# Savitribai Phule Pune University

*(Formerly University of Pune)*

**Two Year Degree Program in Geography**

**(Faculty of Science & Technology)**

Revised Syllabi for

## M.A./M.Sc. (Geography) Part-I

**(For Colleges Affiliated to Savitribai Phule Pune University)**

**Choice Based Credit System Syllabus**

**To be implemented from Academic Year 2019-2020**

# Title of the Course: M.A./M.Sc. (Geography)

## Preamble

Introduction:

SavitribaiPhule Pune University has decided to change the syllabi of various faculties from June,2019. Taking into consideration the rapid changes in science and technology and new approaches in different areas of Geography and related subjects, Board of Studies in Geography after a thorough discussion with the teachers of Geography from different colleges affiliated to the Savitribai Phule Pune University, Pune has prepared the syllabus of M.Sc./M. A. Semester - I and Semester- II (w.e.f. 2019-20) Geography course under the Choice Based Credit System (CBCS). The model curriculum as developed by U.G.C. is used as a guideline for the present syllabi.

Aims and Objectives of the new curriculum :

i) To maintain updated curriculum.

ii) To take care of fast development in the knowledge of Geography.

iii) To enhance the quality and standards of Geography Education.

iv) To provide a broad common frame work, for exchange, mobility and free dialogue across the Indian Geography and associated community.

v) To create and aptitude for Geography in those students who show a promise for higher studies and creative work in Geography.

vi) To create confidence in others, for equipping themselves with that part of Geography which is needed for various branches of Sciences or Humanities in which they have aptitude for higher studies and original work.

**Structure of the Syllabus :**

**Semester – I**

| Sr. No. | Course Code | Core Compulsory Theory Paper (CCTP) | Choice Based Optional Paper (CBOP) | Theory / Practical | Core Compulsory Practical Paper (CCPP) | | Credit |
|---|---|---|---|---|---|---|---|
| 1 | GGUT-111 | Principles of Geomorphology | - | - | - | | 04 |
| 2 | GGUT-112 | Principles of Climatology | - | - | - | | 04 |
| 3 | GGUT-113 | Principles of Economic Geography | - | - | - | | 04 |
| 4 | | | GGDT-114 | Principles of Population and Settlement Geography | - | | 04 |
| 5 | | | | | GGUP-115 | Practical in Physical and Human Geography | 04 |
| | | **Total Credits of Semester I** | | | | | **20** |

## Semester – II

| Sr. No. | Course Code | Core Compulsory Theory Paper (CCTP) | Choice Based Optional Paper (CBOP) | Theory / Practical | Credit | Core Compulsory Practical Paper (CCPP) | Credit |
|---|---|---|---|---|---|---|---|
| 1 | GGUT-121 | Geoinformatics - I | | | | | 04 |
| | **One of the following according to specialization from CCTP** | | | | | | |
| 2 | GGUT-122 | Coastal Geomorphology | - | - | 04 | - | 04 |
| | GGUT-123 | Synoptic Climatology | - | - | 04 | - | |
| | GGUT-124 | Agricultural Geography | - | - | 04 | - | |
| | GGUT-125 | Population Geography | - | - | 04 | - | |
| | **One of the following according to specialization from CCTP** | | | | | | |
| 3 | GGUT-126 | Fluvial Geomorphology | - | - | 04 | - | 04 |
| | GGUT-127 | Monsoon Climatology | - | - | 04 | - | |
| | GGUT-128 | Industrial Geography | - | - | 04 | - | |
| | GGUT-129 | Geography of Rural Settlements | - | - | 04 | - | |
| | **Choice Based Optional Paper ( CBOP) ( 1 Theory + 1 Practical )** | | | | | | |
| 4 | | | GGDT-130 | Geography of Tourism | 02 | | 04 |
| | | | GGDP-131 | Practical in Surveying | 02 | | |
| | | | GGDT-132 | Geography of Disaster Management | 02 | | |
| | | | GGDP-133 | Practical in Map Projections | 02 | | |
| | **Core Compulsory Practical Paper (CCPP)** | | | | | | |
| 5 | | | | | | GGUP-134 Practical of Statistical Techniques for Geography | 04 |
| | | **Total Credits of Semester - II** | | | | | **20** |

## Semester – 5

| Course Code | Core Compulsory Theory Paper (CCTP) | Choice Based Optional Paper (CBOP) | Theory / Practical | Credit | Core Compulsory Practical Paper (CCPP) | Credit |
|---|---|---|---|---|---|---|
| GGUT-231 | Geoinformatics-II | - | - | 04 | - | 04 |
| GGUT-232 | Geographical Thoughts | - | - | 04 | - | 04 |
| **One of the following according to specialization from CCTP** | | | | | | |
| GGUT-233 | Tropical Geomorphology | - | - | 04 | - | 04 |
| GGUT-234 | Applied Climatology | - | - | 04 | - | |
| GGUT-235 | Geography of Rural Development | - | - | 04 | - | |
| GGUT-236 | Urban Geography | - | - | 04 | - | |
| **Choice Based Optional Paper (CBOP) ( 1Theory + 1Practical )** | | | | | | |
| | | GGDT-237 | Practical in Geoinformatics | 02 | - | 04 |
| | | GGDP-238 | Computer -aided Cartography | 02 | | |
| | | GGDT-239 | Watershed Management | 02 | - | |
| | | GGDP-240 | Multivariate Statistics | 02 | - | |
| **One of the following according to specialization from CCPP** | | | | | | |
| | | | | GGUP-241 | Practical in Geomorphology | 04 |
| | | | | GGUP-242 | Practical in Climatology | |
| | | | | GGUP-243 | Practical in Economic Geography | |
| | | | | GGUP-244 | Practical in Population and Settlement Geography | |
| **Total Credits of Semester -III** | | | | | | **20** |

## Semester – IV

| | Core Compulsory Theory Paper (CCTP) | Choice Based Optional Paper (CBOP) | Theory / Practical | Credit | Core Compulsory Practical Paper (CCPP) | Credit |
|---|---|---|---|---|---|---|
| GGUT-241 | Geography of India | - | - | - | - | 04 |
| GGUT-242 | Oceanography | - | - | - | - | 04 |
| GGUT-243 | Biogeography | - | - | - | - | 04 |
| **Choice Based Optional Paper (CBOP) ( 1Theory + 1Practical )** | | | | | | |
| | | GGDT-244 | Geography of Soils | 02 | | 04 |
| | | GGDP-245 | Geostatistics | 02 | | |
| | | GGDT-246 | Political Geography | 02 | | |
| | | GGDP-247 | Regional Planning | 02 | | |
| | | GGDT-248 | Tourism Geography | 02 | | |
| | | GGDP-249 | Social Geography | 02 | | |
| | | GGDP-250 | Interpretation of Topographical Maps & Village Survey / Project work | 02 | | |
| **Core Compulsory Practical Paper (CCPP)** | | | | | | |
| | | | | GGUP-251 | Dissertation / Research Project | 04 |
| | | | | | **Total Credits of Semester - IV** | **20** |

# Semester I

## Course: GGUT-111:Principles of Geomorphology

**Course Outcome:**

1. Student gets acquainted with the basic concepts in Geomorphology.
2. Student understands and gets familiar with Earth system
3. Student understand the theories along with the fundamental concepts in Geomorphology. Gain knowledge about earth's interior its structure and composition. Develop an idea about concept of plate tectonics, and resultant landforms.
4. Understands the overall processes of weathering, mass movement and hill slope. Gain the knowledge of various hill slope models.
5. Understand the varied erosional depositional processes and landforms related to fluvial, coastal, glacial and aeolian processes and identify basic landforms from tectonic, fluvial, glacial, aeolian and coastal environments.

**No. of Credits: 04** **No. of Periods:**

**60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Geomorphology | i. Definitions,Nature and Scope ofGeomorphology<br>ii. History of Geomorphology<br>iii. Basic concepts in Geomorphology<br>iv. Branches of Geomorphology<br>v. Hierarchy of spatial and temporal scales in Geomorphology<br>vi. Geologic time scale | 06 |
| 2 | Geomorphology and Tectonics | i. Internal structure of the Earth:Layers based onphysical and chemical properties<br>ii. Seismic waves and types<br>iii. Wegener's Continental Drift Theory<br>iv. Theory of Plate Tectonics and associated landforms<br>v. Holmes Convectional Current Theory<br>vi. Gravity and Isostasy<br>vii. Paleomagnetism<br>viii. Folds: Types and landforms<br>ix. Faults: Types and landforms | 12 |
| 3 | Weathering and Mass Movement Processes | i. Weathering: Types and related landforms<br>ii. Mass Movement: Types of mass movement | 08 |
| 4 | Hillslopes | i. Hillslope processes and forms<br>ii. Models of hillslope evolution | 06 |

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|---|---|---|---|
| 5 | Fluvial Processes and Landforms | i. Genetic classification of streams<br>ii. Playfair's law<br>iii. River and stream, drainage basin and drainage network patterns<br>iv. River processes: erosion, transportation and deposition<br>v. Fluvial landforms: erosional and depositional<br>vi. DavisianCycle of Erosion | 10 |
| 6 | Glacial Processes andLandforms | i. Glacial system: Types of glaciers<br>ii. Glacial processes: erosion, transportation and deposition<br>iii. Glacial landforms: erosional and depositional | 06 |
| 7 | Coastal Processesand Landforms | i. Sea waves, currents and tides<br>ii. Coastal processes: erosion, transportation and deposition<br>iii. Coastal landforms: erosional and depositional | 06 |
| 8 | Aeolian Processesand Landforms | i. Aeolian environment<br>ii. Wind processes: erosion, transportation and deposition<br>iii. Aeolian landforms: erosional and depositional<br>iv. Work of water in desert and landforms | 06 |

**Reference Books:**


- **Bloom, A.L. (2012**): Geomorphology- A Systematic Analysis of Late Cenozoic Landforms, Prentice-Hall of India, New Delhi
- **Chorley, R.J., Schumm, S. A. and Sugden, D. E. (1984):** Geomorphology, Methuen, London.
- **Gregory, K.J. and Goudie, A.S. (2014):** The SAGE Handbook of Geomorphology, SAGE, London.
- **Christiansen E.H. and Hamblin, W.K. (2008):** The Earths dynamic systems Macmillan, New York and Collier Macmillan London.
- **Holmes, (1944):** Principles of Physical Geology, Thomas Nelson and Sons Ltd, London.
- **Huggett, R.J. (2008):** Fundamentals of Geomorphology, Routledge, London and New York.
- **Goudie A.S. (2004):** Encyclopedia of Geomorphology, Routledge, London and New York.
- **Kale, V.S. (2014):** Landscapes and Landforms of India, Springer, London/New York.
- **Kale, V.S. and Gupta, A. (2010):** Introduction to Geomorphology, Universities Press, Hyderabad
- **Migon, P. (2010):** Geomorphological Landscapes of the World, Springer, London/New York.
- **Ollier, C.D. (1981):** Tectonics and Landforms, Longman, London.
- **Singh, S. (2011):** Geomorphology, PrayagPustakBhawan, Allahabad.
- **Siddhartha, K. (2001):** The Earth's dynamic surface, Kisalaya, Delhi.
- **Spark, B.W. (1972):** Geomorphology, Longman, New York.
- **Steers, A. (1958):** The Unstable Earth, Methuen, London.
- **Strahler, A.H. and Strahler, A.N. (1992):** Modern Physical Geography, John Wiley, New York.

# Semester I

## Course: GGUT- 112:Principles of Climatology

**Course Outcome:**

1. Student gets acquainted with the basic concepts in Climatology
2. Understand the elements of weather and climate, different atmospheric phenomena and climate change.
3. Gain the knowledge to associate climate with other environmental and human issues.
4. Understands the concepts of Insolation and temperature

Realize the way atmospheric moisture works.

**No. of Credits: 04** **No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction toClimatology | i. Meteorology and Climatology<br>ii. Nature and Scope of Climatology<br>iii. Development of Climatology<br>iv. Tropical Climatology | 06 |
| 2 | Earth's Atmosphere | i. Evolution<br>ii. Structure and composition of atmosphere<br>iii. The ozone layer depletion<br>iv. Aurora - types | 08 |
| 3 | Insolation | i. Solar and terrestrial radiation<br>ii. Electromagnetic spectrum<br>iii. Factors affecting insolation<br>iv. Latitudinal and seasonal variation<br>v. Effect of atmosphere<br>vi. Greenhouse effect<br>vii. Heat budget<br>viii. Mechanisms of heat transfer | 10 |
| 4 | Temperature | i. Heat and temperature<br>ii. Temperature measurements and controls<br>iii. Lapse rate<br>iv. Temperature inversion<br>v. Types of inversion | 06 |

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|---|---|---|---|
| 5 | Atmospheric Pressure and Winds | i. Pressure measurement and distribution<br>ii. Factors affecting distribution of pressure<br>iii. Wind observation and measurement<br>iv. Factors affecting wind<br>v. Geostrophic wind and Gradient wind<br>vi. Models of general circulation of the atmosphere<br>vii. Eddy theory<br>viii. Local winds<br>ix. Jet stream<br>x. Cyclones and Anticyclones | 12 |
| 6 | Atmospheri cMoisture | i. Atmospheric moisture<br>ii. Hydrologic cycle<br>iii. Evaporation and condensation<br>iv. Forms of condensation<br>v. Precipitation<br>vi. Types of precipitation<br>vii. Measurement of humidity | 06 |
| 7 | Atmospheri cStability | i. Lapse Rate: normal, environmental, dry adiabatic lapse rate and wet adiabatic lapse rate<br>ii. Stable and unstable air<br>iii. Absolute stability<br>iv. Absolute instability<br>v. Conditional instability | 06 |
| 8 | Air Masses andFronts | i. Introduction to air masses and fronts<br>ii. Types of air masses<br>iii. Types of fronts | 06 |

**Reference Books:**


- **Critchfield, H.J. (Rep. 2010):** General Climatology. Prentice Hall, New Delhi.
- **Lal, D.S. (1998):** 'Climatology', Chaitanya Publishing House, Allahabad.
- **Lutgens, Frederic K. &Tarbuck, Edward J. (2010):** 'The Atmosphere: An Introduction to Meteorology', Pearson Prentice Hall, New Jersey.
- **Oliver, John E. &Hidore, John J. (2003):** Climatology: An Atmospheric Science, Pearson Education, Delhi
- **Savindra Singh (2005):** Climatology, PrayagPustakBhawan, Allahabad.
- Trewartha: Introduction to Weather and Climate.
- **More, Pagar, Thorat (2014):** (Marathi), Elements of Climatology & Oceanography, Atharv Publication, Pune

## Semester I

### Course: GGUT-113 :Principles of Economic Geography

**Course Outcome:**

1. Student gets acquainted with the basic concepts in Economic Geography.
2. Student understands and gets familiar various economic activities and understands the importance of resources.
3. Student understand the theories and models in Economic Geography.
4. Gets acquainted with role of transport and communication in the economic development.
5. Gain an insight in to the varied economic issues related to development in India and the state

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Economic Geography | i. Definition, nature and scope<br>ii. Approaches :traditional and modern<br>iii. Recent trends in Economic Geography | 06 |
| 2 | Economic Activities | i. Definition and classification of economic activities<br>ii. Factors of location of economic activities: physical, social, economic and technical<br>iii. Location of economic activities: Weber's and Von Thunen'smodel | 10 |
| 3 | Resources | i. Definition and classification of resources<br>ii. Significance of natural and human resources in economic development<br>iii. Importance of non-conventional energyresources for sustainable development | 08 |
| 4 | Economic Developme nt | i. Definition and concept of economicdevelopment<br>ii. Measures of economic development<br>iii. Classification of countries on the basis ofeconomic development<br>iv. Rostow's and Myrdal's model | 08 |
| 5 | Transport and Communicati on | i. Various modes of transport<br>ii. Geographical factors and transportation<br>iii. Various means of communication<br>iv. Role of transport and communication ineconomy | 06 |
| 6 | Trade | i. Definition and types of trade<br>ii. Factors affecting on international trade<br>iii. Problems and prospects of international tradewith reference to India<br>iv. E-commerce | 06 |

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|---|---|---|---|
| 7 | Economic Development inIndia | i. Pre-and post-independence economicdevelopment in India<br>ii. Green revolution in India<br>iii. Need of new green revolution in India<br>iv. Regional disparities in India<br>v. Impact of globalization and privatization oneconomic development | 06 |
| 8 | Contemporary Issues | i. Regional disparities in Maharashtra<br>ii. Role of IT industry in economic development in Maharashtra<br>iii. A case study of one local agro-based industry: Economic analysis, problems and prospects (Sugar factory/ winery/ agro-tourist center etc.) | 10 |

**Reference Books:**


- **Alexander, J.W. (1977):** Economic Geography, Prentice Hall of India Pvt. Ltd., New.
- **Chorley, R.J. and Haggett, P. (1970):** Socio Economic Models in Geography, Concept publishing Company Pvt. Ltd., New Delhi.
- **Garnier, B.J. and Delobez, A. (1979):** Geography of Marketing, Longman.
- Hartshorne, T.A. and Alexander, J.W. (2010): Economic Geography, PHI Learning, New Delhi
- **KananChatterjee (2015):** Basics of Economic Geography.
- **Knox, P., Agnew, J. and McCarthy, L. (2008):** The Geography of the World Economy, Hodder Arnold, London.
- **Lloyd, P. and Dicken, B. (1972):** Location in Space: A Theoretical Approach to Economic Geography, Harper and Row, New York Methuen.
- **Mitra, A. (2002):** Resource Studies, Sreedhar publishers, Kolkata.
- **Patil, S.G., Suryawanshi, R.S., Pacharne, S. and Choudhar, A.H. (2014):** Economic Geography, AtharavPrakashan, Pune.
- **Ray, P.K. (1997):** Economic Geography, New Central Book Agency (P) Ltd., Calcutta.

- **Saptarshi, P.G., More, J.C. Ugale, V.R. and Musmade, A.H. (2009**): India A Geographical Analysis Diamond, Pune.
- **Saxena, H.M. (2013):** Economic Geography, Rawat publication, Jaipur.
- **Siddhartha, K. (2000):** Economic Geography: Theories, Process and Patterns, Kisalaya Publications, New Delhi
- **Smith, D.M. (1971):** Industrial Location: An Economic Geographical Analysis, John Wiley and Sons, New York
- **Pagar, Thorat& More (2015):** Agriculture Geography, (Marathi), Atharv Publication, Pune
- **More J. (2014):** Geography & Agriculture For MPSC Examination, (Marathi), Atharv Publication, Pune


## Semester I

### Course: GGDT-114 :Principles of Population and Settlements Geography

**Course Outcome:**

1 Student gets acquainted with the basic concepts in Population and settlement Geography.
2 The students will acquire knowledge about the population distribution in the world, factors affecting population distribution and about the concept of migration.
3 Understand patterns and processes of population growth and its implications.
4 Students understand the theories along with the fundamental concepts in Population and settlement Geography.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Population and Settlement Geography | i. Definition, Nature and scope of Population Geography<br>ii. Development of Population Geography as discipline<br>iii. Approaches to the study of population Geography<br>iv. Definition, subject matter and scope ofSettlement Geography<br>v. Development of Settlement Geography<br>vi. vi. Approaches: genetic, spatial and ecological | 08 |
| 2 | Population Distribution | i. Population distribution and factors affecting distribution of population<br>ii. Density : definition and types<br>iii. Factors affecting density of population<br>iv. Population density in India<br>v. Urbanization: definition and stages<br>vi. Trend and level of urbanization in India | 08 |

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|---|---|---|---|
| 3 | Population Growth and trend | i. Concept of population growth<br>ii. Component of population growth ( Fertility, Mortality, and Migration)<br>iii. Theory of Demographic Transition<br>iv. Malthus Theory<br>v. Population growth and trend in India<br>vi. Migration: concept of migrant and migration, immigration and emigration | 08 |
| 4 | Population Structure and Characteristics | i. Age and sex structure<br>ii. Concept of aging of populations,<br>iii. Dependency ratio<br>iv. Sex Ratio: definition and affecting factors ofsex ratio<br>v. Sex ration in India<br>vi. Population Composition: religious, linguistics, ethnic, marital and educational<br>vii. Literacy: definition and measures of literacy<br>viii. Literacy in India | 06 |
| 5 | Fertility and Mortality | i. Concepts: fertility, fecundity, sterility, cohort<br>ii. Crude birth rate, Total fertility rate<br>iii. Concept of baby boom<br>iv. Concepts: mortality and morbidity<br>v. Death rate and its measures<br>vi. Level and trends of mortality in India | 06 |
| 6 | Human Settlement | i. Classification: urban and rural<br>ii. Rural-urban dichotomy<br>iii. Site and situation aspect in settlement<br>iv. Types: compact, semi-compact, hamleted anddispersed<br>v. Patterns of settlement | 08 |
| 7 | Rural Settlements | i. Definition, classification of villages<br>ii. Size and spacing of villages<br>iii. Nearest neighbor analysis<br>iv. Concepts of dispersion and nucleation<br>v. Factors affecting dispersion and nucleation | 08 |
| 8 | Urban Settlements | i. Concept: urban place, urban agglomeration,urban sprawl<br>ii. Urban settlement hierarchy<br>iii. Urban-rural fringe<br>iv. Rank-size rule<br>v. Central Business District (CBD) | 08 |

**Reference Books:**


- **Bhende, A. and Kanitkar, T. (2011):** Principles of Population Studies, Himalaya Publishing House, Bombay.
- **Beaujeu, G. J. (1966):** Geography of Population, Longman Group Ltd.
- **Chandna, R.C. (Rep.2010):** Geography of Population, Concepts, Determinants and Patterns, Kalyani Publishers, New Delhi.

- **Clark, J. I. (1973):** Population Geography, Pergamon Press Ltd., Oxford.
- **Clark, J.I. (1984):** Geography and Population: Approaches and Applications, Pergamon Press Ltd., Oxford.
- **Hudson, (1970):** Geography of Settlement, Macdonald & Evans Ltd., London.
- **Khullar, D. R. (2011):** India A Comprehensive Geography, Kalyani Publication, New Delhi.
- **Michel Chisholm (1973):** Studies in Human Geography, London.
- **Mishra, R.S.(1975):** Economics of Growth and Development, Somaiya Publication Pvt. Ltd.
- **Singh R.Y. (Rep. 2010):** Geography of Settlements, Rawat Publication.
- **MusmadeArjun, SonawaneAmit and Jyotiram More**, (2015) Population & Settlement Geography (Marathi) -Diamond Publication Pune.


## Semester I

### Course: GGUP-115:Practical in Physical and Human Geography

**Course Outcome:**

1. Student gets acquainted with the basic techniques to be used in Geomorphology and Climatology.
2. Student gets acquainted with the basic techniques to be used in the fields of Economic and Population Geography.
3. Gain an insight in to the varied landforms and understand the process of their formation

**No. of Credits: 04No. of Periods: 60**

| Topic No. | Topic | Sub topics | Periods (3 hours) |
|---|---|---|---|
| | | **A Geomorphology** | |
| 1 | Drainage Network | Stream ordering and Bifurcation ratio<br>i. Strahler'smethod<br>ii. Horton's method | 02 |
| 2 | Drainage Basin Relief Analysis | Relief analysis (for a 3 to 5 order drainage basin; based on grid method)<br>i. Absolute relief map<br>ii. Relative relief map<br>iii. Hypsometric analysis<br>iv. Basin cross profiles<br>v. Block diagram (multiple section) | 03 |
| | | **B Climatology** | |
| 3 | Climatic Element Diagrams | i. Climatograph<br>ii. Climograph<br>iii. Simple wind rose<br>iv. Hythergraph<br>v. Water Budget | 03 |
| 4 | Climatic Classification | i. Koppen's classification | 02 |
| | | **C Economic Geography** | |
| 5 | Crop Combination and Crop Diversification | i. Weaver's method<br>ii. Jasbir Singh | 02 |

| | | | |
|---|---|---|---|
| 6 | Measures of Network Structure | i. Ratio measure<br>ii. Alpha, beta, gamma, etc.<br>iii. Associated number, cyclomatric number | 01 |
| **D Population and Settlement Geography** | | | |
| 7 | Population Indices and Projection | i. Age-sex pyramid<br>ii. Infant mortality rate<br>iii. Population growth rate<br>iv. Population projection | 02 |
| 8 | Measures of Nucleation and Dispersion | i. Rank size rule<br>ii. Nearest neighbor analysis<br>iii. Calculation of centrality | 03 |
| 9 | Field Visit and Report Writing | i. One day study tour or long tour of geographicalinterest places anywhere in the country and excursion report | 02 |

**Reference Books:**


- **AsisSarkar (2015):** Practical Geography, A Systematic Approach, Orient Black Swan
- **Carter, H. (1977):** The study of Urban Geography, Edward Arnold, London.
- **Hans, R. (1978):** Fundamentals of Demography, Surjeet, Delhi.
- **Hudson F.S. (1976):** Geography of Settlements, Estover, Macdonald& Evans, England.
- **Liendsor, J.M. (1997):** Techniques in Human Geography, Routledge.
- **Lloyd, P. and Dicken, B. (1972):** Location in Space - A theoretical approach to economic geography, Harper and Row, New York.
- **Michael, E. and Hurse, E.(1974):** Transportation Geography, McGraw-Hill, New York.
- **Pollard, A.H. and FarhatYusu, (1974):** Demographic Techniques, Rushcutters Bay, N.S.W., Pergamon Press, Australia.
- **Singh, J. and Dhillon, (1984):** Agricultural Geography, Tata McGraw-Hill Publishing Company Limited, New Delhi.
- **Yeats, M.H. (1974):** An Introduction to Quantitative Analysis in Human Geography, McGraw-Hill, New York.

# Semester II

## Course: GGUT-121:Geoinformatics-I

**Course Outcome:**

1. Students can know about concept and components of Geographical Information System. They will understand the GIS Data Structures, develop an idea about GIS Data Analysis and They will know about application of GIS ·.
2. Students will apply spatial data analysis to solve natural, environmental and societal problems and challenges they will apply GIS in different real world situation
3. To know various applications of GIS and GPS in various fields. Handle integrated geospatial techniques and apply them in solving real world problems.
4. To understand and develop the different types of models for GIS spatial analysis
5. Describe various GIS tools and techniques within spatial analytical framework
6. Visualize GIS outputs in different dimensions and to design and produce thematic maps
7. Understand existing data dissemination systems and download appropriate spatial and non-spatial data using web services.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to GIS | i. Definition, potential of GIS, concept of space &time<br>ii. Spatial Information Theory<br>iii. History of GIS<br>iv. Objectives of GIS<br>v. Elements of GIS, hardware &software requirements<br>vi. GIS Applications<br>vii. GIS Tasks- input, manipulation, management,query &analysis, visualization | 14 |
| 2 | Database | i. Spatial: spatial relationship, functionalrelationship, logical relationship<br>ii. Non-spatial: nominal, ordinal, ratio and cyclic | 08 |
| 3 | Data Models | i. Spatial: Geometric primitives, Raster, Vector, Quad tree tessellation, comparative overview of raster and vector models, layers and coverage<br>ii. Non-spatial: DBMS- Advantages, conceptual models; Implementational models- hierarchical, network and relational | 12 |
| 4 | Structuring of Spatial Data | i. Digitizers: manual, semi-automatic & automatic<br>ii. Editing error: detection & correction, topologybuilding | 10 |

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|---|---|---|---|
| 5 | Data Analysis (I) | i. Attribute databases: operations from algebraic theory<br>ii. Operations from set theory SQL: attribute query | 08 |
| 6 | Data Analysis (II) | i. Spatial Databases: map algebra, grid Operations: Local, Focal<br>ii. SQL: spatial query | 08 |

**Reference Books:**


- **Burroughs,P. A. and McDonnell,R.A. (2002):** Principles of Geographical Information System, Oxford University Press.
- **George J. (2004):** Fundamentals of Remote Sensing, Universities Press Pvt. Ltd., Hyderabad.
- **Jensen, J. R. (2003):** Remote Sensing of Environment, An Earth Resource Perspective, Pearson Education Pvt. Ltd., New Delhi.
- Kang- Tsung-Chang, Introduction to Geographical Information System, 2002, McGraw Hill.
- **Lillesand, T. M. and Kiefer R. W. (2002):** Remote Sensing and Image Interpretation, John Wiley and Sons, New Delhi.
- **Lo C. P. and Yeung, A.K.W. (2002):** Concepts and Techniques of Geographic Information System, Prentice Hall, India.
- **Paul A. Lonfley, Michel F. Goodchild, D J. Maguire and D W. Rhind, (2002):**Introduction to Geographic Information Systems and Science, John Wiley and Sons Ltd.
- Fundamentals of Remote Sensing, A Canada Centre for Remote Sensing Remote Sensing Tutorial. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf

# Semester II

## Course: GGUT-122: Coastal Geomorphology

**Course Outcome:**

1 Students will get introduced with the basic concepts of Coastal Geomorphology.
2 The course will help the students to understand concept and theories related to sea-level rise.
3 Students will be aware of the coastal processes those operate in coastal environment.
4 The morphology and hydrodynamics of coastal environment can be deliberated in this course.
5 Students will comprehend the applications of Coastal Geomorphology useful in assessment and management.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction: Coasts and Coastal Systems and Shore Zones | i. The coastal environment: littoral, shore, coastal zones<br>ii. Components of coastal systems processes, sediment transport, morphology, stratigraphy<br>iii. Spatial and temporal scales in CoastalGeomorphology<br>iv. Coastal classification: genetic and morphological | 06 |
| 2 | Coastal Processes | Waves:<br>i. Definition, wave length, amplitude, depth, period, fetch, frequency<br>ii. Types of waves: sea waves, swell waves, capillary waves, gravity waves, long period tidal waves, storm waves, standing waves<br>iii. Process of shoaling: wave breakers- spilling, plunging and surging, reflection, diffraction and refraction of waves<br>Tides:<br>i. Equilibrium theory of tides<br>ii. Semidiurnal, diurnal, spring, and neap tides<br>iii. Amphidromic point, co-tidal lines, coastal tides<br>iv. Tides in bays and estuaries<br>v. Tides and coastal landforms<br>Currents:<br>i. Wave induced shore normal and longshore currents, rip currents, beach drift<br>ii. Wind induced, river induced and tide induced currents, flood and ebb currents | 10 |

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|---|---|---|---|
| 3 | Sea level | i. Transgression, regression, relative andeustatic sea level change<br>ii. Causes and consequences of sea level change<br>iii. Quaternary sea level changes, glacial eustasy, Staircase theory, Holocene transgression<br>iv. Future sea level changes<br>v. Indicators of former sea levels: Fossil beach ridges, beach rocks, abandoned cliffs, caves , raised features , marine terraces | 10 |
| 4 | Coastal sediments | i. Properties of coastal sediments<br>ii. Types: clastic and biogenic sediments<br>iii. Grain size characteristics<br>iv. Sources of sediments: coastline erosion andsea floor<br>v. Pathways of sediments transport: Factorsaffecting transport, sediments trapsand sinks | 08 |
| 5 | Coastal environments -I | i. Fluvial-dominated: Coastal deltas: classification, formation, morphology of deltaplain, delta front and pro-delta, Fan delta, braiddelta, morphodynamics of deltas<br>ii. Tide-dominated: morphology and hydrodynamics of estuaries and tidal flats | 06 |
| 6 | Coastal environments- II | i. Wave-dominated: Process of deposition, Beaches and spits: profiles, types and sediments, barrier islands, coastal sand dunes,dune systems, sea cliffs and caves: formation and morphology, shore platforms: formation types and morphology, sea arches, stack, stumps, geos and blow holes<br>ii. Biotic environments: mangrove swamps and salt marshes, corals and coral reefs | 06 |
| 7 | Applied coastal Geomorphology -I | Current coastal issues:<br>i. Sea level rise<br>ii. Storm hazard management<br>iii. Tsunami<br>iv. Coastal erosion and progradation<br>v. Wetlands, kharlands, estuarine reclamation<br>vi. Salt intrusion and subsidence of coastalaquifers | 08 |
| 8 | Applied coastal Geomorphology- II | Coastal hazard management:<br>i. Impact, vulnerability and risk<br>ii. Shoreline erosion management<br>iii. Coastal adaptation and resilience<br>iv. Coastal conservation<br>v. Coastal policies and plans<br>vi. Coastal Regulation Zone (CRZ Notification2018)<br>vii. Local and international case studies | 06 |

**Reference Books:**


- **Bird, E.C. (2000):** Coastal Geomorphology: An Introduction, John Wiley and Sons, Chichester.
- **Bloom, A.L. (2002):** Geomorphology: A Systematic Analysis of Late Cenozoic, Landforms, Prentice-Hall of India, New Delhi.
- **Davis, J.L. (1980):** Geographical variation in coastal development, Longman, New York
- **Goudie, A.S. (Eds.) (2004):** Encyclopaedia of Geomorphology, Routledge, London.
- **Ivan, V. (2006):** Global Coastal Change, Blackwell publishing, Oxford.
- **Karlekar Shrikant (2009):** Coastal processes and landforms, Diamond Publication, Pune
- **King, C.A.M. (1972):** Beaches and Coasts, Edward Arnold, London.
- **Masselink, G. Hughes, M. and Knight, J. (2011):** Introduction to Coastal Processes and Geomorphology Hodder Education, London.
- **Pethick, J. (1984):** An Introduction to Coastal Geomorphology, Arnold-Heinemann, London.
- **Tooley, M. M. and Shennan, I. (1987):** Sea level changes, Basil Blackwell, Oxford, U. K. 8.


## Semester II

### Course: GGUT-123: Synoptic Climatology

**Course Outcome:**

1. To understand the basics of Synoptic Climatology and its approaches.
2. To study various types of observation, analysis and reporting of weather data.
3. 3. To understand the formats and reading of Indian daily weather report.
4. To understands Tropical and Extra-Tropical weather systems.
5. To understands the different weather patterns.
6. To develop skills of weather interpretation and forecasting with focus on application in Pollution studies, Marine, Aviation, Disaster and Agriculture.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Synoptic Climatology | i. Definition, nature and scope<br>ii. Levels of climatological synthesis | 03 |
| 2 | Approaches | i. Analytical approach<br>ii. Synoptic approach | 03 |
| 3 | Weather reporting and analysis | i. Observing, reporting,collecting and analysis of weather data by India Meteorological Department<br>ii. Synoptic charts and maps, synoptic scale motion, laws of motion | 04 |
| 4 | Tropical Weather Systems | i. Easterly Waves- formation and characteristics<br>ii. Tropical Cyclones (Hurricanes)- formation, life cycle, structure and dynamics<br>iii. Thunderstorm- origin, structure and stages ofdevelopment,<br>iv. Tornadoes- development and occurrence | 12 |

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|---|---|---|---|
| 5 | Extra-Tropical Weather Systems | i. Air masses and fronts<br>ii. Air masses of North America, Europe and Asia<br>iii. Types of fronts<br>iv. Frontal weather, frontogenesis and frontolysis<br>v. Principal zones of frontogenesis<br>vi. Rossbywaves, wave cyclone- formation,<br>a. life cycle, idealized weather | 12 |
| 6 | Weather Patterns | i. Clouds- classification<br>ii. Precipitation processes<br>iii. Fog- formation and types<br>iv. Heat and cold waves | 10 |
| 7 | Weather Forecasting | i. Types of weather forecasting<br>ii. Methods of weather forecasting<br>iii. Role of satellites | 08 |
| 8 | Application of Synoptic Climatology | i. Application in pollution studies<br>ii. Marine activities<br>iii. Aviation<br>iv. Disaster prevention and preparedness<br>v. Agriculture | 08 |

**Reference Books:**


- **Barry, R.G. and Perry, A.H. (1973):** Synoptic Climatology: Methods and Applications, Methuen and Co. Ltd., London.
- **Lutgens, Frederic K. and Tarbuck, Edward J. (2010):** The Atmosphere: An Introduction to Meteorology, Pearson Prentice Hall, New Jersey.
- **Navarra, J.G. (1979):** Atmosphere, Weather and Climate, W. B. Saunders Company, Philadelphia.
- **Petterson, S. (1969):** Introduction to Meteorology, McGraw Hill, New York.
- **Rama Sastry, A.A. (1984):** Weather and Weather Forecasting, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi.
- **Stringer, E.T. (1972):** Foundations of Climatology, W. H. Freeman and Company, New York.

## Semester II

**Course: GGUT- 124 :Agricultural Geography**

**Course Outcome:**

1. Students will learn about the scientific definitions of agricultural Geography, data sources, their constraints and techniques to analyze spatial distribution of agricultural development.
2. Students will help them to acquire the knowledge of agricultural Geography and its development.
3. On completion of the course the student will be able to understand comprehensively stages of the
4. Agricultural developments, problems and process and development of Industries.
5. It will help to students to understand the different types of agriculture, agricultural theories and models.

**No. of Credits: 04** **No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Agricultural Geography | i. Definition, nature, scope and significance<br>ii. Approaches: systematic, commodity, regional, recent<br>iii. Recent trends in Agriculture Geography | 08 |
| 2 | Significance of Agriculture | i. Significance of agriculture in world<br>ii. Importance of agriculture in the Indian economy<br>iii. Role of agro-based industry in regionaldevelopment | 06 |
| 3 | Determinates of Agriculture | i. Physical factors<br>ii. Economic factors<br>iii. Social factor<br>iv. Technological factors | 10 |
| 4 | Agricultural regionalization | i. Definition and concept<br>ii. Views of Baker and Whittlesey<br>iii. Crop combination techniques: Weaver and Thomas method<br>iv. Agricultural efficiency: Kendall's ranking coefficient, Bhatia's method<br>v. v. Agricultural regions of India | 10 |
| 5 | Agricultural Types | i. Intensive subsistent farming<br>ii. Mixed farming<br>iii. Horticulture<br>iv. Plantation agriculture<br>v. Commercial grain farming<br>vi. Shifting cultivation | 08 |
| 6 | Problems and Prospects of | i. Problems and prospects with reference to India<br>ii. Droughts and famines<br>iii. Role of irrigation in agriculture development<br>iv. Agricultural productivity in India | 05 |

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|---|---|---|---|
| | Agriculture | | |
| 7 | Sustainable Agricultural Development in India | i. Waste land management<br>ii. Organic farming concept<br>iii. Crop rotation<br>iv. Group farming<br>v. Pest and weed management<br>vi. Agro-forestry<br>vii. Agro-tourism | 07 |
| 8 | Characteristics of Indian agriculture | i. Green revolution in India: problems associated with Indian agriculture<br>ii. National agricultural policy<br>iii. Recent changes in Indian agriculture | 06 |

**Reference Books:**


- **Aiyer, A.K.Y.N. (1949):** Agricultural and Allied Arts in Vedic India.
- **Bayliss Smith, T.P. (1987):** The Ecology of Agricultural Systems. Cambridge University Press, London.
- **Berry, B.J.L. et. al. (1976):** The Geography of Economic Systems. Prentice Hall, New York.
- **Brown, L.R. (1990):** The Changing World Food Prospects - The Nineties and Beyond. World Watch Institute, Washington D.C.
- **Dyson, T. (1996):** Population and Food, Global Trends and Future Prospects. Routledge, London.
- **Gregor, H.P. (1970):** Geography of Agriculture. Prentice Hall, New York.
- **Grigg, D.B. (1974):** The Agricultural Systems of the World. Cambridge University Press, New York.
- **Grigg. D.G. (1974):** The Agricultural Systems of the world An Evolutionary Approach.
- **Hartshorn, T.N. and Alexander, J.W. (1988):** Economic Geography. Prentice Hall, New Delhi.
- **Illbery, B.W. (1985):** Agricultural Geography, Social & Economic Analysis, Oxford University Press.
- **Mannion, A.M. (1995):** Agriculture and Environment Change. John Wiley, London.
- **Morgan, W.B. (1987):** Agriculture in the Third World - A Spatial Analysis. Westview Press, Boulder.
- **Morgan. W.B. and Monton, S.C. (1971):** Agricultural Geography Methuen, London.

- **Patil S. G., Suryawanshi R. S., Pacharne S. and Choudhar A. H. (2014**): Economic Geography, AtharavPrakashan, Pune.
- **Pagar S. D., More J. C. &Thorat A. M. (2015):** Agricultural Geography,Atharva Publication, Pune.
- **Randhawa, M.S. (1980):**An History of Agriculture in India Vols. I, II, III, IV, ICAR, New Delhi.
- **Saptarshi P.G., More J.C., Ugale V.R., Musmade A.H. (2009):** India A Geographical Analysis, Diamond, Pune.
- **Sauer, C.O. (1969):** Agricultural Origins and Dispersals. M.I.T. Press, Mass, U.S.A.
- **Singh, J. and Dhillon, S.S. (1988):** Agricultural Geography, 2nd edition, Tata McGraw-Hill, New Delhi.
- **Singh, J. and Dhillon, S.S. (1994):** Agricultural Geography, Tata McGraw Hill, Publishing Co.
- **Symons, Leslie (1970):** Agricultural Geography, G. Belt and Sons Ltd., London.
- **Tarrent, J.R. (1970):** Agricultural Geography, David and Charles, Newton Abbot.
- **Wigley, G. (1981):** Tropical Agriculture: The Development of Production, 4th edition, Arnold, London

## Semester II

**Course: Gg. 213:Population Geography**

**Course Outcome:**

1. To learn the nature and scope of population geography and various sources of population data.
2. To understand the population distribution, density and determinants of population growth in the World.
3. To review and understand the subject matter with the help of population theories.
4. To study the measures of nuptiality, fertility, mortality and analyse levels & trends of fertility & mortality in India.
5. To study the population movement including various types, theories, determinants & consequences of migration.
6. To understand the demographic, social, economic & cultural composition of population.
7. To able to know the concept of HDI & GDI and relation between population & development.
8 To understand the population policy of India and China.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1. | Introduction | i. Definitions, nature and scope of Population Geography<br>ii. Sources of population data: census, national sample survey, sample registration survey, NFHS, DLHS data | 08 |
| 2. | Population Dynamics | i. Population distribution in the world<br>ii. Density of population in the world<br>iii. Determinates of population growth | 06 |
| 3. | Population Theory | i. Malthus Theory<br>ii. Optimum Population Theory<br>iii. Demographic Transition Model | 08 |
| 4. | Fertility | i. Concepts and measures of Nuptiality and fertility<br>ii. Levels and trends of fertility in India<br>iii. Determinants of fertility<br>iv. Theories of fertility | 08 |
| 5 | Mortality | i. Concept of mortality & morbidity<br>ii. Measures of mortality<br>iii. Recent mortality levels in world<br>iv. Mortality trends in India | 08 |
| 6 | Migration | i. Definition, types (Internal and International)<br>ii. Concept: refugee, brain-drain migration<br>iii. Determinants and consequences of migration. | 06 |

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| | | iv. Lee's Theory of Migration<br>v. Ravenstein's laws of migration<br>vi. Push-pull factors of migration | |
| 7 | Population Composition | Population Composition:<br>i. Demographic<br>ii. Social<br>iii. Economic<br>iv. Cultural | 08 |
| 8 | Population Development and Policies | Concept of Population Index:<br>i. Human Development Index (HDI)<br>ii. Gender Development Index (GDI)<br>iii. Relation between population and development<br>iv. Population policy of India<br>v. New Population policy of China | 08 |

**Reference Books:**


- **Agarwala, S.N. (1977):** India's population Problems, Tata McGraw Hill publishing Co. Ltd. , New Delhi.
- **Bose Ashis et.al. (1974):** Population in India's Development Vikas Publishing House, New Delhi, 1974.
- **ChandnaR.C. (1986) :**Geography of Populationconcepts, Determinants and Patterns, Kalyani Publishers, New Delhi
- **Clarke J.I :** Population Geography, Pergamon Press, Oxford,1973.
- **Clarke J.I. (Ed)(1984):**Geography and Population, Approaches and Applications, PergamonPress, Oxford
- **Crook Nigel :**Principles of Population and Development, Pergamon Press New York, 1997.
- **GarnierB.J. (1970) :**Geography of Population, Longman, London
- **Pathak, K.B. and F.Ram, (1992) :** Techniques of Demographic analysis. Bombay: Himalaya Publishing house
- **Sundaram K.V. and SudeshNangia (Ed) (1986):** Population Geography, Heritage Publications, Delhi
- **U N D P (2002) :** Human Development Report, Oxford, 2002.
- **Woods R. (1970) :** Population Analysis in Geography, Longman, London
- **ZelinskyWilbur (1966) :** A Prologue to Population Geography Prentice Hall
- **MusmadeArjun, SonawaneAmit and Jyotiram More,** (2015): Population & Settlement Geography (Marathi) -Diamond Publication Pune.

## Semester II

**Course: GGUT-126: Fluvial Geomorphology**

**Course Outcome:**

1. Students will get introduced with the basic concepts of Fluvial Geomorphology.
2. The course will provide students with an overview of the fluvial systems and their dynamics.
3. Students will be aware of micro fluvial environment and the landscape.They will understood the concepts in Drainage Basin Hydrology, Open Channel Hydraulics, Channel Morphology, Hydraulic Geometry, Fluvial Erosion, Sediment Transport, Fluvial Deposition & River Metamorphosis
4. The morphology and hydrodynamics of coastal environment can be deliberated in this course.
5. Students will achieve the ability to understand process and mechanism involved in fluvial action for landform development.
6. Advanced knowledge in fluvial geomorphology develop advanced knowledge in fluvial geomorphology which deals with the action of the flow of water in the development of landform.
7. Different mechanisms and processes both traditional and contemporary have been included to cover up the important aspects of the subject. Students will also learn the relevance of applied aspects of Geomorphology in various fields.

**No. of Credits: 04** **No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to FluvialGeomorphology | i. Definition and scope<br>ii. Drainage basin and streamnetwork<br>iii. The drainage basin as a geomorphicunit<br>iv. Horton's laws of drainagecomposition<br>v. Laws of allometric growth<br>vi. Phases of drainage network development- Glock's model | 4 |
| 2 | Drainage Basin Hydrology | i. Runoff generation and types (infiltration-excess overland flow, throughflow, pipeflow and saturation-excess overland flow)<br>ii. Channel initiation<br>iii. Gully and channel formation<br>iv. Discharge and magnitude/frequency of flows in river system (flood stages and hydrographs, discharge measurement methods) | 4 |
| 3 | Open Channel Hydraulics | i. Types of flows- steady and unsteady flow, uniform and non-uniform flow, and Laminar and turbulent flow<br>ii. Flow behaviour- sub-critical, critical and supercritical flow<br>iii. Flow velocity variations and measurement methods<br>iv. Shear stress and stream power | 06 |

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| 4 | Channel Morphology | i. River categories- alluvial, bedrock and mix alluvial-bedrock<br>ii. Cross-section morphology and reach morphology- width-depth ratio, channel capacity, wetted perimeter, hydraulic radius and gradient<br>iii. Controls on channel morphology- morphologic and hydrologic controls<br>iv. Channel bed configuration- ripples, dunes, anti-dunes, riffle-pool sequence, steps and pools<br>v. Channel patterns or planforms- straight, meandering, braided, anabranching and anastomosing<br>vi. Concept of grade- long profile: below, near and above grade conditions | 10 |
| 5 | Hydraulic Geometry | i. At-a-station hydraulic geometry<br>ii. Downstream hydraulic geometry<br>iii. (Relation of discharge with width, depth, velocity and gradient) | 6 |
| 6 | Fluvial Erosion | i. Types of erosion- vertical, lateral and headword erosion<br>ii. Erosional Processes- solution, abrasion, cavitation, attrition, impaction, hydraulic action<br>iii. Erosionallandforms of bedrock channels- gorge, canyon, incised meanders, rapids, waterfalls, potholes, inner channels, grooves,<br>etc. | 8 |
| 7 | Sediment Transport | i. Types of river load- solution and particulate load<br>ii. Capacity and competence<br>iii. Entrainment of sediment- forces acting on a submerged particle, critical shear stress and critical velocity<br>iv. Modes of sediment transport in rivers- dissolved load, wash load, bedload and suspended load<br>v. Measurement of sediment load<br>vi. Sediment yield | 8 |
| 8 | Fluvial Deposition | i. Floodplains and associated features- meanders, point bars, ox-bow lakes, naturallevees, backswamps, yazoo streams, etc.<br>ii. River terraces- formation and classification<br>iii. Alluvial fans and bajadas<br>iv. Delta- formation and types<br>v. Mid-channel and bank attached channel forms | 8 |

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| 9 | River Metamorphosis | i. Definition, environmental change<br>ii. Evidences of metamorphism (direct observations, historical records, sedimentaryevidence and dating techniques)<br>iii. Long-term and short-term adjustments<br>iv. Quaternary fluvial systems | 6 |

**Reference Books:**


- **Charlton, R. (2008):** Fundamentals of fluvial Geomorphology, Routledge, New York.
- **Fryirs, K.A. and Brierley, G.J. (2013):** Geomorphic Analysis of River Systems: An approachto reading the landscape, Wiley-Blackwell.
- **Garde, R.J. (2006):** River Morphology, New age international limited publishers New Delhi.
- **Kale, V.S. and Gupta, A. (2001):** Introduction to Geomorphology, Orient Longman, Kolkata.
- **Knighton, D. (1998):** Fluvial forms and processes, Arnold, an imprint of Hodder Education, an Hachette UK Company, London.
- **Kondolf, M.G. and Piegay, H. (2016):** Tools in Fluvial Geomorphology, Wiley-Blackwell.
- **Leopold, L.B., Wolman, M.G. and Miller, P. (1954):** Fluvial processes in Geomorphology, Freeman and Co.San Francisco.
- **Maithi, R. (2016):** Modern approaches to Fluvial Geomorphology, Primus Books.
- **Mangelsdorf, J., Scheurmann, K. and Weib, F.H. (1989):** River Morphology, Springer-Verlag.
- **Morisawa, M. (1985):** Rivers: Forms and Processes, Longman, UK.
- **Richards, K. (1982):** River: Forms and processes in alluvial channels. Methuen and Co. London.
- **Robert, A. (2003):** River Processes: An Introduction to Fluvial Dynamics. Hodder Education, and Hachette UK Company, London.
- **Schumm, S. A. (1977):** Fluvial Systems. Wiley, New York.
- **Schumm, S.A., Mosley, M.P. and Weaver, W.E. (1987):** Experimental Fluvial Geomorphology, A Wiley, Inter-science Publication.

## Semester II

**Course: GGUT-127: Monsoon Climatology**

**Course Outcome:**

1. To understand the basic concepts of Monsoon and Monsoon Climatology.
2. To understand the origin of monsoon and monsoon models.
3. To study various regional aspects of Indian Monsoon.
4. To understands the inter-seasonal and inter-annual variation of Indian monsoon.
5. To acquire knowledge of scales, factors, models and current monsoon forecasting system of India Meteorological Department.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Monsoon | i. Introduction and scope of MonsoonClimatology<br>ii. Historical background and economic importance of monsoon | 05 |
| 2 | Origin of Monsoon | i. Different concepts related to origin of Monsoon – Thermal concept, Flohn'sconcept, Aerological concept<br>ii. The Asian Monsoon: East and South Asian Monsoon<br>iii. Classical Theory of Indian Monsoon<br>iv. Tibetan Plateau and Monsoon | 12 |
| 3 | Monsoon Model | i. Driving mechanism<br>ii. Monsoon on non-rotating and rotating Earth<br>iii. Realistic Monsoon Model | 08 |
| 4 | Monsoon Climatology | i. Normal temperature, wind and pressure,<br>ii. Datesof onset and withdrawal of monsoonrainfall | 06 |
| 5 | Regional Aspects of Indian Monsoon | i. Semi-permanent systems- heat low, Monsoontrough,<br>ii. Easterly Jet, Tibetan High | 06 |
| 6 | Intra-seasonal Variation | i. Active and break period, depressions, troughof low Pressure<br>ii. Mid-tropospheric disturbances, offshore and onshore vortices<br>iii. Effect of topography | 06 |
| 7 | Interannual Variation | i. Variability of summer monsoon rainfall<br>ii. Snow cover<br>iii. Meteorological Teleconnections: El Niño Southern Oscillation (ENSO)<br>iv. Indian Ocean Dipole (IOD)<br>v. North Atlantic Oscillation (NAO)<br>vi. Walker Circulation<br>vii. Role of ocean and upper atmosphere | 10 |

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| 8 | Forecasting of Monsoon | i. Different time scales<br>ii. Factors for forecasting<br>iii. Power regression and parametric model<br>iv. Current monsoon forecasting system of India Meteorological Department<br>v. MONEX and IIOE | 07 |

**Reference Books:**


- **Das, P.K. (1991):** Monsoons, National Book Trust, New Delhi.
- **Fein, J.S. and Stephens, P.L. (1987):** Monsoons, John Wiley and Sons, New York.
- **Keshavmurty, K.N. (1992):** The Physics of Monsoons, Allied Publishers Limited, New Delhi.
- **Pant, G.B. and Rupa Kumar, K. (1997):** Climates of South Asia, John Wiley and sons, Chichester.
- **Rao, Y.P. (1976):** Meteorological Monograph, Meteorology No. 1/1976, Southwest Monsoon, India Meteorological Department.


## Semester II

### Course: GGUT-128: Industrial Geography

**Course Outcome:**

1. On completion of the course the student will be able to understand comprehensively stages of the economic process and development of Industries.
2. It will help them to identify industrial problems and consequences.
3. It will help them to understand the development and significance of manufacturing Industries and its links with the world economy.
4 Students will understand the location of major manufacturing activities with the support of various industrial location theories and models.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Industrial Geography | i. Definition, nature and scope<br>ii. Manufacturing and regional economies<br>iii. Importance of industries in India's economic development | 06 |
| 2 | Industrial Location | i. Factors of industrial location:physical, economic, political and socio-cultural<br>ii. Centralization and decentralization ofindustries<br>iii. Agglomeration of industries<br>iv. Industrial linkages<br>v. Footloose industry | 08 |

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|---|---|---|---|
| 3 | Models in Industrial Geography | i. Weber's model<br>ii. Losch's model<br>iii. Greenhut's model<br>iv. Israd's model | 08 |
| 4 | Problems and Prospects of Industries in India | i. Iron and steel<br>ii. Cotton textile<br>iii. Sugar industries<br>iv. Automobile<br>v. Chemical<br>vi. Tourism industry | 10 |
| 5 | Industrial Regions of India | i. Industrial regions of India<br>ii. Characteristics of industrial regions<br>iii. India's industrial policy<br>iv. Agro-based industries in India<br>v. SEZ<br>vi. Small Scale Industries in India | 06 |
| 6 | Industrial Regions | Study of two industrial from each region<br>i. Western Europe<br>ii. Anglo-America<br>iii. Japan<br>iv. China | 08 |
| 7 | IT Industriesin India | i. Currents scenario of IT Industry in India<br>ii. Major IT hubs in India<br>iii. Problems and prospects of IT industry in India<br>iv. Impact of globalization on IT industry in India | 08 |
| 8 | Currents Scenario of Industry Sector in India | i. Role of MIDC in economic development ofMaharashtra.<br>ii. Role of FDI in development of IndianIndustry<br>iii. Problems and prospects of agro-based industries in Maharashtra | 06 |

**Reference Books:**


- **Alexander, JW. (1973):** Economic Geography, Prentice Hall, New Jersey.
- **Baghla, S. (2017):** Industrial Geography, Book Enclave Publication.
- **Estall and Buchanan (1969):** Industrial Activity and Economic Geography.
- **Smith, David, M. (1971):** Industrial Location- An Economic Geographical Analysis, John Wiley and Son, New York.
- **Miller, E.C. (1977):** Manufacturing-A study of Industrial Location, Penn State University, University Park, U.S.A.
- **Shaw, E.B. (1979):** An Anglo-America- A Regional Geography.

- **Riley, R.C. (1973):** Industrial Geography, Progress Publication, Moscow.
- **Watts, H.D. (1989):** Industrial Geography, Longman Group Ltd. Hong Kong.
- **Carlo, G., Mehdi, J. and Dino, M. (2003):** Fundamentals of Software Engineering, Pearson Edu. Pte. Ltd. New Delhi.
- **Richard, E. Fairley:** Software Engineering- Concepts, Tata Mc-Graw Hill Publishing Company, New Delhi.
- **Shahid, Y. and Kaoru, N. (2010):** Changing the Industrial Geography in Asia, The Impact of China &India, World Bank Publications.
- **Robinson, H. (1996):** Geography of Tourism, Macdonald and Evans, London.

## Semester II

**Course: GGUT-129: Geography of Rural Settlements**

**Course Outcome:**

1. To understand the evolution of settlements & sequence of occupancy from neolithic to modern period.
2. To learn the historical, cultural and geographical aspects of settlements reflected in place names.
3. To understand the growth and distribution of settlements and also know about factors affecting on the growth of settlements.
4. To understand the concept of dispersion, nucleation and accordingly measuring the degree of dispersion.
5. To explain the Von Thunen & Ricardo theories of rural land use.
6. To understand the rural economic activities and concept of centrality and hierarchy of rural service centers. Central Place Theory
7. To understand the morphogenesis of rural settlements and socio-economic transformation in rural areas.
8. To understand the demographic characteristics of rural settlement.
9. To understand the various type, causes & consequence of migration in rural areas.
10. To familiarize the student with house types and settlement patterns in the Maharashtra.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction toGeography of Rural Settlements | i. Definition<br>ii. Evolution of settlements<br>iii. Sequence of occupancy from Neolithic to modern period<br>iv. Historical, cultural and geographical aspects of settlements reflected in place names | 07 |
| 2 | Growth andDistribution | i. Site, situation,location<br>ii. Various factors affecting on settlement site and situations<br>iii. Dispersion and nucleation<br>iv. Factors affecting dispersion andnucleation<br>v. Methods of the measuring degree ofdispersion<br>vi. Factors affecting growth ofsettlements<br>vii. System of land division<br>viii. Water rights system of agriculture<br>ix. Land tenancy system | 12 |
| 3 | Theories of Rural Land Use | i. Intensity of land use<br>ii. Labour cost<br>iii. Marketing of product<br>iv. Von Thunen Theory<br>v. Ricardo Theory | 10 |

| | | | |
|---|---|---|---|
| 4 | Rural EconomicActivities | i. Functional analysis of service village and<br>a. trading Center<br>ii. Centrality and hierarchy of ruralservice centers<br>iii. Central Place Theory | 06 |
| 5 | Morphogenesis ofRural SettlementsandTransformation | Morphogenesis:<br>i. Social<br>ii. Cultural<br>iii. Economic organization within villages<br>iv. Functional growth<br>v. Socio-economic transformation in rural areas | 06 |
| 6 | Demographic Characteristics ofRural Settlement | i. Age-Sex, Education, Occupation, Caste<br>ii. Migration: causes &consequence ofmigration in rural areas<br>iii. Seasonal migration<br>iv. Commuting patterns | 07 |
| 7 | Rural House Types | i. Primitive, vernacular and modernhigh rise<br>ii. Physical, social, cultural andeconomic factors<br>iii. Size, functional use and architectural style<br>iv. Building material | 06 |
| 8 | Rural Settlementsin Maharashtra | i. Various patterns<br>ii. House types and settlement patternsin the Maharashtra<br>iii. Modern forms of rural settlements | 06 |

**Reference Books:**


- **Alam, S.M. et.al. (1982):** Settlement System of India Oxford and IBH Publication Co., New Delhi.
- **Chisholm M. (1967):** Rural Settlement and Land use. John Wiley, New York.
- **Clout, H.D. (1977):** Rural Geography, Pergamon, Oxford.
- **Doniel, P. and Hopkinson, M. (1986):** The Geography of settlement Oliver &Byod, Edinburgh.
- **Grover, N. (1985):** Rural Settlement: A Cultural Geographical Analysis. Inter India Publication, Delhi.

- **Hudson, F.S. (1976):**A Geography of Settlements, Macdonald and Evans, New York.
- **Ramchandran, H. (1985):** Village clusters and Rural Development. Concept Publication, New Delhi.
- **Rao R. N. (1986):** Strategy for Integrated Rural Development. B.R. Publication, Delhi.
- **Sen, L.K. (1972):** Readings in Micro-level Planning and Rural Growth Centers, National Institute of Community Development, Hyderabad.
- **Srinivas M.N. (1968):** Village India, Asia Publication House, Bombay.
- **Wanmati S. (1983):** Service Centers in Rural India, B.R. Publication Corporation, Delhi.
- **Musmade AH, Sonawane AE, More JC, (2015):** Population & Settlement Geography, (Marathi), Diamond Publication, Pune

## Semester II

**Course: GGDT-130: Geography of Tourism**

**Course Outcome:**

1. Students will get introduced with the basic and recent concepts related to tourism.
2. The course will help the students to understand various factors which affect tourism.
3. Students will comprehend various roles of accommodation in tourism.
4. Students will be aware of Indian tourism through various case studies.
   Students will get overall knowledge about tourism section in India.

**No. of Credits: 02No. of Periods: 30**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction to Geography of tourism | i. Definition: tourist and tourism<br>ii. Concept of recreation and leisure<br>iii. Importance of tourism<br>iv. Impact of tourism on economy of nation | 02 |
| 2 | Classification and Recent Concepts of Tourism | i. Classification on the basis of: nationalitytime of travel, number of tourist and purpose<br>ii. Recent concepts: agro-tourism, eco-tourism, heritage tourism and adventure tourism | 10 |
| 3 | Factors of Tourism | i. Physical factors:relief, climate, vegetation, wild life and water bodies<br>ii. Socio-cultural factors:religious, historical and cultural, economic, transportation and accommodation | 08 |
| 4 | Role of Accommodation in Tourism | i. Hotels, motels, inn, saraies, dharmashalas<br>ii. Governmentaccommodation, tourist homes<br>iii. Youth hostels, cottages, tents, caravans<br>iv. Rail yatribhavan, house boats<br>v. Private accommodations and unrecognizedaccommodations | 06 |
| 5 | Indian Tourism | Case studies<br>i. Hill stations: Manali, Mahabaleshwar<br>ii. Beaches: Kalangut (Goa), Ganpatipule<br>iii. Historical centres: Agra, Pratapgad<br>iv. Caves : Badami, Ajanta<br>v. Religious Centres: Prayagraj (Allahabad), Shirdi<br>vi. National Parks: Kaziranga, Tadoba<br>vii. Dams: SardarSarovar, Koyna<br>viii. Waterfalls: Nohkalikai Fall, Thoseghar | 04 |

**Reference books**


- **Bhatia A.K. (1996):** Tourism Development: Principles and Practices, Sterling Publishers, New Delhi
- **Bhatiya, A.K.(1991):** International Tourism - Fundamentals and Practices, Sterling, New Delhi,
- **Chandra, R.H.(1998):** Hill Tourism: Planning and Development, Kanishka Publishers, New Delhi,
- Hunter, C and Green, H.(1995): Tourism and the Environment: A Sustainable Relationship, Routledge, London,
- **Inskeep, E. (1991):** Tourism Planning: An Integrated and Sustainable Development Approach,Van Nostrand and Reinhold, New York,
- **Kaul, R.K.(1985):** Dynamics of Tourism & Recreation. Inter-India, New Delhi.
- **Kaur, J.(1985):** Himalayan Pilgrimages & New Tourism Himalayan Books, New Delhi,
- **Lea, J.(1988):** Tourism and Development in the Third World, Routledge, London,
- **Milton, D.(1993):** Geography of World Tourism Prentice. Hall, New York,
- **Pearce, D.G.(1987):** Tourism To-day: A Geographical Analysis, Harlow, Longman, Pratap, R. and Prasad, K. (2005): Tourism Geography, Shree Publishers & Distributors, New Delhi.
- **Robinson, H.A.(1996):** Geography of Tourism. Macdonald and Evans, London,
- **Sharma, J.K. (ed.)(2000):** Tourism Planning and Development - A new perspective, Kanishka Publishers, New Delhi,
- **Suryawanshi, R.S.(2012):** Assessment of Potential for Eco- Tourism, Northern Thane District, Maharashtra. Lap Lambert Academic Publishing, Germany
- **Shaw, G. and Williams, A.M.(1994):** Critical issues in Tourism-A Geographical Perspective, Oxford: Blackwell,
- **Sinha P. C. (ed.)(1998):** Tourism Impact Assessment, Anmol Publishers, New Delhi,
- **Theobald, W. (ed.)(1994):** Global Tourism: The Next decade, Oxford, Butterworth, Heinemann, Oxford,
- **Voase, R.(1995):** Tourism: The Human Perspective Hodder& Stoughton, London

## Semester II

### Course: GGDP-131: Practical in Surveying

**Course Outcome:**

1. Students will understand the basic fundamentals of surveying i.e. Benchmarks, Spot heights, reduced levels, Interpolation and contouring
2. Student will draw cross profiles of rivers using Collimation and rise and fall method of Dumpy level survey
3. Student will prepare contour map of the region using Transit theodolite
4. Study and understand the techniques of surveying, using dumpy level and theodolite for practical, field work, research, and measurement and management of area.
5. Field visit will give spatial data using Dumpy level survey and Transit theodolite survey

**No. of Credits: 02No. of Periods: 30**

| Topic No. | Topic | Sub topics | Periods (3 hours) |
|---|---|---|---|
| 1 | Introduction to Surveying | i. Definitions and methods<br>ii. Benchmarks<br>iii. Spot heights<br>iv. Reduced levels<br>v. Interpolation and contouring | 01 |
| 2 | Dumpy/Auto level | i. Various components and common terms used in dumpy level survey<br>ii. Collimation method and Rise and Fall method<br>iii. Profile drawing and block contouring | 02 |
| 3 | Transit Theodolite | i. Various components and common terms used in Theodolite<br>ii. Intersection method and Tachometric method | 02 |
| 4 | Total Station | i. Various components and common terms used in Total Station<br>ii. Area and profile drawing | 03 |
| | Field Visit | i. Dumpy level/Theodolite /Total Station Survey of a Beach, River Profiles and Slope | 02 |

**Reference books**


- **AsisSarkar (2015):** Practical Geography, A Systematic Approach, Orient Black Swan
- **Duggal, S.K. (2013):** Surveying Vol. 2, McGraw Hill Publication, New York.
- **Kanetkar, T.P. and Kulkarni, S.V. (2010):** Surveying and Leveling Vol. II, Pune Vidyarthi Publication, Pune.
- **Maslov, AV., Gordeev, A.V. and Batrakov, Yu.G. (1984):** Geodetic surveying, Mir Publishers, Moscow.
- **Rangwala, S.C. (2011):** Surveying and Leveling, Charotar Publishing HousePvt. Ltd. Anand, (Gujarat), India.
- **Punmia, B.C., Jain A. and Jain A. (2011):** Surveying, Vol. II. and III, Laxmi Publication - New Delhi.

## Semester II

**Course No: GGDT-132: Geography of Disaster Management**

**Course Outcome:**

1. To introduce the concepts,classification of disasters.
2. To appraise the students with various causes and effects of disaster.
3. To identify the various causes and effects of disaster
   To create the Technologies for disaster management amongst the students.

**No. of Credits: 02No. of Periods: 30**

| Topic No. | Topic | Sub topics | No. of Periods |
|---|---|---|---|
| 1 | Introduction | Concepts and definitions<br>i. Disaster, Hazard, Vulnerability, Resilience, Risks<br>ii. Classification of disasters | 02 |
| 2 | Natural Disasters | Causes and effects:<br>i. Earthquake, Volcano, Landslide,Tsunami<br>ii. Cyclone, Flood, Drought | 10 |
| 3 | Man-made disaster | Causes and effects:<br>i. Fire, Terrorism, Food poisoning<br>ii. Strike and lockouts, accidents, stampedes<br>iii. Major man-made disaster examples in India | 08 |
| 4 | Disastermanagement | i. Phases of disaster cycle<br>ii. First aid<br>iii. Role of Armed forces,police forces and NGO'S in disaster management | 06 |
| 5 | Technologies for Disaster Management | i. Application of Modern Technologies for the emergency communication<br>ii. Uses of remote sensing, GIS and GPS in disaster management | 04 |

**Reference books**


- **Agarwal, A. and Narain S. (Ed) (1999):** State of India's Environment. The Citizens Report, Centre for Science and Environment, New Delhi
- **Bryant Edward (2000):** Natural Hazards, Cambridge University Press
- **Daly, H.E. (1996):** Beyond Growth, Beacon Press, Boston
- **Daly, H.E and Twonseed K.N. (Ed) (1993):** Valuing the earth – Economics, Ecology and Ethics, MIT Press, London
- **Hart M. G. (1986):** Geomorphology, Pure and Applied, George Allen and Unwin, London
- **Morrisawa M (Ed) (1994):** Geomorphology and Natural Hazards, Elsevier, Amsterdam
- **Singh Savindra (2000):** Environmental Geography, ParagPustakBhavan, Allahabad
- **Smith, K. (2001):** Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge
- **Turk J. (1985):** Introduction to Environmental Studies, Saunders, College Publication, Japan
- **Saptarshi PG, More JC, Ugale VR, (2009):** Geography and Natural Hazads, (Marathi), Diamond Publishing
- **Musmade AH, More JC (2014):** Geography of Disaster Management, (Marathi), Diamond Publication, Pune

**Course: GGDP-133: Practical in Map Projections**

**Course Outcome:**

1. Students will be able to know concept of measurement and determination of projections.
2. Students will be acquainted with the knowledge regarding the latitude and longitude with the help of Projections and their different applications.
3. Students will comprehend the location through traversing techniques, to calculate and plot the projections.
4. The practical course will help to analyse errors and derive unknown bearings, distance, coordinates, curves, elements and areas through projections.
5. Students will get overall knowledge about map projections and their importance.

**No. of Credits: 02No. of Periods: 30**

| Topic No. | Topic | Sub topics | Periods (3 hours) |
|---|---|---|---|
| 1 | Map projections | iv. Definition and necessity of projections<br>v. Types- Perspective and non- perspective, conventional<br>vi. Classification based on a) Developable surfaces used b) Position of source of light c) Properties | 01 |
| 2 | Zenithal Projections | iii. Zenithal Polar Gnomonic Projection<br>iv. Zenithal Polar Stereographic Projection | 03 |
| 3 | Conical Projections | vi. Polyconic Projection<br>vii. International Map Projection (Modified Polyconic ) | 02 |
| 4 | Cylindrical Projections | i. Mercator's Projection<br>ii. Universal Transverse Mercator (UTM) Projection | 02 |
| 5 | Conventional MapProjections | i. MollweideProjection<br>ii. Sinusoidal Projection | 02 |
| **Graphical construction, properties and uses of following projections (2 exercise of each)** | | | |

**Reference books**


- **Asis Sarkar (2015):** Practical Geography, A Systematic Approach, Orient Black Swan
- **Maling, DH. (1973):** Coordinate systems and map projections, George Philip, London.
- **Richardus, P. and Adler Ron, K. (1972):** Map projections, North Holland publ. Co., Amsterdam.
- **Saha, P. and Basu, P. (2007):** Advanced Practical Geography, Books and Allied (P) Ltd. Kolkatta.
- **Steers, J.A. (1970):** An Introduction to Study of Map Projections. University of London Press Ltd., London.

**Course: GGUP-134:Practical of Statistical Techniques for Geography**

**Course Outcome:**

1. To introduce the importance, applications of statistical techniques in geography.
2. To introduce and calculate statistical methods and its application.
3. To enable the students to understand central tendency.
4. To introduce the Probability and probability distribution.
5. To acquaint the students with the correlation and regression analysis.
6. To introduce the time series analysis, application, components and plotting.

**No. of Credits: 04 No. of Periods: 60**

| Topic No. | Topic | Sub topics | Periods (3 hours) |
|---|---|---|---|
| 1 | Introduction to Statistical Techniques in Geography | i. Introduction and applications of statistical techniques in Geography<br>ii. Types of statistics: descriptive and inferential statistics<br>iii. Geographical data<br>a) Primary and secondary data<br>b) Spatial and temporal data<br>c) Discrete and continuous data<br>d) Grouped and ungrouped data<br>iv. Scales of measurement: nominal, ordinal, interval and ratio | 01 |
| 2 | Descriptive Statistics | i. Introduction to descriptive statistics<br>ii. Central tendency: mean, mode, median<br>iii. Dispersion: variance and standard deviation<br>iv. Skewness and kurtosis<br>(Calculations of above parameters for ungrouped and grouped data) | 03 |
| 3 | Probability and Probability Distributions | i. Introduction to probability<br>ii. The Normal Probability Distribution<br>iii. The Binomial Probability Distribution<br>iv. The Poisson Probability Distribution | 03 |
| 4 | Inferential Statistics | i. Introduction to inferential statistics<br>ii. Population and sample<br>iii. Hypothesis testing: Null and alternate hypothesis<br>iv. The Chi-square test (Two sample case)<br>v. Student's 't' test (Two sample tests)<br>vi. ANOVA (Analysis of variance)/ F ratio test | 05 |

| | | | |
|---|---|---|---|
| 5 | Correlation and Regression Analysis | i. Introduction to bi-variate correlation and regression<br>ii. The product-moment correlation coefficient<br>iii. Significance testing in correlation analysis<br>iv. Linear regression equation<br>v. Exponential regression equation<br>vi. Power-law regression equation<br>vii. Concept of residuals and explained variance | 05 |
| 6 | Time Series Analysis | i. Introduction and definition of time series<br>ii. Applications of time series analysis<br>iii. Components of time series<br>iv. Calculation and plotting of moving averages (3 and 5)<br>v. Curve fitting by method of least squares | 02 |
| 7 | Fieldwork and DataCollection | i. Collection of primary and/or secondary data by fieldwork or field visit<br>ii. Analysis of data by using appropriate statistical technique(s)<br>iii. Report writing | 01 |

**Reference Books:**


- **AsisSarkar (2015):** Practical Geography, A Systematic Approach, Orient Black Swan
- **David, E. (1989):** Statistics for Geographers.
- **Elhance, D.L., Elhance, V. and Aggarwal B.M. (2014):** Fundamentals of Statistics, KitabMahal, Allahabad.
- **Hammond, R. and McCullagh, P. (1978):** Quantitative Techniques in Geography, Clarendon Press. Oxford, London.
- **Karlekar, S. and Kale, M. (2006):** Statistical Analysis of Geographical Data, Diamond Publication, Pune.
- **Liendsor, J. M. (1997):** Techniques in Human Geography, Routledge.
- **Norcliffe, G.B. (1977):** Inferential Statistics for Geographers, Hutchinson, London.
- **Rogerson, P.A. (2015):** Statistical Methods for Geography, SAGE Publication, London.
- **Wheller, D., Shaw, G. and Barr, S. (2010):** Statistical Techniques in Geographical Analysis, David Fulton, Routledge, New York.
- **Yeats, M. H. (1974):** An Introduction to Quantitative Analysis in Human Geography.