

University of Kalyani



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)

Department of Geography

University of Kalyani

Kalyani, Nadia-741235, West Bengal

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

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-101	Geotectonics, Geomorphology and Hydrology	Theory	10	40	4	50
GEO/CC/T-102	Climatology	Theory	10	40	4	50
GEO/CC/T-103	Soil and Biogeography	Theory	10	40	4	50
GEO/CC/T-104	Geographical Thought	Theory	10	40	4	50
GEO/CC/P-105	Morphometric Analysis and Surveying	Practical	15	60	6	75
GEO/AECC/P-106	Perception Survey	Practical	5	20	2	25
	Total		60	240	24	300

GEO: Geography, CC: Core Courses, T: Theory, P: Practical, AECC: Ability Enhancement Compulsory Courses

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

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-207	Population and Settlement Geography	Theory	10	40	4	50
GEO/CC/T-208	Research Methodology	Theory	10	40	4	50
GEO/CC/T-209	Cartography and Geoinformatics	Theory	10	40	4	50
GEO/CC/P-210	Remote Sensing and GIS	Practical	15	60	6	75
GEO/CC/P-211	Project using Remote Sensing and GIS	Practical	5	20	2	25
GEO/GEC/T-212	Elements of Geography (Open Course)	Theory	10	40	4	50
	Total		60	240	24	300

GEO: Geography, CC: Core Courses, T: Theory, P: Practical, GEC: Generic Elective Courses

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

Paper code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voice	Credit	Marks
GEO/CC/T-313	Social Geography, Cultural Geography and Economic Geography	Theory	10	40	4	50
GEO/CC/T-314	Political Geography and Historical Geography	Theory	10	40	4	50
GEO/CC/T-315	Geography of Hazards and Disasters	Theory	10	40	4	50
GEO/DSE/AG/T-316/ GEO/DSE/EG/T-316/ GEO/DSE/UG/T-316/ GEO/DSE/FG/T-316	Agricultural Geography-I (Special Paper)/ Environmental Geography-I (Special Paper)/ Urban Geography-I (Special Paper)/ Fluvial Geomorphology-I (Special Paper)	Theory	10	40	4	50
GEO/CC/P-317	Quantitative Techniques in Geography	Practical	15	60	6	75
GEO/SEC/P-318	Field Report	Practical	5	20	2	25
	Total		60	240	24	300

GEO: Geography, CC: Core Courses, T: Theory, P: Practical, DSE: Discipline Specific Elective, SEC: Skill Enhancement Courses

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-I

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-101	Geotectonics, Geomorphology and Hydrology	Theory	10	40 (Semester-end Examination)	4	50

- Unit-1:** Plate tectonics as a unified theory of global tectonics
- Unit-2:** Tectonic geomorphology: Influence of tectonics in landscape evolution
- Unit-3:** Concepts in Geomorphology: spatial scale, temporal scale, systems, feedback, equilibrium and threshold
- Unit-4:** Catchment process and fluvial processes; Factors regulating entrainment, transportation and deposition
- Unit-5:** Adjustment of channel forms and patterns to morphodynamic variables
- Unit-6:** Coastal morphodynamic variables and their influence in evolution of landforms
- Unit-7:** Periglacial processes and landforms
- Unit-8:** Elements of slope and different approaches to study slope development
- Unit-9:** Concept of basin hydrology and run off cycle; Unit hydrograph, rating curve and their applications
- Unit-10:** Storm water and flood management: storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation
- Unit-11:** Drought management: drought assessment and classification, drought analysis techniques, drought mitigation planning
- Unit-12:** Methods of water conservation: rainwater harvesting and watershed management

Mode of Internal Evaluation: Class test

References:

- Bloom, A.L., 1998. Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, 3rd edition, Prentice Hall of India, New Delhi.
- Bridges, E. M., 1990. World Geomorphology, Cambridge University Press, Cambridge.
- Chorley, R.J., Schumm, S.A. and Sugden, D.E., 1984. Geomorphology, Routledge, Oxfordshire.
- Chow, V., Maidment, D. and Mays, L., 2017. Applied Hydrology, McGraw Hill Education, New York.
- Christopherson, R. W., 2011. Geosystems: An Introduction to Physical Geography, 8th edition, Macmillan Publishing Company, New York.
- Davie, T., 2008. Fundamentals of Hydrology, 2nd edition, Routledge, London.
- Gupta. A., 2011. Tropical Geomorphology, Cambridge University Press, Cambridge.
- Holmes, A., 1959. Principles of Physical Geology, Thomas Nelson & Sons, London.
- Huggett, R.J., 2011. Fundamentals of Geomorphology, Routledge, New York.
- Kale, V.S. and Gupta, A., 2001. Introduction to Geomorphology, Orient Longman Ltd., Hyderabad.
- Knighton, A. D., 1984. Fluvial Forms and Processes, Edward Arnold Publishers, London.
- Reddy, P. J. R., 2011. A Text Book of Hydrology, 3rd edition, USP pub.
- Selby, M.J., 1985. Earth's Changing Surface, Oxford University Press, London.
- Singh, S., 1998. Geomorphology, Prayag Pustak, Allahabad.
- Skinner, B. J., and Stephen, C. P., 2000. The Dynamic Earth: An Introduction to Physical Geology, 4th edition, John Wiley and Sons.
- Strahler, A.H., 1996. Introducing Physical Geography, John Wiley & Sons, New York.
- Thornbury, W. D., 1969. Principles of Geomorphology, Wiley, New Jersey.
- Wilhite, D.A. and Pulwarty, R.S. (eds), 2018. Drought and Water Crises: Integrating Science, Management, and Policy, 2nd edition, CRC Press, Taylor & Francis, London.

SEMESTER-I

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-102	Climatology	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Adiabatic and isothermal processes

Unit-2: Atmospheric stability and instability

Unit-3: Air-masses

Unit-4: Tri-cellular model

Unit-5: Atmospheric fronts: classification, formation and characteristics

Unit-6: Formation of precipitation; Rainmaking

Unit-7: El Nino, Southern Oscillation and La Nina

Unit-8: Monsoon: theories of its origin; Recent trends of monsoon in India

Unit-9: History of global climate change

Unit-10: Climate change: causes and evidences

Unit-11: Global warming: consequences and adaptations

Unit-12: Weather forecasting: short, medium and long range

Mode of Internal Evaluation: Class test

References:

- Barry, R. G. and Carleton, A. M., 2001. Synoptic and Dynamic Climatology, Routledge, UK.
- Barry, R. G. and Chorley, R. J., 2010. Atmosphere, Weather and Climate, 9th edition, Routledge, Oxon.
- Byers, H.R.,1974. General Meteorology, 4th edition, McGraw Hill, New York.
- Critchfield, H. J., 1987. General Climatology, Prentice-Hall of India, New Delhi.
- Das, P.K., 1995. Monsoons, National Book Trust, New Delhi.
- Huntington, E. and Visser, S.S., 1922. Climatic Changes; Their Nature and Causes, Yale University Press, New Haven.
- Lal, D. S., 1993. Climatology, 3rd edition, Chaitanya Pub. House, New Delhi.
- Lutgens, F. K., Tarbuck, E. J. and Tasa, D., 2009. The Atmosphere: An Introduction to Meteorology, Prentice-Hall, Englewood Cliffs, New Jersey.
- Oliver, J. E. and Hidore, J. J., 2002. Climatology: An Atmospheric Science, Pearson Education, New Delhi.
- Trewartha, G. T. and Horne L. H., 1980. An Introduction to Climate, 5th edition, McGraw Hill Higher Education, New York.

SEMESTER-I

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-103	Soil and Biogeography	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Soil forming processes with reference to podsolisation, laterisation and calcification

Unit-2: Soil system, soil taxonomy and world pattern of soils

Unit-3: Soil nutrients

Unit-4: Soil organisms

Unit-5: Soil degradation and soil conservation

Unit-6: Concept of integrated management of soil

Unit-7: Plant ecology: concept of adaptation, succession and climax

Unit-8: Dispersal and migration of animals: means and barriers

Unit-9: Ecological footprint

Unit-10: Biodiversity: issues and challenges

Unit-11: International Biological Programme; Man and Biosphere Programme

Unit-12: Wildlife conservation and management: sanctuaries, national parks and biosphere reserves with reference to India

Mode of Internal Evaluation: Class test

References:

- Biswas, T.D., and Mukherjee, S.K., 1997. Textbook of Soil Science. Tata McGraw Hill, New Delhi.
- Brady, N.C. and Weil, R.R., 1996. The Nature and Properties of Soil, 11th edition, Longman, London.
- Chapman, J.L. and Rens, M.J., 1993. Ecology: Principle and Applications. Cambridge University Press, Cambridge.
- Floth, H.D., 1990. Fundamentals of Soil science, 8th edition, John Wiley and Sons, New York.
- Huggett, R., 1998. Fundamentals of Biogeography, Routledge, London.
- Kormondy, E.J., 1996. Concept of Ecology, 4th edition, Prentice-Hall, New Delhi.
- Morgen, R.P.C., 1995. Soil Erosion and Conservation, 2nd edition, Longman, London
- Myers, A.A., and Giller, P.S., 1998. Analytical Biogeography: an Integrated Approach to Study and Plant Distribution, Chapman and Hall, London.
- Schwab, G.O., Fangmer, D.D., and Elliot, W.L., 1996. Soil and Water Management Systems, 4th edition, John Eiley and sons Inc., New York
- Sharma, P.D., 1998. Ecology and Environment, 7th edition, Rastogi Publications, Meerut.
- Shukla, R.S. and Chandel, P.S., 1994. Plant Ecology, 8th edition, S. Chand and Company Ltd., New Delhi.
- Singh, R.B. (eds.), 2009. Biogeography and Biodiversity. Rawat Publication, Jaipur.
- Weaver, J.E. and Clements F.E., 1983. Plant Ecology, 2nd edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

SEMESTER-I

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-104	Geographical Thought	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Contributions of Greek, Roman, Indian scholars during the ancient period and Arab scholars during the medieval period

Unit-2: Contributions of Humboldt and Ritter in Geography

Unit-3: Social Darwinism and its importance in Geography; Morphology of cultural landscape (Carl O. Sauer)

Unit-4: Major paradigms in Geography and their shift

Unit-5: Dualism and Dichotomies in Geography: Physical and Human Geography, Regional and Systematic Geography, Ideographic and Nomothetic approach

Unit-6: Positivism and Quantitative revolution in Geography

Unit-7: System approach in Geography

Unit-8: Critical revolution in Geography; Humanistic Geography; Radical Geography; Behavioural Geography

Unit-9: Welfare Geography

Unit-10: Feminism and Feminist Geography

Unit-11: Postmodernism and Postmodern Geography

Unit-12: Subaltern studies in Geography

Mode of Internal Evaluation: Class test

References:

- Adhikari, S., 2015. Fundamentals of Geographical Thought, Orient Blackswan Pvt. Ltd., Hyderabad.
- Freeman, T.W., 1961. A Hundred Years of Geography, Aldine Transaction, New Brunswick.
- Hartshorne, R., 1939. The Nature of Geography: A Critical Survey of Current Thought in the Light of the Past, Association of American Geographers, Washington.
- Hartshorne, R., 1959. Perspective on the Nature of Geography, Association of American Geographers, Washington.
- Harvey, D., 1969. Explanation in Geography, Edward Arnold, London.
- Hussain, M., 2015. Evolution of Geographical Thought, sixth edition, Rawat Publications, Jaipur.
- Jazeel, T. and Legg, S.(eds), 2019. Subaltern Geographies, University of Georgia Press, Georgia.
- Johnston, R. J., and Sidaway, J. D., 2004. Geography & Geographers: Anglo-American Human Geography since 1945, sixth edition, Arnold, London.
- Johnston, R.J., Gregory, D., Pratt, G. and Watts, M. (eds), 2000. The Dictionary of Human Geography, fourth edition, Blackwell Publishers, New Jersey.
- Peet, R., 1977. Radical Geography, Maaroufa Press, Chicago.
- Peet, R., 1998. Modern Geographical Thought, Wiley, New Jersey.
- Smith, D. M., 1977. Human geography: a welfare approach, Edward Arnold, London.
- Soja, E.W., 1989. Postmodern Geographies: The Reassertion of Space in Critical Social Theory, Verso, London.
- Moss, P.(ed), 2002. Feminist Geography in Practice: Research and Methods, Wiley-Blackwell, New Jersey.

SEMESTER-I

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/P-105	Morphometric Analysis and Surveying	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75

Unit-1: Principle of SOI topographical map numbering systems: old and open series

Unit-2: Profile drawing and analysis: serial, superimposed, projected and composite, longitudinal or valley thalweg

Unit-3: Interpretation: structure, relief, drainage, vegetation, transport and settlement from topographical maps (Plateau and Plain)

Unit-4: Application of fluvial morphometric techniques on drainage basins demarcated on the topographical map-
Linear aspect

Unit-5: Application of fluvial morphometric techniques on drainage basins demarcated on the topographical map-
Aerial aspect

Unit-6: Application of fluvial morphometric techniques on drainage basins demarcated on the topographical map-
Relief aspect

Unit-7: Slope analysis (Wentworth)

Unit-8: Nearest Neighbour Analysis of settlement distribution

Unit-9: Introduction to surveying and levelling

Unit-10: Determination of distance by Transit Theodolite

Unit-11: Determination of height by Transit Theodolite (level ground base accessible case, base inaccessible case)

Unit-12: Survey using GNSS; Principles of Total Station survey

Mode of Internal Evaluation: Continuous assessment based on class performance

References:

- Kochher, C.I., 1993. A Text Book of Surveying, S.K. Katariya and Sons, Delhi.
- Roy, S.K., 2010. Fundamentals of Surveying, 2nd edition, PHI Learning Pvt. Ltd., New Delhi.
- Sarkar, A., 1997. Practical Geography: A Systematic Approach, Orient Longman Ltd., Hyderabad.
- Sen, P.K., 1993. Geomorphological Analysis of Drainage Basins: An Introduction to Morphometry and Hydrological Parameters, The University of Burdwan, Bardhaman.
- Singh, R.L. and Singh, R.P.B., 1991. Elements of Practical Geography, Kalyani Pub., New Delhi.
- Strahler, A. and Strahler, A., 2007. Physical Geography, 2nd edition, John Wily & Sons, Inc., New Jersey.
- Zavoianu, I., 1985. Morphometry of Drainage Basins, Developments in Water Science, Elsevier Science Ltd., Amsterdam.

SEMESTER-I

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/AECC/P-106	Perception Survey	Practical	5	20 (Report Writing = 15; Viva Voce = 5)	2	25

- Each student will prepare an individual Perception Survey Report based on primary survey related to the following broad areas:
 - i) Physical Environmental Issues
 - ii) Socio-cultural Environmental issues
- Perception Survey Report should not exceed 5000 words.

Mode of Internal Evaluation: Continuous assessment based on class performance

References:

- Cloke, P., Cook, I., Crang, P., Goodwin, Painter, J. and Philo, C., 2004. Practising Human Geography, Sage Publication Ltd., London.
- Ingold, T., 2022. The Perception of the Environment: Essays on Livelihood, Dwelling and Skill, Routledge, Oxon.
- Lavrakas, P. L.(ed), 2008. Encyclopedia of Survey Research Methods, Sage Publication, Inc., California.
- Tuan, Y.F., 1990. Topophilia: A Study of Environmental Perception, Attitudes, and Values, Cambridge University Press, Cambridge.
- UNESCO, 1978. Guidelines for Field Studies in Environmental Perception, The United Nations Educational, Scientific and Cultural Organization, Paris.

SEMESTER-II

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-207	Population and Settlement Geography	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Changing scope and approaches to Population Geography; Population Geography as distinct from Demography

Unit-2: Sources of population data

Unit-3: Theories of population growth: Malthusian, Marxian, Neo-Malthusian

Unit-4: Factors controlling fertility, mortality and migration

Unit-5: Demographic Transition Model; Stable Population Growth and Equilibrium Population

Unit-6: Population policies – Pro and Anti Natal, Comparative study of population policies between India and China

Unit-7: Concept of Ekistics; Study on settlement hierarchies

Unit-8: Theories and models of settlement study: Central Place Theory, Rank-size Rule and concept of Primacy

Unit-9: Census categories of settlements in India; Rural-urban dichotomy and interaction

Unit-10: Types, pattern and segregation of rural settlements in India

Unit-11: Urbanization in India as multi-dimensional process; Urban Renewal in Indian context

Unit-12: Megalopolis and Ecumenopolis; Urban Green Space

Mode of Internal Evaluation: Class test

References:

- Barrett, H. R., 1995. Population Geography, Oliver and Boyd, Edinburgh.
- Chandana, R.C. and Sidhu, M.S., 1996. Geography of Population: Concepts Determinants and Pattern, Kalyani Publishers, New Delhi.
- Chisholm, M., 1967. Rural Settlement and Land use, John Wiley, New York.
- Clarke J. I., 1965. Population Geography, Pergamon Press, Oxford.
- Doniel, P. and Hopkinson, M., 1986. The Geography of Settlement, Oliver & Boyd, Edinburgh.
- Garnier J.B., 1978. Geography of Population, Longman, London.
- Hassan, M.I., 2005. Population Geography, Rawat Publications, Jaipur.
- Hudson, F.S., 1976. A Geography of Settlements, Macdonald and Evans, New York.
- Jones, H. R., 2000. Population Geography, 3rd edition, Paul Chapman, London.
- Pacione M.(ed), 1986. Population Geography: Progress & Prospect, Routledge, London.
- Singh, R.Y., 2002. Geography of Settlements, Rawat Publications, Jaipur.

SEMESTER-II

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-208	Research Methodology	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Spectrum of Geographical Research and its approaches: Inductive and Deductive

Unit-2: Perspectives of Geographical Research: Objective and Subjective

Unit-3: Methodological orientation: Quantitative and Qualitative

Unit-4: Literature Review and identification of Research Gap

Unit-5: Identification of Research Problem

Unit-6: Preparation of Survey Questionnaire and Schedule

Unit-7: Formulation of Research Questions and Hypothesis Building

Unit-8: Methods of Sampling; Sample Size and Sample Design

Unit-9: Methods of data collection, acquisition and treatment of data

Unit-10: Research Ethics with special reference to Plagiarism

Unit-11: Abstract, Summary and Synopsis: their differences

Unit-12: Referencing style and preparation of Bibliography

Mode of Internal Evaluation: Preparation of Reference and Bibliography on any field of Geographical research

References:

- Ahuja, R., 2001. Research Methods, Rawat Publications, Jaipur.
- Das, D. K. L, 2000. Practice of Social Research, Rawat Publications, Jaipur.
- Ford, E.D., 2000. Scientific Method for Ecological Research, Cambridge University Press, Cambridge.
- Gibaldi, J. and Ahtert, W. S.,1989. MLA handbook for writers of research papers, Affiliated East West Press Pvt. Ltd., New Delhi.
- Harper, C., and Marcus, R., 2007. Research for Development: A practical Guide, Vistaar Publication, New Delhi.
- Kothari, C. R., 2019. Research Methodology: Methods and Techniques, 4th edition, New Age International Publishers, New Delhi.
- Kothari, C.R., 2013: Quantitative Techniques, Vikas Publishing House, Noida.
- Montello, D.R. and Sutton, P.C., 2013. An Introduction to Scientific Research Methods in Geography & Environmental Studies, sage Publication Ltd., London.
- Robinson, G.M., 1998. Methods and Techniques in Human Geography, John Wiley and Sons Ltd., New Jersey.
- Singh, K., 2007. Quantitative Social Research Methods, Sage Publication, New Delhi.
- Somekh, B., and Lewin, C., 2005. Research Methods in the Social Science, Vistaar, New Delhi.

SEMESTER-II

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-209	Cartography and Geoinformatics	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Cartography and Geoinformatics: nature and scope

Unit-2: Concept of Geoid

Unit-3: Spheroids with special reference to Everest and WGS-84

Unit-4: Principles and properties of UTM Projection

Unit-5: Nature of EMR, EMS, and interaction with atmosphere and surface materials

Unit-6: Resolution of satellite data: types and significance

Unit-7: Remote Sensing Platforms and Sensors: Landsat, IRS and Sentinel series

Unit-8: Digital Image Processing – Radiometric correction, Georeferencing and mosaicking

Unit-9: FCC preparation and Image Classification

Unit-10: Digital Elevation Model: types and sources

Unit-11: Analytical Modelling in GIS, GNSS-GIS integration

Unit-12: Concept of bigdata, machine learning and deep learning

Mode of Internal Evaluation: Class test

References:

- Joseph, G., 2005. Fundamentals of Remote Sensing, Universities Press (India) Pvt. Ltd., Hyderabad.
- Lillesand, T.M., Kiefer, R.W., and Chipman, J.W., 2017. Remote Sensing and Image Interpretation, 6th edition, Wiley India Pvt. Ltd., New Delhi.
- Nag P. and Kudra, M., 1998. Digital Remote Sensing, Concept, New Delhi.
- Panda, B.C., 2005. Remote Sensing: Principles and Applications, Viva Books Pvt. Ltd., New Delhi.
- Rees, W. G., 2001. Physical Principles of Remote Sensing, Cambridge University Press, Cambridge.
- Richards, J.A. 2012. Remote Sensing Digital Image Analysis: An Introduction, 5th Edition, Springer, Berlin.

SEMESTER-II

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/P-210	Remote Sensing and GIS	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75

Unit-1: Basics of principles of visual interpretation of satellite images

Unit-2: Visual image interpretation: identification and delineation of physical features and cultural features from satellite images

Unit-3: Radiometric correction of satellite data

Unit-4: Georeferencing of maps and images

Unit-5: Preparation of Standard and Non-Standard FCC

Unit-6: Identification of landuse and landcover using digital numbers

Unit 7: Image classification (un-supervised and supervised)

Unit-8: Features digitization from maps and images

Unit-9: Analysis of relief characteristics using digital elevation model – relief; slope; aspect; contour

Unit-10: Extraction of drainage from DEM

Unit-11: Calculation of indices: NDVI and NDWI

Unit 12: Integration of spatial and non-spatial data and preparation of thematic maps using software

Mode of Internal Evaluation: Continuous assessment based on class/laboratory performance

References:

- Campbell J. B., 2007. Introduction to Remote Sensing, 4th edition, Guildford Press, New York.
- Chuvieco, E., 2020. Fundamentals of Satellite Remote Sensing: An Environmental Approach, 3rd edition, CRC Press, Taylor & Francis Group, Florida.
- Green, K., Congalton, R.G. and Tukman, M., 2017. Imagery and GIS: Best Practices for Extracting Information from Imagery, Esri Press, California.
- Jensen J. R., 2004. Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall, New Jersey.
- Lillesand, T.M., Kiefer, R.W., and Chipman, J.W., 2017. Remote Sensing and Image Interpretation, 6th edition, Wiley India Pvt. Ltd., New Delhi.
- Richards, J.A. 2012. Remote Sensing Digital Image Analysis: An Introduction, 5th Edition, Springer, Berlin.
- Sabins, F.F., 1996. Remote Sensing: Principles and Interpretation, 3rd edition, W.H.Freeman & Co Ltd., New York.

SEMESTER-II

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/P-211	Project using Remote Sensing and GIS	Practical	5	20 (Project Report Writing = 15+ Viva Voce = 5)	2	25

- Each student will prepare an individual Project using Remote Sensing and GIS techniques following broad areas:
 - i) Physical Environment
 - ii) Socio-cultural Environment
- Individual Project Report should not exceed 5000 words.

Mode of Internal Evaluation: Continuous assessment based on class/laboratory performance

References:

- Albert, D.P., 2012. Geospatial Technologies and Advancing Geographic Decision Making: Issues and Trends, Information Science Reference, IGI Global, Hershey.
- Campbell J. B., 2007. Introduction to Remote Sensing, 4th edition, Guildford Press, New York.
- Chuvieco, E., 2020. Fundamentals of Satellite Remote Sensing: An Environmental Approach, 3rd edition, CRC Press, Taylor & Francis Group, Florida.
- Green, K., Congalton, R.G. and Tukman, M., 2017. Imagery and GIS: Best Practices for Extracting Information from Imagery, Esri Press, California.
- Jensen J. R., 2004. Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall, New Jersey.
- Lillesand, T.M., Kiefer, R.W., and Chipman, J.W., 2017. Remote Sensing and Image Interpretation, 6th edition, Wiley India Pvt. Ltd., New Delhi.
- Richards, J.A. 2012. Remote Sensing Digital Image Analysis: An Introduction, 5th Edition, Springer, Berlin.
- Sabins, F.F., 1996. Remote Sensing: Principles and Interpretation, 3rd edition, W.H.Freeman & Co Ltd., New York.

SEMESTER-II

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/GEC/T-212	Elements of Geography (Open Course)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Layering of the earth with special reference to crust

Unit-2: Fluvial processes and landforms

Unit-3: Indian Monsoon

Unit-4: Soil Profile development; physical and chemical properties of soil

Unit-5: Factors of population growth; Types of migration

Unit-6: Rural and urban settlements and its classification

Unit-7: Major economic activities- primary, secondary and tertiary

Unit-8: Types of agriculture

Unit-9: Indian industries: Iron and Steel and Tourism

Unit-10: Crisis, conservation and management of resource; Sustainable development

Unit-11: Concept and types of scale and map; Land survey instruments and their uses

Unit-12: Concept and classification of hazards; Natural hazards in West Bengal: Flood and Landslide

Mode of Internal Evaluation: Class test

References:

- Alexander, J. W., 1963. Economic Geography, Prentice-Hall Inc., Englewood Cliffs, New Jersey.
- Basak, N.N., 2008. Surveying and Levelling, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
- Chandana, R.C. and Sidhu, M.S., 1996. Geography of Population: Concepts Determinants and Patterns, Kalyani Publishers, New Delhi.
- Chorley, R.J. and Kennedy, B.A., 1971. Physical Geography: A Systems Approach, Prentice Hall, Upper Saddle River, New Jersey.
- Das, P.K., 1995. Monsoons, National Book Trust, New Delhi.
- Harvey, A., 2012. Introducing Geomorphology: A Guide to Landforms and Processes, Dunedin Academic Press, Edinburgh.
- Mandal, R.B., 1982. Land Utilization: Theory and Practice, Concept Pub. Co., New Delhi.
- Mishra, A., 2012. New Dimensions of Disaster Management in India: Perspectives, Approaches and Strategies (Set of 2 Volumes), Serials Publications, New Delhi.
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- Singh, J., and Dhillon, S.S., 1984. Agricultural Geography, Tata McGraw-Hill, New Delhi.
- Singh, R.L. and Singh, R.P.B., 1991. Elements of Practical Geography, Kalyani Pub., New Delhi.
- Singh, R.Y., 2002. Geography of Settlements, Rawat Publications, Jaipur.
- Valentine, G., 2001. Social Geographies: Space and Society, Routledge, London.

SEMESTER-III						
Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC /T-313	Social Geography, Cultural Geography and Economic Geography	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Development of Social Geography; Concept of human ecology; Concept of space: Place, space and locale,</p> <p>Unit-2: Society: Elements, structure and processes; Social exclusion and inclusion</p> <p>Unit-3: Geography of inequality: race, ethnicity, gender and caste; Ethno-ecology of PVTGs in India</p> <p>Unit-4: Welfare Geography: Social well-being, HDI, GEM</p> <p>Unit-5: Development of Cultural Geography; Concept of cultural ecology</p> <p>Unit-6: Mosaic of culture, language, religion and customs</p> <p>Unit-7: Role of technology for the evolution of culture; Cultural landscape; Cultural diffusion</p> <p>Unit-8: Migration and Diaspora; Indian Diaspora in USA</p> <p>Unit-9: Concept of agricultural region, Changing perspective of Agriculture; Concept of industrial region, Changing perspective of Industry</p> <p>Unit-10: Theories and Models of spatial interaction (E. Ullman and M.E.Hurst)</p> <p>Unit-11: WTO in international trade; Role of GATT in LPG Economy and its impact on Industry and trade; Forward trading and E-commerce</p> <p>Unit-12: From Export Processing Zone to Special Economic Zone; Exclusive Economic Zone</p>						
Mode of Internal Evaluation: Seminar Presentation any aspect of Social /Cultural/Economic Geography						

References:

- Ahmed A., 1999. Social Geography, Rawat Publications, Jaipur.
- Alexander J. W., 1963. Economic Geography, Prentice-Hall Inc., New Jersey.
- Bagchi-Sen, S. and Smith, H. L., 2006. Economic Geography: Past, Present and Future, Routledge, London.
- Bjelland, M.D., Montello, D.R., Fellmann, J.D., Getis, A. and Getis, J., 2013. Human Geography: Landscapes of Human Activities, 12th edition, McGraw-Hill Education, New York.
- Cater J. and Jones T., 1995. Social Geography: An Introduction to Contemporary Issues, John Wiley & Sons, New Jersey.
- Dohrs, F.E. and Sommers, L.M., 1967. Cultural Geography, Thomas Y Crowell Company, New York.
- Jones, E. and Eyles, J., 1977. An Introduction to Social Geography, Oxford University Press, Oxford.
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- Mitchell, D. 2000. Cultural Geography: A Critical Introduction, Wiley-Blackwell, New Jersey.
- Panelli R., 2004. Social Geographies: From Difference to Action, Sage Publications Ltd., London.
- Rachel, P., Barke, M., Fuller, D., Gough, J., MacFarlane, R. and Mowl, G., 2014. Introducing Social Geographies, Routledge, Oxon.
- Shafi, M., 2006. Agricultural Geography, Dorling Kindersly (India) Pvt. Ltd., Licensees of Pearson Education in South Asia. New Delhi.
- Smith D. M., 1977. Human geography: A Welfare Approach, Edward Arnold, London.
- Valentine, G., 2001. Social Geographies: Space and Society, Routledge, London.
- VanGrasstek, C., 2013. The history and future of the World Trade Organization, Geneva.
- Wheeler, J.O., Muller, P.O., Thrall, G.I. and Fik, T.J., 1998. Economic Geography, John Wiley & Sons, New Jersey.

SEMESTER-III

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva-Voce	Credit	Marks
GEO/CC /T-314	Political Geography and Historical Geography	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Basic perspective of Political Geography; Geographical perspectives on formation of State; Concept of frontiers and boundaries

Unit-2: Concept of State after Ratzel and Marx

Unit-3: Colonialism, Imperialism and Federalism; Core-periphery concept

Unit-4: Politico-economic blocs: SAARC, EU and BRICS

Unit-5: Concept of Geopolitics; Geopolitical significance of international water disputes: India and its neighbouring countries; Geopolitics of petroleum

Unit-6: Concept of Electoral Geography; Approaches to the study of electoral politics: Spatial and ethnic behavioural approaches

Unit-7: Scope and content of Historical Geography; Historical Geography and Historiography

Unit-8: Ancient period: Territorial organization of JANAPADAS in India

Unit-9: Agriculture, industry, trade and urbanization under the Mughal Empire

Unit-10: Plantation farming and textile industry during Colonial India

Unit-11: Post- colonial urbanization in India

Unit-12: Partition of India and linguistic formation of state; Deterritorialisation for the formation of new provinces in India in the new millennium

Mode of Internal Evaluation: Class test

References:

- Adhikari, S., (2002). Political Geography, Rawat Publications, Jaipur.
- Agnew, J.A., 1997. Political Geography: A Reader, Arnold, London.
- Ahmad, A., 2002. Social Geography, Rawat Publications, New Delhi.
- Ahmad, A., 2012. Social Geography of India, Concept Publishing Company, New Delhi.
- Baker, A.R.H., 2003. Geography and History: Bridging the Divide, Cambridge University Press, Cambridge.
- Cox, K.R., 2002. Political Geography: Territory, State, and Society, Blackwell Publishers, Oxford.
- Kumar, D. and Desai, M.(eds), 1983. The Cambridge Economic History of India, Vol. 2, Cambridge University Press, Cambridge.
- Norton, W., 1984. Historical analysis in geography, Longman, London.
- Pounds, N.J.G., 1963. Political Geography, McGraw-Hill, New York.
- Raychaudhuri, T. and Habib, I. (eds), 1982. The Cambridge Economic History of India, Vol. 1, Cambridge University Press, Cambridge.

SEMESTER-III

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/CC/T-315	Geography of Hazards and Disasters	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Concept and types of hazards and disasters</p> <p>Unit-2: Assessment of risk and vulnerability</p> <p>Unit-3: Concept of hazard reduction and disaster management</p> <p>Unit-4: Climatic hazards: Tropical cyclones (prediction, precaution and mitigation)</p> <p>Unit-5: Marine hazard: Tsunami (prediction, precaution and mitigation)</p> <p>Unit-6: Hydrological hazards: Flash floods in Himalayan Region and floods in southern part of West Bengal</p> <p>Unit-7: Mountain hazards: Landslide and avalanche</p> <p>Unit-8: Nuclear hazards and Radio-active contamination</p> <p>Unit-9: Plastic hazards</p> <p>Unit-10: Arsenic contaminations in Deltaic Bengal</p> <p>Unit-11: Fluoride contaminations in western part of West Bengal</p> <p>Unit-12: Role of National Disaster Mitigation Agency for management of hazards and disasters</p>						
Mode of Internal Evaluation: Class test						

References:

- Alexander, D., 1993. Natural Disasters, ULC Press Ltd., London.
- Collins, L.R., and Schneid, T.D., 2000. Disaster Management and Preparedness, Taylor and Francis, Florida.
- Edwards, B., 2005. Natural Hazards, Cambridge University Press, Cambridge.
- Gupta, H.K., 2010. Disaster Management, Universities Press India, Hyderabad.
- Kapur, A., 2010. Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.
- Modh, S., 2010. Managing Natural Disaster: Hydrological, Marine and Geological Disasters. Macmillan, New Delhi.
- Singh, J., 2007. Disaster Management, Future Challenges and Opportunities, I.K. International Pvt. Ltd., New Delhi.
- Singh, R.B., 2005. Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi.
- Singh, R.B., 2006. Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, Jaipur.
- Sinha, A., 2001. Disaster Management: Lessons Drawn and Strategies for Future, New United Press, New Delhi.
- Smith, K., 2011. Natural Hazards, Routledge, London
- Stoltman, J.P. et al., 2004. International Perspectives on Natural Disasters, Kluwer Academic Publications, Dordrecht.

SEMESTER-III

Paper Code	Paper	Theory/ Practical	Internal Assessment / Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/AG/ T-316	Agricultural Geography-I: BASIC CONCEPT IN AGRICULTURAL GEOGRAPHY (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50

Unit-1: Nature, scope and significance of Agricultural Geography

Unit-2: Approaches to the study of Agricultural Geography: regional and systematic

Unit-3: Determinants of agricultural profile: physical and non-physical determinants

Unit-4: Concept of sustainable agriculture

Unit-5: Concept of integrated farming systems

Unit-6: Significance of mixed farming

Unit-7: Concept of organic farming and dry farming

Unit-8: Agricultural region: concept and evolution

Unit-9: Techniques and methods of agricultural regionalization

Unit-10: Agricultural systems of the world after Whittlesey

Unit-11: Models in agriculture: von Thunen's Model

Unit-12: Concept of precision farming

Mode of Internal Evaluation: Research proposal on any aspect of Agricultural Geography

References:

- Andrae, B., 1981. Farming, Development and Space: A World Agricultural Geography, De Gruyter, Berlin.
- Burger, A., 1994. The Agriculture of the World, Aldershot, Avebury.
- Chandran, S., Unni, M.R. and Thomas, S. (eds), 2019. Organic Farming: Global Perspectives and Methods, Woodhead Publishing, Cambridge.
- Grigg, D. B., 1974. The Agricultural Systems of the World: An Evolutionary Approach, Cambridge University Press, Cambridge.
- Grigg, D., 1995. An Introduction to Agricultural Geography, 2nd edition, Routledge, London.
- Morgan, W. B., and Munton, R. J. C., 1971. Agricultural Geography, Methuen, London.
- Shafi, M., 2006. Agricultural Geography, Dorling Kindersly (India) Pvt. Ltd., New Delhi.
- Singh, J., and Dhillon, S.S., 1984. Agricultural Geography, Tata McGraw-Hill, New Delhi.
- Srinivasan, A.(ed), 2006. Handbook of Precision Agriculture: Principles and Applications, Haworth Press, Binghamton.
- Symons, L., 1979. Agricultural Geography, Westview Press, Boulder, Colorado.
- Tarrant, J. R., 1973. Agricultural Geography, David & Charles, Devon.
- Walia, S.S. and Walia, U.S., 2020. Farming System and Sustainable Agriculture, Scientific Publishers (India), Jodhpur.
- Zaman, A., 2019. Integrated Farming System & Agricultural Sustainability, New India Publishing Agency, New Delhi.

SEMESTER-III						
Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/EG/ T-316	Environmental Geography-I: BASIC CONCEPT (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Environmental studies and Environmental Geography; Nature, scope and content of Environmental Geography</p> <p>Unit-2: Ecosystem approach in Environmental studies</p> <p>Unit-3: Structure and function of Ecosystem</p> <p>Unit-4: Fundamental principles of natural ecology; Principles of human ecology</p> <p>Unit-5: Concept of environmental system, Environmental balance and Environmental degradation</p> <p>Unit-6: Carrying capacity of the environment</p> <p>Unit-7: Bio-geo-chemical cycles: types and significance</p> <p>Unit-8: Energy flow and balance of energy in the biosphere</p> <p>Unit-9: Stationary state economy and equilibrium population</p> <p>Unit-10: Environmentalism in Geography</p> <p>Unit-11: Approaches to the study of environment: Reductionist, Holistic and Organismic</p> <p>Unit-12: Environmental philosophy: Spaceship earth, Deep ecology and Gaia-hypothesis</p> <p>Mode of Internal Evaluation: Research proposal on any aspect of Environmental Geography</p>						

References:

- Bharucha, E., 2008. Textbook of Environmental Studies, Universities Press India, Hyderabad.
- Chandna, R. C., 2002. Environmental Geography, Kalyani Publishers, Ludhiana.
- Chiras, D.D., 2010. Environmental Science, 1st Indian edition, Jones and Bartlett India, New Delhi.
- Cunningham, W. P. and Cunningham, M. A., 2004. Principals of Environmental Science: Inquiry and Applications, Tata Macgraw Hill, New Delhi.
- Dash, M.C., 2001. Fundamentals of Ecology, 2nd edition, Tata McGraw-Hill, New Delhi.
- Goudie, A., 2001. The Nature of the Environment, Blackwell, Oxford.
- Miller, G. T., 2004. Environmental Science: Working with the Earth, Thomson Brooks Cole, Singapore.
- Odum, E. P. and Barrett, G.W., 2005. Fundamentals of Ecology, Cengage Learning India.
- Singh S., 2020. Environmental Geography, Pravalika Publications, Allahabad.
- White, I.D., Mottershead, D.N. and Harrison, S.J., 1984. Environmental Systems: An Introductory Text, George Allen and Unwin Ltd., London.

SEMESTER-III

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/DSE/UG /T-316	Urban Geography-I: BACKGROUND AND BASIC CONCEPTS (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Emergence of Urban Geography as a discipline: changing approaches and methodological foundations</p> <p>Unit-2: Concept of urban</p> <p>Unit-3: Concept of urbanism and urbanization</p> <p>Unit-4: History of urbanization in India: Mughal and Colonial period</p> <p>Unit-5: Patterns and process of urbanization in Independent India</p> <p>Unit-6: Origin and classification of urban Settlements: Mumford, J.M. Houston, G.Taylor, C.D. Haris and Nelson</p> <p>Unit-7: Concepts of urban region: Metropolis, Megalopolis, Ecumenopolis, Conurbation, City region</p> <p>Unit-8: Concepts of Megacity, Sister Towns, Edge Cities</p> <p>Unit-9: Concepts of Planned Towns, New Towns, Satellite Towns, Green/ Garden Cities,</p> <p>Unit-10: Changing urban forms: Urban corridor, rural-urban fringe, urban sprawl, counter-urbanization</p> <p>Unit-11: Urban as a system: City-size distribution (Zipf and Berry) and urban primacy</p> <p>Unit-12: Concept of urban-rural continuum</p> <p>Mode of Internal Evaluation: Research proposal on any aspect of Urban Geography</p>						

References:

- Carter, H., 1981. The study of Urban Geography, Arnold-Heinemann.
- Dickinson, R.E., 1964. City and region, Rutledge, London.
- Fyfe, N. R. and Kenny, J. T., 2005. The Urban Geography Reader, Routledge.
- Hall T., 2006. Urban Geography, Taylor and Francis.
- Kaplan, D. H., Wheeler, J. O. and Holloway, S. R., 2008. Urban Geography, John Wiley.
- Knox, P. L. and McCarthy, L., 2005. Urbanization: An Introduction to Urban Geography, Pearson Prentice Hall, New York.
- Mumford, L. 1961. The City in History, Harcourt Brace World, New York.
- Pacione, M., 2009. Urban Geography: A Global Perspective, Taylor and Francis.

SEMESTER-III						
Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva-Voce	Credit	Marks
GEO/DS E/FG/T-316	Fluvial Geomorphology-I: MECHANISM OF FLUVIAL PROCESSES (Special Paper)	Theory	10	40 (Semester-end Examination)	4	50
<p>Unit-1: Scope, nature and significance of fluvial geomorphology; Scales in Fluvial geomorphology</p> <p>Unit-2: Fluvial system: Components, input output, Variables of fluvial system: internal and external, adjustable and controlling factors</p> <p>Unit-3: Linear, Areal and Altitudinal properties of drainage basin; Law of stream number and stream length, law of basin area;</p> <p>Unit-4: Hydraulics of channel flow: Stream Energy; Types of flow; type of links, number of links</p> <p>Unit-5: River velocity, factors and its distribution in open channels; Flow resistance, Chézy's and Manning's equation</p> <p>Unit-6: Channel initiation and Evolution of channel pattern, importance of headward extension and branching, lateral expansion</p> <p>Unit-7: Classification of natural streams by D. L. Rosgen</p> <p>Unit-8: Erosion: threshold of erosion, processes of erosion, river bank erosion</p> <p>Unit-9: Transportation: processes of entrainment, bedload transport dynamics; Channel competence</p> <p>Unit-10: Deposition: factors controlling deposition, depositions along the channel and across the channel</p> <p>Unit-11: Sediment deposits: nature and characteristics, flood plain and deltaic plain deposits</p> <p>Unit-12: Fluvial processes and forms</p>						
Mode of Internal Evaluation: Research proposal on any aspect of Fluvial Geomorphology						

References:

- Bloom, A.L., 1998. Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, 3rd edition, Prentice Hall of India, New Delhi.
- Charlton, R., 2016. Fundamentals of Fluvial Geomorphology, 2nd edition, Routledge, London.
- Kale, V.S, Gupta, A., 2001. Introduction to Geomorphology, Orient Longman, Hyderabad.
- 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.

SEMESTER-III						
Paper Code	Paper	Theory/ Practical	Internal Assessment / Evaluation	Examination/ Report/ Viva-Voce	Credit	Marks
GEO/CC/P- 317	Quantitative Techniques in Geography	Practical	15	60 (Semester-end Examination = 50; Laboratory Note Book + Viva Voce = 5+5=10)	6	75
<p>Unit-1: Sample size, Sampling techniques for geographical analysis Unit-2: Concept of Probability and Normal Probability Distribution Unit-3: Skewness and Kurtosis Unit-4: Hypothesis Testing: Parametric test: t-test, z-test Unit-5: Hypothesis Testing: Non Parametric test: Chi-square test Unit-6: Basic Matrix Algebra Unit-7: Bivariate Regression Analysis: linear and exponential Unit-8: Correlation: Pearson's Product-Moment Correlation; Spearman's Rank Correlation Unit-9: Location of Mean Centre of population and shift over time Unit-10: Location Quotient, Unit-11: Lorentz Curve Unit-12: Shortest path analysis by Shimbel Index</p>						
Mode of Internal Evaluation: Class test						

References:

- Alvi, Z. 2002. Statistical Geography: Methods & Applications, Rawat Publications, Jaipur.
- Dadson, S.J., 2017. Statistical Analysis of Geographical Data: An Introduction, John Wiley & Sons Ltd., Sussex.
- Mahmood, A., 1999. Statistical Methods in Geographical Studies, Rajesh Publications, Delhi.
- McCarroll, D. 2017. Simple Statistical Tests for Geography, CRC Press, Taylor & Francis Group, Florida.
- Pal, S.K., 1998. Statistics for Geoscientists: Techniques and Applications, Concept publishing Company, New Delhi.
- Robinson, G.M., 1998: Methods and Techniques in Human Geography, John Wiley & Sons Ltd., New Jersey.
- Rogerson, P., 2001. Statistical Methods for Geography, Sage Publications Ltd., London.
- Silk, J., 1979. Statistical Concepts in Geography, George Allen & Unwin, London.
- Walford, N., 1995. Geographical Data Analysis, John Wiley & Sons, Chichester.

SEMESTER-III

Paper Code	Paper	Theory/ Practical	Internal Assessment/ Evaluation	Examination/ Report/ Viva- Voce	Credit	Marks
GEO/SEC/P-318	Field Report	Practical	5	20 (Field Report = 15; Viva Voce = 5)	2	25
<ul style="list-style-type: none"> Each student will prepare an individual Field Report following broad areas: Physical, socio-cultural, politico-economic issues Students are required to carry out a comprehensive field work in a village/mouza/town/C.D.Block/ drainage basin selecting a particular research problem. There should be a clear-cut Problem, background, Objectives, Methodology and Major Findings. The text of the fieldwork should not exceed 5000 words and 15-20 pages of illustrations (A4 Pages). 						
Mode of Internal Evaluation: Continuous assessment during field survey						

References:

- Albert, D.P., 2012. Geospatial Technologies and Advancing Geographic Decision Making: Issues and Trends, Information Science Reference, IGI Global, Hershey.
- Kothari, C. R., 2019. Research Methodology: Methods and Techniques, 4th edition, New Age International Publishers, New Delhi.
- McCarroll, D. 2017. Simple Statistical Tests for Geography, CRC Press, Taylor & Francis Group, Florida.
- Robinson, G.M., 1998: Methods and Techniques in Human Geography, John Wiley & Sons Ltd., New Jersey.
- 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/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., Ní 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> <p>Mode of Internal Evaluation: Class test</p>						

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., Bhattacharya, 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

- 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

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
<p>Unit-1: Crop calendar</p> <p>Unit-2: Ergograph</p> <p>Unit-3: Crop concentration index after Bhatia</p> <p>Unit-4: Crop productivity index after Enyedi and Shafi</p> <p>Unit-5: Crop diversification index after Simpson and Gibbs-Martin</p> <p>Unit-6: Crop combination analysis after Weaver and Rafiullah</p> <p>Unit-7: Determination of available N, P, K in soil; pH and organic carbon in soil</p> <p>Unit-8: Measurement and mapping of land capability</p> <p>Unit-9: Determination, mapping and analysis of soil nutrient indices and soil fertility</p> <p>Unit-10: Preparation and analysis of agricultural maps using RS and GIS</p> <p>Unit-11: Identification of seeds and crop plants</p> <p>Unit-12: Application of statistical software in agricultural research</p>						
<p>Mode of Internal Evaluation: Continuous assessment on performance in Agricultural Geography Laboratory and RS & GIS Laboratory.</p>						

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
<p>Unit-1: Identification and study of an environmental problem in field; Environmental rating</p> <p>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</p> <p>Unit-3: Floral species survey using grid method</p> <p>Unit-4: Cartographic presentation of primary/secondary data and collation of environmental maps</p> <p>Unit-5: Preparation and interpretation of environmental maps using RS and GIS</p> <p>Unit-6: Mapping of spatial and temporal variations of environmental parameters applying Geoinformatics</p> <p>Unit-7: Measurement of air pollutants</p> <p>Unit-8: Measurement of noise pollution</p> <p>Unit-9: Determination of available N, P, K in soil; pH and organic carbon in soil</p> <p>Unit-10: Determination of Acidity and Alkalinity of water; TSS and TDS in water; BOD and Total Hardness of water</p> <p>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</p> <p>Unit-12: Application of statistical software for environmental data analysis</p>						
<p>Mode of Internal Evaluation: Continuous assessment on performance in GIS Laboratory and Environmental Geography Laboratory</p>						

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.
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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:

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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:

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