gamma indices

Unit-9: Accessibility (Shimbel Index), Centrality (König index) and Detour mapping

Unit-10: Measures of noise pollution, TSS, TDS and BOD of water

Unit-11: Preparation of land cover land use maps using RS and GIS techniques

Unit-12: Preparation of Survey Schedule/Questionnaire on urban environmental issues

Mode of Internal Evaluation: Continuous assessment on performance in Urban Geography Laboratory and RS & GIS Laboratory

References:

- Kurtz, N.R., 1983. *Introduction to Social Statistics*, McGraw-Hill International Book Company, Auckland.
- Mahmood, A., 1998. *Statistical Methods in Geographical Studies*, Rajesh Publication.
- Markandey, K. and Simhadri, S. 2009. *Urban Environment and Geoinformatics*, Rawat Publications, Jaipur.
- Sopher, D., 1980. *An Exploration of India*, Cornell University Press, Ithasa.
- Taylor, P. J., 1977. *Quantitative methods in Geography*, Houghton Mifflin Co., London.
- Toyne, P, and Newby, P.,1971. *Techniques in Human Geography*, Macmillian, London.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/FG/ P-422	Fluvial Geomorphology-V: QUANTITATIVE ANALYSIS OF DRAINAGE BASIN AND CHANNEL (Special Paper)	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75

Unit-1: Drainage basin identification and delineation from topographical maps, satellite images, and digital elevation models

Unit-2: Computation and analysis of channel planforms and indices: sinuosity and braiding

Unit-3: Morphometric analysis of drainage basin: linear, areal and relief aspects

Unit-4: Analysis of drainage basin using GIS

Unit-5: Hypsometric curve: construction and analysis

Unit-6: Measurement and interpretation of channel parameters: width, depth, wetted perimeter, cross-sectional area, hydraulic radius, velocity, and discharge

Unit-7: Measurement and analysis of channel geomorphic units

Unit-8: Measurement and interpretation of channel parameters: sinuosity and braiding

Unit-9: Interpretation of morphometric and morphologic changes from topographical maps and satellite images

Unit-10: Construction and interpretation of hydrographs (monthly, annual) and rating curves

Unit-11: Mapping of flood inundation and risk zones

Unit-12: Textural analysis of river sediments and pebbles using sieves and slide callipers

Mode of Internal Evaluation: Continuous assessment on performance in Fluvial Geomorphology Laboratory

References:

- Goudie, A., et al.,1990. Geomorphological Techniques, Unwin Hyman, London.
- Kondolf, M.G. and Piégay, H., 2016. Tools in Fluvial Geomorphology, 2nd edition, Wiley-Blackwell, New Jersey.
- Leopold, L.B., Wolman, M.G. and Miller, J.P., 1992. Fluvial Processes in Geomorphology, Dover Publications, Inc. New York.
- Mitchel, C. W., 1992. Terrain Evaluation, Routledge, London.
- Morisawa, M., 1985. Rivers, Longman, London.
- Throne C.R., Hey, R.D., Newson, M. D. (eds), 1997. Applied Fluvial Geomorphology for River Engineering and Management, John Wiley & Sons, Chichester.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva-Voce	Credit	Mark s
GEO/DSE/AG/P-423	Agricultural Geography - VI: Field Based Project Report/Dissertation (Special Paper)	Practical	15	60 Individual Field Based Project Report/ Dissertation + Seminar Presentation + Viva Voce (30+15+15=60)	6	75

- Each student will prepare an individual Field Based Project Report/Dissertation based on primary survey and secondary survey related to any relevant issue on Agricultural Geography Special Paper.

Mode of Internal Evaluation: Field performance

References:

- Clifford, N., French, S. and Valentine, G. (eds) 2010: Key Methods in Geography, Sage Publications Ltd., London.
- Ford, E.D., 2000. Scientific Method for Ecological Research, Cambridge University Press, Cambridge.
- Gregor, H.F., 1970: Geography of Agriculture: Themes in Research, Prentice-Hall, New Jersey.
- Kothari, C.R., 2013: Quantitative Techniques, Vikas Publishing House, Noida.
- Phillips, R. and Johns, J., 2012. Fieldwork for Human Geography, Sage Publications Ltd., London.
- Richards, J.A., 2012. Remote Sensing Digital Image Analysis: An Introduction, 5th Edition, Springer, Berlin.
- Robinson, G.M., 1998: Methods and Techniques in Human Geography, John Wiley and Sons Ltd., New Jersey.
- Sahu, P.K., 2016: Applied Statistics for Agriculture, Veterinary, Fishery, Dairy and Allied Fields, Springer India.
- Stoddard, R.H., 1982. Field Techniques and Research Methods in Geography, Kendall/Hunt Publishing Company, Dubuque, Iowa.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/EG/P-423	Environmental Geography- VI: Field Based Project Report/Dissertation (Special Paper)	Practical	15	60 Individual Field Based Project Report/ Dissertation + Seminar Presentation + Viva Voce (30+15+15=60)	6	75

Each student will prepare an individual Field Based Project Report/Dissertation based on primary survey and secondary survey related to any relevant issue on Environmental Geography Special Paper

Mode of Internal Evaluation: Field performance

References

- Creswell J., 1994. Research Design: Qualitative and Quantitative Approaches, Sage Publications.
- Goudie A., 2001. The Nature of the Environment, Blackwell, Oxford.
- Kothari, C. R., 2019. Research Methodology: Methods and Techniques, 4th edition, New Age International Publishers, New Delhi.
- Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., 2017. Remote Sensing and Image Interpretation (6th edition). Wiley India Pvt. Ltd., New Delhi.
- Pal, S. K., 1998. Statistics for Geoscientists, Tata McGraw Hill, New Delhi.
- Santra, S.C., 2001. Environmental Science, 1st edition, New Central Book Agency, Calcutta.
- White, I.D., Mottershead, D.N. and Harrison, S.J., 1984. Environmental Systems: An Introductory Text, George Allen and Unwin Ltd., London.
- Wolcott, H., 1995. The Art of Fieldwork, Alta Mira Press, Walnut Creek, CA.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva-Voce	Credit	Mark s
GEO/DSE/UG/P-423	Urban Geography-VI: Field Based Project Report/Dissertation (Special Paper)	Practical	15	60 Individual Field Based Project Report/ Dissertation + Seminar Presentation + Viva Voce (30+15+15=60)	6	75

- Each student will prepare an individual Field Based Project Report/Dissertation based on primary survey and secondary survey related to any relevant issue on Urban Geography Special Paper.

Mode of Internal Evaluation: Field performance

References:

- Briggs, K.,1970. Field Work in Urban Geography, Oliver and Boyd, Edinburgh.
- Cadwallader, M.,1985. Analytical Urban Geography, Prentice Hall, London.
- Ford, E.D., 2000. Scientific Method for Ecological Research, Cambridge University Press, Cambridge.
- Gibbs, J.P. (eds), 1961.Urban Research Methods, D. Van Nostrand Co. Inc., New Jersey.
- Toyne, P. and Newby, P., 1971. Techniques in Human Geography. MacMillian, London.

SEMESTER-IV

Paper Code	Paper	Theory/ Practical	Internal Assessment / Evaluation	Examination/ Report/ Viva-Voce	Credit	Marks
GEO/DSE/FG/P-423	Fluvial Geomorphology –VI: Field Based Project Report/Dissertation Dissertation (Special Paper)	Practical	15	60 Individual Field Based Project Report/ Dissertation + Seminar Presentation + Viva Voce (30+15+15=60)	6	75

- Each student will prepare an individual Field Based Project Report/Dissertation based on primary survey and secondary survey related to any relevant issue on Fluvial Geomorphology.

Mode of Internal Evaluation: Field performance

References:

- Andrews, H. C, 1977. Computer Techniques in Image Processing, Academic Press, NY.
- Barber, G. M., 1988. Elementary Statistics for Geographers, The Guilford Press, London.
- Bhagat, J, 2010. Geomorphic Evolution of The Nunbil Basin- Through Morphometric Measures, Radha Publications, New Delhi.
- Dury. G. H., 1972. Map Interpretation, Pitman Pub., London.
- Garde. R. J.,2016. River Morphology, New Age International (P) Ltd. Publishers.
- Goudie, A, et al., 1990. Geomorphological Techniques, Routledge,
- Throne, C.R. Hey Richard, Newson, Malcolm, D. (eds), 1998. Applied Fluvial Geomorphology for River Engineering & Management, John Wiley & Sons Inc.
- Townsend, J, R, G. (ed), 1981. Terrain Analysis and Remote Sensing, George Allen & Unwin, London.