

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	:	B.Sc.(Geography)
<b>Class</b>	:	T. Y .B. Sc.
<b>Semester</b>	:	V
<b>Name of Vertical Group</b>	:	<b>Major Core</b>
<b>Course Code</b>	:	<b>GEO(S)-301- MJ</b>
<b>Course Title</b>	:	<b>Principles of Climatology</b>
<b>Type of course</b>	:	Theory
<b>Total Credits</b>	:	04
<b>Workload</b>	:	(15hours/ credit) 4 credits x 15 hours =60 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, scope, and branches of climatology along with the elements of weather and climate.
2. To develop an understanding of the Earth–atmosphere energy system, atmospheric circulation, moisture processes, and mechanisms of precipitation.
3. To familiarize students with climatic classifications, major world climatic regions, and contemporary issues related to climate variability and climate change.

**Topics and Learning Points**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Nature and Scope of Climatology	i. Definition, Nature and Scope of Climatology ii. Weather and Climate iii. Elements of Weather and Climate iv. Branches of Climatology	6
2.	Earth– Atmosphere Energy System	i. Solar radiation and Earth–Sun relationship ii. Insolation and its spatial variation iii. Reflection, absorption and scattering iv. Terrestrial radiation v. Earth’s heat budget vi. Greenhouse effect and global warming	12
3.	Atmospheric Circulation and Weather Systems	i. Atmospheric pressure belts ii. Planetary wind systems iii. General circulation of the atmosphere iv. Jet streams	10
4.	Atmospheric Moisture and Precipitation	i. Humidity: concept and measurement ii. Condensation processes iii. Cloud types and classification iv. Forms of precipitation v. Mechanisms of rainfall: Convective, Orographic and Cyclonic	12

Topic No	Topic Name	Sub Topic	No. of Hours
5.	Climatic Classification and World Climates	i. Need for climatic classification ii. Köppen climatic classification iii. Thornthwaite classification (conceptual overview) iv. Major climatic regions of the world: Equatorial, v. Tropical, Desert, Mediterranean, Temperate and Polar	12
6.	Climate Change	i. Climate variability vs. Climate change ii. Evidences of climate change iii. Natural and Anthropogenic causes	8

### Course Outcomes:

#### By the end of this course, students will be able to:

- CO1: Explain the basic concepts of weather, climate, climatology, and the elements influencing atmospheric processes.
- CO2: Describe the Earth–atmosphere energy system, including insolation, terrestrial radiation, heat budget, greenhouse effect, and global warming.
- CO3: Analyze atmospheric circulation patterns, pressure belts, planetary winds, jet streams, and their role in weather systems.
- CO4 : Differentiate the processes of humidity, condensation, cloud formation, and various types and mechanisms of precipitation.
- CO5 : Assess climatic classifications, identify major climatic regions of the world, and evaluate the causes and impacts of climate change.

### References:

1. Climatology: An Introduction by D.S. Lal (1998), Sharda Pustak Bhawan, Allahabad.
2. Atmospheric Science: S.S. Singh (2005), Pinnacle Learning, Delhi.
3. Principles of Climatology: K. S. Srivastava and P. K. Mishra (2012), Vikas Publishing House, Noida.
4. Climatology- Fundamentals and Applications: M. S. Rao (2015), McGraw Hill Education, New Delhi.
5. The Atmosphere- An Introduction to Meteorology: Frederick K. Lutgens, Edward J. Tarbuck, and Dennis G. Tasa (2018), Pearson Education, London.
6. Climatology: Robert V. Rohli and Anthony J. Vega (2018), Jones & Bartlett Learning, Burlington.
7. Introduction to Climatology: P.J. Robinson and C.W. Henderson-Sellers (1999), Routledge, London.
8. Atmosphere, Weather and Climate: Roger G. Barry and Richard J. Chorley (2009), Routledge, London.
9. Climate Change- Science, Impacts and Policy: S. C. Gupta (2011), Oxford University Press, Oxford
10. Essentials of Meteorology: An invitation to the atmosphere: Ahrens, C. D. & Henson, R. (2016), Cengage Learning.
11. General Climatology: Critch field, H. J (2010), Prentice Hall, New Delhi.
12. Climatology: An Atmospheric Science: Oliver, J. E. & Hidore, J. J. (2003), Pearson Education, Delhi.
13. Climatology: Rohli, R. V & Vega, A. J. (2018), Jones & Bartlett Publishers.
14. Climatology: Savindra Singh (2005), Prayag Pustak Bhawan, Allahabad.

# Savitribai Phule Pune University, Pune

## B.Sc. (Geography) as per NEP 2020

Name of the Programme	:	B.Sc.(Geography)
Class	:	T. Y. B. Sc.
Semester	:	V
Name of Vertical Group	:	Major Core
Course Code	:	GEO(S) -302-MJ
Course Title	:	Physical Geography of India
Type of course	:	Theory
Total Credits	:	04
Workload	:	(30 hours / credit) 2 credits x 30 hours = 60 hours in semester

### Objectives of the Course:

1. To develop an understanding of the geographical setting, physiography, drainage systems, climate, soils, and forests of India.
2. To acquaint students with the interrelationship between physical features, natural resources, and environmental conditions in India.
3. To enhance analytical understanding of environmental issues such as soil degradation, deforestation, and resource conservation measures in India.

Topic No	Topic Name	Sub Topic	No. of Hours
1.	Introduction	i. Geographical and relative location of India ii. Frontiers of India. iii. Strategic Significance iv. Geological Structure	10
2.	Physiography	<b>Main physiographic divisions &amp; their importance</b> i. The northern mountains ii. The north Indian Plain iii. The peninsular plateau iv. The coastal lowlands v. The islands	10
3.	Drainage Systems	<b>A) Himalayan drainage systems:</b> i. Indus ii. Ganga iii. Brahmaputra <b>B) Peninsular drainage system</b> 1. East Flowing Rivers: i. Godavari ii. Krishna iii. Mahanadi 2. West Flowing Rivers: i. Narmada ii. Tapi iii. Mahi	10
4.	Climate	<b>A) Main Seasons &amp; Associated weather conditions:</b> i. The winter ii. The summer iii. The rainy monsoon <b>B) Origin and mechanism of monsoon:</b> i. Traditional concept: Halley's view	10

Topic No	Topic Name	Sub Topic	No. of Hours
		ii. Recent Concept: a. Role of Tibet plateau b. The Intertropical Convergence Zone (ITCZ) c. Jet Stream d. El-Nino	
5.	Soils	<b>A) Major soil types and their distribution in India:</b> i. Alluvial soil    ii. Black soil iii. Red soil      iv. Laterite and Lateritic soils vi. Forest and Mountain soils vii. Arid viii. Saline and alkaline soils ix. Peaty and Marshy soils <b>B) Soil degradation and soil conservation</b>	10
6.	Forest	<b>A) Major forest types and their distribution in India:</b> i. Moist Tropical forests ii. Dry Tropical forests iii. Montane Sub-tropical forests iv. Montane Temperate forests v. Alpine forests <b>B) Deforestation and conservation of forest</b>	10

### Course Outcomes:

**By the end of this course, students will be able to:**

- CO1:** Describe the geographical location, strategic importance, frontiers, and geological structure of India.
- CO2:** Explain the major physiographic divisions and drainage systems of India and analyse their geographical significance.
- CO3:** Interpret the climatic characteristics of India, including the mechanism of monsoon and the influence of factors such as ITCZ, Jet Stream, Tibet Plateau, and El-Nino.
- CO4:** Differentiate the major soil types and forest types of India and assess their distribution, uses, and environmental significance.
- CO5:** Evaluate the problems of soil degradation and deforestation and propose suitable conservation and management measures for sustainable resource use.

### References:

1. Agrawal A. N. (2019): "Indian economy, Developmental Problems and policies" New Age International Pvt. Ltd.
2. Bhende, Asha A and Kanitkar Tara (2015): "Principles of Population Studies", Himalaya Pub. House, New Delhi.
3. Chandana R. C. (2016): "Geography of population", Kalyani Publishers, New Delhi.

4. Chopra S. N. - India, an Area Study.
5. Deshpande C. D. (1992): "India: A Regional Interpretation", Indian Council of Social Science Research and National Book Centre, New Delhi
6. Dubey and Negi - Economic Geography of India.
7. Gopal Singh (1976): "Geography of India" Atma Ram Pub., Delhi
8. Khullar D. R. (2018) : "India: a Comprehensive Geography" Kalyani Publishers
9. Majid Husain (2008): "Geography of India", Tata McGraw Hill, New Delhi
10. Mathur, S. M. (1994): Physical Geology of India, National Book Trust, New Delhi, India.
11. Memoria, I. B. - Geography of India. 12. Singh R. L. (1971): "India-A Regional Geography". NGSI, Varanasi.
12. Sandip Sampat Tadakhe, Lt. Prakash Ramesh Barde, Prakash Arjun Pagare, Ganesh Madhukar Dhawale .(2025) – "Geography of India – Landscapes, Resources and People", AG Publishing House, Bhopal, M.P. India.
13. Singh R. L. (1971): "India-A Regional Geography". NGSI, Varanasi.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	V
<b>Name of Vertical Group</b>	∴	<b>Major Core</b>
<b>Course Code</b>	∴	<b>GEO(S)-303-MJP</b>
<b>Course Title</b>	∴	<b>Practical Applications in Climatology and Soil Geography</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	04
<b>Workload</b>	∴	(30 hours/ credit) 4 credits x 30 hours = 120 hours in semester

**Objectives of the Course:**

1. To develop practical skills in the use, handling, and interpretation of meteorological instruments for recording weather and climatological data.
2. To enable students to analyze and interpret weather maps, isobaric patterns, and seasonal weather conditions using IMD data and modern weather applications.
3. To impart field-based and laboratory skills in soil sampling, analysis, and interpretation of soil physical and chemical properties for environmental and geographical studies.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to Weather Instruments	<b>1.Understanding weather Instruments: mechanisms, functions and usage</b> i. Temperature: Simple Thermometer and Thermograph ii. humidity: Hygrometer and Hygrograph iii. Precipitation: Rain Gauge iv. Air pressure: Barometer and Barograph v. Wind direction: Wind Vane vi. Wind velocity: Cup Anemometer vii. Evaporation: Evaporation Pan <b>2. Practical activities:</b> i. Demonstrating of weather instruments ii. Recording and interpreting climatological readings	30
2.	Isobaric Patterns	1. Drawing of isobaric patterns and associated weather i. Cyclone ii. Anticyclone iii. Ridge iv. Trough v. Wedge vi. Secondary depression vii Col	20
3.	Weather Maps	1.Introduction to IMD weather maps/reports 2. Symbols in daily weather report used by (IMD) 3. Reading and interpretation of weather maps of three seasons:	20

Topic No	Topic Name	Sub Topic	No. of Hours
		i. Summer ii. Monsoon (Rainy) iii. Winter 4. Weather applications App: Mausam, Meghdoot, Damini 5. Visit to nearby India Meteorological Weather Station	
4.	Soil Sample Collection & Field Techniques	Various methods of soil sampling and at least one field sampling by using soil augur or core tubes	20
5.	Study of physical properties of soils	Laboratory determination of i) Soil texture ii) Soil Moisture iii) Bulk density and Specific gravity iv) Percentage porosity	12
6.	Study of chemical properties of soils	Laboratory determination of i) Soil pH ii) Soil EC iii) CaCO <sub>3</sub> v) Organic carbon vi) Organic matter vii) NPK	18

### Course Outcome:

**By the end of this course, students will be able to:**

**CO1:** Explain and demonstrate the use of various meteorological instruments and their role in measuring different weather elements.

**CO2:** Identify, and interpret different isobaric patterns and analyze associated weather conditions.

**CO3:** Interpret IMD weather maps and use weather applications to understand and analyze seasonal weather patterns.

**CO4:** Collect soil samples and analyze soil texture, structure, and porosity using appropriate field and laboratory techniques.

**CO5:** Measure and evaluate soil pH, electrical conductivity, and fertility status to assess soil quality for environmental applications.

### References:

1. Birkeland, P.W. – Soils and Geomorphology (Oxford University Press).
2. Brady, N.C. & Weil, R.R. – The Nature and Properties of Soils (Pearson).
3. Buol, S.W., Southard, R.J., Graham, R.C., & McDaniel, P.A. – Soils: Genesis and Classification (Wiley).
4. Critchfield, H. J. (1997). *General Climatology*. Prentice Hall.
5. Jarraud, M. (2008). Guide to meteorological instruments and methods of observation (WMO No. 8). World Meteorological Organization: Geneva, Switzerland.
6. Kale, V.S. & Gupta, A. – Introduction to Climatology (Scientific Publishers).
7. Lutgens, F.K. & Tarbuck, E.J. – The Atmosphere: An Introduction to Meteorology (Pearson/Prentice Hall).
8. M. Rajeevan, Indian Climate and Weather Systems, Springer India, 2016 Barry, R. G., & Chorley, R. J. (2010). *Atmosphere, Weather, and Climate*. Routledge.
9. Monkhouse, F. J., & Small, J. (1978). *A Dictionary of Meteorology*. Edward Arnold Publishers

10. Petterssen, S. (1956). *Weather Analysis and Forecasting*. McGraw-Hill.
11. Practical/Field manuals and laboratory protocols in Soil Analysis and Climatology.
12. Stringer, E. T. (1972). *Techniques of Meteorology*. W. H. Freeman & Co.
13. Trewartha, G. T., & Horn, L. H. (1994). *An Introduction to Climate*. McGraw-Hill Education.
14. World Meteorological Organization. (1983). Guide to meteorological instruments and methods of observation. Secretariat of the World Meteorological Organization.

**Web References:**

1. World Meteorological Organization (WMO): [www.wmo.int](http://www.wmo.int)
2. India Meteorological Department (IMD): [www.imd.gov.in](http://www.imd.gov.in)
3. National Weather Service: [www.weather.gov](http://www.weather.gov)

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	V
<b>Name of Vertical Group</b>	∴	<b>Major Elective</b>
<b>Course Code</b>	∴	<b>GEO(S) - 310 - MJ</b>
<b>Course Title</b>	∴	<b>Fundamentals of Soil Geography</b>
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(15hours/ credit) 2 credits x15 hours = 30 hours in semester

**Objectives of the Course:**

1. To introduce students to the fundamental concepts, nature, scope, and importance of soil geography (pedology) in geographical studies.
2. To develop an understanding of soil formation processes, soil profile characteristics, and soil classification systems.
3. To create awareness about soil degradation issues and soil conservation methods along with the application of RS and GIS techniques in soil management.

**Topics and Learning Points**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction	A. Definition of Soil B. Definition of Soil Geography (Pedology) C. Nature & Scope of Soil geography D. Approaches to The Study of Soil Geography i. Pedagogical Approach ii. Edapological Approach E. Importance of soil studies in Geography	08
2.	Soil Formation & Soil Profile	A) Factors Responsible for Soil Formation i. Parent Rock ii. Relief iii. Climate iv. Living Organisms v. Time vi Anthropogenic B) Soil Profile: Meaning & Horizons. C) Soil Classification-Zonal, Intrazonal and Azonal Soils	11
3.	Soil Degradation and Conservation	A. Soil Degradation- Definition, Types, Causes and Effects B. Soil Conservation- Definition and need of soil conservation C. Methods of Soil Conservation D. Role of RS and GIS in Soil Conservation.	11

## Course Outcomes:

**By the end of this course, student will be able to:**

- CO1:** Explain the basic concepts of soil, soil geography, its nature, scope, and significance in geography.
- CO2:** Describe and analyze the factors responsible for soil formation and identify soil horizons in a soil profile.
- CO3:** Classify soils into zonal, intrazonal, and azonal types and interpret their characteristics.
- CO4:** Analyze soil degradation processes including their causes, types, and effects on the environment.
- CO5:** Evaluate soil conservation methods and understand the application of Remote Sensing (RS) and GIS in soil conservation and management.

## References:

1. Birkeland, P. W. (1999): Soils and Geomorphology, Oxford University Press, New York.
2. Brady, N. C., and Weil, R. R. (2008): The Nature and Properties of Soils, Prentice Hall, New Jersey.
3. Bridges, E. M. and Davidson, D. A. (1982): Principles and Applications of Soil Geography, Longman Group, London.
4. Daji, J. A. (1970): A Textbook of Soil Science, Asia Publication House, New York.
5. Gustafson, A.S. (2007): "Soils and Management" Published by Agrobios (India).
6. Kale V. B. (2020): Soil Geography, Himalaya Publishing House, Mumbai.
7. Lal, R. (ed.), (2002): Encyclopaedia of soil science. Marcel Dekker, New York.
8. Miller, C. E. & L.M. Turk, (2001): "Fundamental of soil Science" Biotech Books Delhi.
9. Miller, R. W. and Donahue, R. L. (1992): Soils: An Introduction to Soils and Plant Growth, Prentice-Hall of India, New Delhi.
10. Panda, S. C. (2007): "Soil water conservation and dry farming" Published by Agrobios (India).
11. Pitty, A. F. (1978): Geography and Soil Properties, Methuen and Co., London.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	:	B.Sc.(Geography)
<b>Class</b>	:	T. Y. B. Sc.
<b>Semester</b>	:	V
<b>Name of Vertical Group</b>	:	<b>Major Elective</b>
<b>Course Code</b>	:	<b>GEO(S) -311-MJ</b>
<b>Course Title</b>	:	<b>Geoinformatics - I</b>
<b>Type of course</b>	:	Theory
<b>Total Credits</b>	:	02
<b>Workload</b>	:	(15hours/ credit) 2 credits x15 hours = 30 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, scope, and importance of Geoinformatics and Geographic Information Systems (GIS).
2. To develop an understanding of spatial and non-spatial data, their sources, and data models used in GIS.
3. To provide knowledge of GIS data processing, editing techniques, and spatial analysis methods for geographical applications.

**Topics and Learning Points**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to Geoinformatics	i. Definition of Geoinformatics ii. Scope and Importance of Geoinformatics iii. History of GIS iv. Components of GIS v. Functions of GIS:GIS tasks-Input, Manipulation, Management, Query analysis, Visualization	08
2.	Sources and types of GIS data	i. Spatial and Non-Spatial Data ii. Sources of Spatial Data- Toposheets, Surveying, Aerial photographs, Satellite images iii. Types of Spatial Data– Characteristics of Vector Data and Raster Data iv. Vector Data Model– Point, Line, Polygon v. Raster Data Model– Grid and Cells vi. DBMS-Meaning and Introduction	08
3.	GIS data editing And attribute data linking	i. Methods of Data Input – Scanning, Digitization ii. Georeferencing iii. Topology building topological errors, Locational errors, edge matching iv. Attribute Data linking	07
4.	Spatial and non-spatial data analysis	i. Query analysis-Spatial, Non-spatial, Spatiotemporal, dissolve, Overlay analysis, merge, buffer analysis, ii. TIN Spatial analysis, Overlay analysis, iii. Topographic analysis (DEM and DTM)	07

## Course Outcomes:

### By the end of this course, student will be able to:

- CO1:** Explain the basic concepts, scope, importance, history, and components of Geoinformatics and GIS.
- CO2:** Differentiate between spatial and non-spatial data and describe vector and raster data models along with their characteristics.
- CO3:** Describe and apply methods of GIS data input, georeferencing, and attribute data linking in spatial databases.
- CO4:** Analyze various spatial and non-spatial data analysis techniques such as query analysis, overlay, buffer, and dissolve operations.
- CO5:** Evaluate and interpret topographic and spatial data using GIS tools such as DEM, DTM, TIN, and multicriteria analysis for geographical problem solving.

## References:

1. Kang-tsung Chang (2003) Geographic Information Systems, Tata McGraw Hill, New Delhi
2. Star J, and J. Estes, (1994), Geographic Information Systems: An Introduction, Prentice Hall, New Jersey.
3. Michael F. Goodchild and Karen K. Kemp (1990) Introduction to GIS, National Center for Geographic Information and Analysis, University of California, Santa Barbara.
4. Clarke, Keith C. (1999) Getting Started with Geographic Information Systems, Prentice Hall, New Jersey
5. Lo Albert, C.P., and Young, K.W (2003) Concepts and Techniques of Geographical Information Systems, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Williams J. (1995): Geographic information from space, John Wiley and Sons, England,
7. DeMers Michel N.(2000): Geographic Information Systems, John Wiley and Sons.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	:	B.Sc.(Geography)
<b>Class</b>	:	T. Y. B. Sc.
<b>Semester</b>	:	V
<b>Name of Vertical Group</b>	:	<b>Major Elective</b>
<b>Course Code</b>	:	<b>GEO(S)-312- MJP</b>
<b>Course Title</b>	:	<b>Fundamentals of Mapping Techniques</b>
<b>Type of course</b>	:	Practical
<b>Total Credits</b>	:	02
<b>Workload</b>	:	(30 hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Objectives of the Course:**

1. To develop skills in base map preparation using Survey of India toposheets and interpretation of contour information for geographical analysis.
2. To introduce techniques of climatic mapping including isohyets, isotherms, and choropleth methods for spatial representation of climatic data.
3. To train students in the use of Google Earth Pro for digital mapping, spatial visualization, and preparation of thematic maps.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Base Map Preparation from Toposheet	i. Introduction to toposheets and its importance ii. Extracting a base map from toposheet iii. Tracing and indexing features iv. Drawing and Interpretation of Contour Maps	20
2.	Techniques in Climatic Mapping	i. Meaning and nature of climatic data ii. Data sources and tabulation iii. Isohyets (rainfall) and Isotherms (temperature) iv. Choropleth Method (Rainfall regions)	20
3.	Google Earth Pro-Based Mapping	i. Overview and installation (For computer) of Google Earth Pro ii. Tools and features: Zoom, Search, Historical Imagery, Layers (borders, roads, weather, 3D buildings), Street View iii. Adding placemarks, paths, polygons, folders; modifying styles and colours iv. Map creation using Google Earth Pro: college campus or any other area with at least four features.	20

## Course Outcomes:

### By the end of this course, student will be able to:

- CO1: Explain the concepts and importance of toposheets and demonstrate base map preparation and feature extraction techniques.
- CO2: Interpret contour maps and analyze physical features using topographic information from Survey of India maps.
- CO3: Apply climatic data analysis techniques to prepare isohyets, isotherms, and choropleth maps for spatial representation.
- CO4: Use Google Earth Pro tools for creating, editing, and visualizing spatial features such as placemarks, paths, and polygons.
- CO5: Develop thematic maps using Google Earth Pro by integrating spatial data and representing geographical features effectively..

## References:

1. Ahirrao, D. Y. And Karanjkehele, E.K., (2002), Pratyakshik Bhugol, Sudarshan Publication, Nashik.
2. M. Rajeevan, Indian Climate and Weather Systems, Springer India, 2016 Barry, R. G., & Chorley, R. J. (2010). Atmosphere, Weather, and Climate. Routledge.
3. Singh Gopal (1996). Map Work and Practical Geography, Vikas Publishing House Pvt. Ltd., New Delhi.
4. Singh, R.L., and Kanaujia L.R.S. (1963). Map Work and Practical Geography, Central Book Depot, Allahabad.
5. Singh, R.L., and Singh, R.P.B. (1997). Elements of Practical Geography, Kalyani Publishers, New Delhi.
6. Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd, Orient Blackswan
7. Kumbhar, A., 2000. Pratyakshik Bhugol, Sumeru Publications, Mumbai.
8. Indian Daily Weather Report, IMD, Pune
9. Gupta, K. K. & Tyagi, V. C. (1992) Working with Maps, Survey of India, DST, New Delhi
10. Ramamurthy, K. (1982)Map Interpretation, Rex Printers, Madras
11. Negi, B. S. (2005) Practical Geography, Kedarnath and Ramnath publication Meerut
12. Khullar, Practical Geography King Publication, Dehradun
13. S. D. Pagar, D. D. Mulukh, J. C. More & Others (2025) ,Practicals in weather observation (Marathi ), Nirali Publication Pune,

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	V
<b>Name of Vertical Group</b>	∴	<b>Major Elective</b>
<b>Course Code</b>	∴	<b>GEO(S)-313- MJP</b>
<b>Course Title</b>	∴	<b>Practicals in GIS Techniques</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(30 hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Objectives of the Course:**

1. To introduce students to the fundamentals of GIS software, its components, and basic workspace operations.
2. To develop practical skills in GIS data handling, including data conversion, georeferencing, digitization, and coordinate transformation.
3. To train students in GIS-based spatial analysis, visualization, and topographic analysis using raster and vector data models.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to GIS	i. Introduction to GIS software (e.g., QGIS / Arc GIS interface) ii. Understanding GIS components and workspace iii. Importing raster and vector data	06
2.	GIS Data and Data Models	(Hands-on training using GIS software) i. Identification of spatial and non-spatial data ii. Scanning of maps and conversion into formats – JPEG, PDF, BMP, TIFF iii. Conversion of coordinates – DMS to DD and DD to DMS iv. Georeferencing of maps/toposheets v. Selection of appropriate map projection	10
3.	GIS Data Input and Editing	(Hands-on training using GIS software) i. Digitization of map features (point, line, polygon) ii. Georeferencing of scanned toposheets iii. Exporting vector data as .shp files; building topology and identifying topological errors iv. Importing raster data (map, DEM, etc.) v. Clipping area of interest (AOI) vi. Exporting raster data – Arc ASCII file, Grid file, DEM file vii. Overlay of GPS survey points on vector and raster data viii. Attribute data creation and linking tables to vector data	20

Topic No	Topic Name	Sub Topic	No. of Hours
4.	GIS Output and Visualization	(Hands-on training using GIS software) i. Map layout preparation – Title, Grid, Scale, North Arrow, Index map (for vector and raster data) ii. Exporting maps into JPEG, PDF, and TIFF formats iii. Preparation of 3D view using DEM	12
5.	GIS Spatial Analysis	(Hands-on training using GIS software) i. Query analysis (spatial and non-spatial) ii. Overlay analysis and merge operations iii. Buffer analysis	12

### Course Outcomes:

**By the end of this course, student will be able to:**

**CO1:** Explain the basic concepts of GIS, its components, software interface, and types of spatial data.

**CO2:** Apply GIS techniques for data preparation including digitization, georeferencing, and coordinate conversion of spatial data.

**CO3:** Analyze and manage vector and raster data through import, export, clipping, and attribute data linking operations.

**CO4:** Perform spatial analysis techniques such as query, overlay, buffer, and merge operations using GIS software.

**CO5:** Create and interpret thematic maps, 3D visualization, and topographic outputs using DEM and GIS tools for geographical applications.

### References:

1. Kang-tsung Chang (2003) Geographic Information Systems, Tata McGraw Hill, New Delhi
2. Star J, and J. Estes, (1994), Geographic Information Systems: An Introduction, Prentice Hall, New Jersey.
3. Michael F. Good child and Karen K. Kemp (1990) Introduction to GIS, National Center for Geographic Information and Analysis, University of California, Santa Barbara.
4. Clarke, Keith C. (1999) Getting Started with Geographic Information Systems, Prentice Hall, New Jersey
5. Lo Albert, C.P., and Young, K.W (2003) Concepts and Techniques of Geographical Information Systems, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Williams J. (1995): Geographic information from space, John Wiley and Sons, England,
7. DeMers Michel N. (2000): Geographic Information Systems, John Wiley and Sons.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	V
<b>Name of Vertical Group</b>	∴	VSC
<b>Course Code</b>	∴	GEO(S) - 321-VSC
<b>Course Title</b>	∴	Geography of Tourism
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(15 hours/ credit) 2 credits x 15 hours = 30 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, nature, scope, and significance of Tourism Geography and its relationship with geographical studies.
2. To develop an understanding of different types of tourism, their classification, and the physical, socio-cultural, and political determinants of tourism.
3. To create awareness about the impacts of tourism on economy, society, and environment along with tourism policies and the role of ICT in tourism development.

**Topics and Learning Points:**

Topic No	Topic Name	Sub Topic	No. of Hours
1.	Introduction of Tourism Geography	i. Definition of Tourism Geography ii. Definition of Tourists and Tourism iii. Nature and Scope of Tourism Geography iv. Importance of Tourism v. Role of Geography in Tourism	08
2.	Types and Classification of Tourism	a. Classification based on i. Nationality ii. Travel Time iii. Purpose b. Concept of Tourism i. Geo-tourism ii. Eco-Tourism iii. Wildlife Tourism iv. Agro-Tourism v. Health/medical Tourism vi. Sports & Adventure Tourism	12
3.	Determinants and Policies of Tourism	Determinants a. Physical i. Relief ii. Climate iii. Forest & Wildlife	12

Topic No	Topic Name	Sub Topic	No. of Hours
		b. Socio-Cultural i. Religious   ii. Historical   iii. Sports iv. Architectural Attractions c. Political i. Policies ii. Accessibility iii. Safety of Tourist Tourism Policy: i. World Tourism Organization ii. Indian Tourism Development Corporation iii. Maharashtra Tourism Development Corporation	

### Course Outcomes:

#### By the end of this course, student will be able to:

- CO1:** Explain the basic concepts, nature, scope, and importance of Tourism Geography and its role in geographical studies.
- CO2:** Classify different types of tourism such as agro-tourism, eco-tourism, wildlife tourism, health tourism, and adventure tourism based on purpose, time, and nationality.
- CO3:** Analyze the physical, socio-cultural, and political factors that influence tourism development in different regions.
- CO4:** Evaluate the economic, socio-cultural, and environmental impacts of tourism including employment generation, cultural changes, and ecological footprint.
- CO5:** Interpret tourism policies and assess the role of organizations such as WTO, ITDC, and MTDC along with emerging trends and ICT applications in tourism.

### References:

- Cooper, C. and Hall, M., (2008). Tourism and Leisure: Issues and Challenges. Channel View Publications, Bristol.
- Goeldner, C. R. and Ritchie, J. R. B.,(2017).Tourism: Principles, Practices, Philosophies. John Wiley & Sons, Hoboken.
- Singh, V. and Joshi, S.,(2012).Tourism Planning and Development: Concepts and Issues. Sterling Publishers, New Delhi.
- Page, S. and Connell, J., (2009).Tourism: A Modern Synthesis. Cengage Learning, Hampshire.
- Seth P.N., (1985), Successful Tourism Management, Sterling Publisher Ltd., New Delhi.
- Mhatre, S., (2015), Tourism Geography: An Integrated Approach. Himalaya Publishing House, Mumbai.
- Kulkarni, A., and Shah, N. (2018), Tourism in Nashik: A Comprehensive Guide. Notion

Press, Chennai.

8. Deshmukh, P., (2019), Tourism in Ahmednagar: Trends and Challenges. Udyog Sahayadri, Ahmednagar.
9. Patil, N. and Chavan, S.,(2017),Tourism in Pune: Exploring the Cultural Capital. Sahyadri Books, Pune.
- 10.Pacharne et al (2024) Tourism Geography, Atharva Publication, Pune
- 11.Sharma, S. and Gupta, M.,(2013),Tourism Development in India: A Case Study Approach. PHI Learning Pvt. Ltd., New Delhi.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	V
<b>Name of Vertical Group</b>	∴	VSC
<b>Course Code</b>	∴	GEO(S) - 322-VSC
<b>Course Title</b>	∴	Principles of Watershed Management
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(15 ours/ credit) 2 credits x 15 hours = 30 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, philosophy, components, and socio-economic aspects of watershed management including watershed delineation and codification.
2. To develop an understanding of the structure and functioning of watersheds through their morphological and climatic characteristics.
3. To enable students to evaluate land, soil, slope, and vegetation resources for sustainable watershed planning and management.

**Topics and Learning Points:**

Topic No	Topic Name	Sub Topic	No. of Hours
1.	Introduction to watershed management	i. Concept of watershed management ii. Components of watershed: land, water & vegetation iii. Physical and socio-economic characteristics of watershed iv. Watershed delineation v. Classification of Watershed based on Are	10
2.	Function and structure of watershed	i. Morphological characteristic of watershed: linear, aerial and relief aspects ii. Climatic characteristics of watershed (water cycle): evaporation, condensation, precipitation, interception, infiltration, percolation, transpiration, runoff and storage	10
3.	Watershed analysis	i. Concept of Land Evaluation and Land System Approach ii. Land Capability Evaluation <ul style="list-style-type: none"> <li>• Definition and significance of land capability</li> <li>• Classification of land capability based on FAO guidelines</li> </ul> iii. Land Suitability Evaluation <ul style="list-style-type: none"> <li>• Definition and significance of land suitability</li> <li>• Classification of land suitability based on FAO framework</li> </ul> iv. Land Productivity <ul style="list-style-type: none"> <li>• Definition of land productivity</li> <li>• Storie Index Method for evaluating land productivity</li> </ul>	10

**Course Outcomes:**

**By the end of this course, student will be able to:**

- CO1:** Apply the fundamental concepts, philosophy, and components of watershed management in geographical studies.
- CO2:** Analyze the structure and functioning of watersheds using morphological and climatic characteristics such as water cycle processes.
- CO3:** Interpret watershed processes including evaporation, infiltration, runoff, and storage to understand hydrological balance.
- CO4:** Evaluate land capability and soil resources using classification systems such as Storie Index, Productivity Index, and Soil Fertility Capability Classification.
- CO5:** Develop sustainable watershed planning strategies by integrating land, soil, slope, vegetation, and community participation principles.

**References:**

1. Brosius, J. P., Lovelace, G., & Martini, F. (2005). Disciplines and interdisciplinary practices: The case of watershed management. *Society & Natural Resources*, 18(3), 199-212.
2. Desai, V.R., Mishra, A., & Ashwini Kumar, (2025). *Watershed Planning and Management*. [www.AgriMoon.com](http://www.AgriMoon.com)
3. Heathcote, I. W. (2009). *Integrated watershed management: principles and practice*. John Wiley & Sons.
4. Katyal, J.C., R.P. Singh, Shrinivas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. *Field Manual on Watershed Management*. CRIDA, Hyderabad.
5. Katturajan, K., (2023). *Watershed Management*. Department of Geography School of Sciences Tamil Nadu Open University Chennai - 600015.
6. Lyon, J. G. (2002). GIS for water resources and watershed management. In *GIS for Water Resource and Watershed Management* (pp. 1-6). CRC Press.
7. Mahnot, S.C. 2014. *Soil and Water Conservation and Watershed Management*. International Books and Periodicals Supply Service. New Delhi.
8. McCool, D. K., & Lee, R. G. (Eds.). (2017). *Watershed management: Balancing sustainability and environmental change*. CRC Press.
9. Naiman, R. J. (Ed.). (2012). *Watershed management: balancing sustainability and environmental change*. Springer Science & Business Media.
10. Novotny, V., Ahern, J., & Brown, P. (2010). *Water centric sustainable communities: planning, retrofitting, and building the next urban environment*. John Wiley & Sons.
11. Sabatier, P. A., Focht, W., Lubell, M., Trachtenberg, Z., Vedlitz, A., & Matlock, M. (2005). *Collaborative approaches to watershed management*.
12. Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. *Participatory Integrated Watershed Management: A Field Manual*. Central Soil and Water Conservation Research and Training Institute, Dehradun.
13. Singh, G.D. and T.C. Poonia. 2003. *Fundamentals of Watershed Management Technology*. Yash Publishing House, Bikaner.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	V
<b>Name of Vertical Group</b>	∴	<b>FP/OJT/ CEP</b>
<b>Course Code</b>	∴	<b>GEO(S) -331 - FP/CEP</b>
<b>Course Title</b>	∴	<b>Field Visit and Report Writing</b>
<b>Type of course</b>	∴	FP/OJT/CEP
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(30 hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Objectives of the Course:**

1. To promote experiential and field-based learning by exposing students to real-world geographical environments and phenomena.
2. To develop skills in designing questionnaires, collecting primary data, and using appropriate field techniques and tools for geographical investigation.
3. To enhance analytical and report writing abilities through systematic data interpretation and documentation of field observations.

**Guidelines for field visit in Geography:**

1. **Students should be taken on a field visit keeping the following points in mind, and a report should be prepared accordingly**
  - a. **Define Objectives:** Clearly state the purpose and objectives of the field visit.
  - b. **Pre-Visit Preparation:** Study the area using maps, satellite images, and previous reports etc. Prepare questionnaires and data collection sheets. , Arrange necessary permissions and logistics (transport, equipment, etc.).
  - c. **Formulate a Plan:** Decide the route, time schedule, and division of tasks among team members.
  - d. **Gather Necessary Tools:** Bring field equipment (compass, GPS, camera, notebooks, measuring tape, surveying instruments etc.).
  - e. **Safety Measures:** Ensure safety protocols, carry first aid, and inform someone about your visit plan.
  - f. **On-Field Data Collection:** Record observations systematically (physical features, human activities, etc.). , Conduct interviews or surveys if required. , Take photographs and mark locations on maps. , Collect samples (soil, water, vegetation) if necessary.
  - g. **Maintain Field Diary:** Write daily records of activities, observations, and experiences.
  - h. **Follow Ethical Practices:** Respect local communities and environment. , Do not disturb wildlife or natural habitats.

## Guidelines for field visit report writing in Geography:

1. **Title Page:** Include the title, name of the student, subject teacher, date, and institution etc.
2. **Table of Contents:** List all sections with page numbers, list of maps, graphs, charts etc.
3. **Introduction:** State the objectives, significance, and location of the study.
4. **Methodology:** Describe how data was collected (tools, techniques, sampling methods).
5. **Description of Study Area:** Provide background information about the area (location, climate, topography, etc.).
6. **Presentation of Data:** Use tables, charts, maps, and photographs to present findings.
7. **Analysis and Interpretation:** Analyze data, identify patterns, and interpret results in context.
8. **Discussion:** Compare findings with previous studies; discuss implications and limitations.
9. **Conclusion:** Summarize key findings and relate them to objectives.
10. **Recommendations:** Suggest measures for improvement, management, or further study.
11. **References:** List all sources, books, articles, and websites consulted.
12. **Appendices:** Attach questionnaires, raw data, maps, and additional material, if any.

## Course Outcome:

**By the end of this course, students will be able to:**

- CO1: Understand and explain the objectives and procedures involved in conducting geographical field visits.
- CO2: Design questionnaires and data collection sheets for systematic gathering of primary data in field studies.
- CO3: Apply field techniques using instruments such as GPS, compass, and surveying tools for collecting geographical data.
- CO4: Analyze field data through observation, interviews, mapping, and interpretation of physical and human geographical features.
- CO5: Prepare a structured and well-documented field visit report by organizing, interpreting, and presenting collected data effectively.

### Format of Field Visit Diary Department of Geography

Sr. No.	Content	Brief Information
1.	Name of the Student	
2.	Roll No.	
3.	Name of the College	
4.	Title for field visit / field visit report	
5.	Name of the Subject Teacher	
6.	Date of field visit	
7.	Objective of field visit	➤ ➤ ➤
8.	Name of the study area	
9.	Key Geographical features of study area	
10.	Time wise scheduled of field visit Date: _____ to _____ am/pm _____ to _____ am/pm	Brief activity details _____ _____



**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	:	B.Sc.(Geography)
<b>Class</b>	:	T. Y. B. Sc.
<b>Semester</b>	:	V
<b>Name of Vertical Group</b>	:	<b>Minor</b>
<b>Course Code</b>	:	<b>GEO(S) - 341 - MN</b>
<b>Course Title</b>	:	<b>Introduction to Oceanography</b>
<b>Type of course</b>	:	Theory
<b>Total Credits</b>	:	02
<b>Workload</b>	:	(15 hours/ credit) 2 credits x 15 hours = 30 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, scope, and significance of Oceanography and develop understanding of the distribution and characteristics of oceans and seas.
2. To develop knowledge about ocean floor relief, properties and movements of ocean water, and their influence on Earth's environmental systems.
3. To create awareness regarding marine environmental issues, oceanic phenomena, and sustainable coastal and marine resource management practices.

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to Oceanography	i. Meaning, nature and scope of Oceanography ii. Branches of Oceanography iii. Distribution of land and water on the Earth iv. Major oceans and seas of the world	8
2.	Ocean Floor Relief	i. Relief features of ocean floor: Continental shelf, continental slope, abyssal plain, oceanic trenches and mid-oceanic ridges ii. Coral reefs: Types	7
3.	Movement and Properties of Ocean Water	i. Waves and tides: causes and characteristics ii. Temperature of ocean water and factors affecting ocean water temperature iii. Salinity: distribution and controlling factors iv. Ocean currents: causes and types	8
4	Marine Resource Management	i. El-Nino and La-Nina phenomena ii. Marine pollution and coastal environmental problems iii. Sustainable Integrated Coastal Zone Management (ICZM)	7

**Course Outcomes:**

**By the end of this course, student will be able to:**

CO1: Explain the meaning, nature, scope, and branches of Oceanography along with the distribution of land and water on the Earth.

- CO2: Describe and interpret the major relief features of the ocean floor and classify different types of coral reefs.
- CO3: Analyze the movements and physical properties of ocean water including waves, tides, temperature, salinity, and ocean currents.
- CO4: Evaluate the causes and impacts of oceanic phenomena such as El-Nino and La-Nina on climate and marine environments.
- CO5: Assess marine pollution, coastal environmental problems, and the significance of Integrated Coastal Zone Management (ICZM) for sustainable marine resource management.

## References:

1. Oceanography: Savindra Singh, Well-known Indian Geography text covering ocean processes, currents, tides, SST, and human-environment interactions - suitable for undergraduate studies.
2. समुद्र विज्ञान (Oceanography): D. S. Lal (Hindi), introductory book on oceanography concepts in Hindi, useful for foundational learning.
3. Samudra Vigyan (Oceanography): Govind Shardendu (Hindi), Another Hindi textbook focusing on basic oceanography topics.
4. Samudra Vidya (Oceanography): Ajit Kumar Shil, Concise Indian text on Oceanography fundamentals.
5. The Indian Ocean: Fundamentals of Marine Geology, Physics and Chemistry: Sridhar D. Iyer, Victor J. Loveson, Prasanna S. Kumar & V. V. S. S. Sarma, Focuses on Indian Ocean dynamics, geology, chemistry, and physical processes - valuable for Unit 2 and SST/climate topics.
6. Hand Book of Oceanography (2 Vols.) by Indian Contributors, Comprehensive reference covering multiple oceanography branches with Indian and global examples.
7. Marine Ecology & Oceanography in India: Various Indian Authors (Often edited collections or university texts) Useful for marine ecosystems, human impacts, and environmental management sections.
8. Books by Indian Oceanographers (for deeper reading / case studies) Publications by Aditi Pant - insights on marine algae, coastal ecosystems, and Indian Ocean research.
9. Marine Biology & Oceanography in Indian Context: Edited volumes and lecture notes from Indian universities Useful for SDG 14, biodiversity, and sustainability discussions.
10. Coastal Zone Management in India: Issues & Perspectives: Indian authors/edited book Focuses on ICZM policy issues and sustainability planning (helps Unit-3 policy learning).
11. Introduction to Physical Oceanography: *Robert H. Stewart* - physics of currents, waves, tides, SST and climate.
12. Descriptive Physical Oceanography: Lynne D. Talley et al- detailed modern text on ocean structures and dynamics.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Core</b>
<b>Course Code</b>	∴	<b>GEO(S) - 351 - MJ</b>
<b>Course Title</b>	∴	<b>Principles of Economic Geography</b>
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	04
<b>Workload</b>	∴	(15 hours/ credit) 4 credits x 15 hours = 60 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, scope, evolution, and approaches of Economic Geography as a discipline.
2. To develop an understanding of economic activities, levels of economic development, and major models of economic growth and land-use patterns.
3. To analyze the spatial distribution of agriculture, industry, trade, and transport systems and their role in economic development.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction Economic Geography	i. Meaning, Nature and Scope ii. Evolution and Development iii. Branches of Economic Geography	10
2.	Economic Development	i. Concept of Economic Development ii. Levels of Economic Development (Developed, Developing and Underdeveloped Countries) iii. Rostow's Model of Economic Growth	10
3.	Agriculture	i. Meaning and Types of Agriculture (Commercial grain farming, Plantation, Mixed farming) ii. Determinants of Agriculture (Physical, Economic, Social, Technological, Political and Biological) iii. Von Thunen's Model of Agricultural Land Use iv. Agricultural Technology: Irrigation	12
4.	Industry	i. Meaning and Classification of Industries ii. Factors affecting on Industrial Location iii. Weber's Theory of Industrial Location iv. Major Industries: Textile, Automobile, IT	12

Topic No	Topic Name	Sub Topic	No. of Hours
5.	Transportation	i. Transport: Factors Affecting Transportation ii. Modes of Transport iii. Major World Transport Routes	8
6.	Trade	i. Trade: Meaning and Factors Affecting Trade ii. Types of Trade and Balance of Trade iii. WTO & Trade Blocs (SAARC, BRICKS, ASIAN)	8

### Course Outcomes:

**By the end of this course, student will be able to:**

**CO1:** Explain the meaning, nature, scope, and development of Economic Geography along with its major branches and approaches.

**CO2:** Describe and analyze the concept of economic development, levels of development, and models such as Rostow's Model of Economic Growth.

**CO3:** Interpret agricultural systems and evaluate the factors affecting agriculture along with models like Von Thünen's agricultural land use model.

**CO4:** Analyze industrial location theories and explain the distribution and characteristics of major industries such as iron and steel, textile, automobile, and IT industries.

**CO5:** Evaluate trade and transport systems, including factors affecting trade, modes of transport, WTO, and major trade blocs such as SAARC, BRICS, and ASEAN.

### References:

- Alexander, J. W. (1963): *Economic Geography*. Prentice Hall of India.
- Coe, N. M., Kelly, P. F., & Yeung, H. W. C. (2020): *Economic Geography: A Contemporary Introduction* (3rd ed.) Wiley-Blackwell.
- Gautam, A. (2010): *Geography of Resources: Exploitation, Conservation and Management*. ShardaPustakBhawan.
- Grigg, D. (1995): *An Introduction to Agricultural Geography*. Routledge.
- Hartshorn, T. N., & Alexander, J. W. (1988): *Economic Geography*. Prentice-Hall of India.
- Husain, M. (2008): *Geography of India*. Tata McGraw Hill.
- Khullar, D. R. (2010): *India: A Comprehensive Geography*. Kalyani Publishers.
- Leong, G. C., & Martin, E. (1974): *Human and Economic Geography*. Oxford University Press.
- Pandey, P. N., & Fernandes, M. R. (2000): *General Geography of India*. NiraliPrakashan.
- Paranjape, Gupte, & Karmarkar. (1974): *Economic and Commercial Geography*. NiraliPrakashan.
- Robinson, H. (1978): *Geography of Transport*. Macdonald & Evans.

12. Sharma, T. C., & Coutinho, O. C. (1983): *Economic and Commercial Geography of India*. Vikas Publishing House.
13. Siddhartha, K. (2020): *Economic Geography: Theories, Process and Patterns*. KitabMahal.
14. Singh, J., & Dhillon, S. S. (2004): *Agricultural Geography*. Tata McGraw-Hill.
15. Warf, B. (Ed.): (2010): *Encyclopedia of Geography*. SAGE Publications.
16. Weber, A. (1929): *Theory of the Location of Industries*. University of Chicago Press.
17. World Trade Organization (WTO): Annual Reports. (Current data for Unit V: Trade Blocs and WTO)
18. आरेकर आर आणि .डी .अंकुश बी व्यापारी :(२०१३) आहेर .भूगोल, अथर्व प्रकाशन, पुणे .
19. चौधरी शं.रा., शिंदे बा.द., चव्हाण मि आणि .भा.देशमुख भा भूगोलाशास्त्राची :(१९९४) .व.मुलतत्वे, हिमालया पब्लिशिंग हाउस, मुंबई.
20. पदेप्रभावती वाणिज्य :भूगोल, निराली प्रकाशन, पुणे .
21. मुसमाडे अ .,ह .वाणी बा .,क .बिराजदार रा .त्र् .आणि भैलुमे सं. अ : (२०२१)आर्थिक भूगोल ,२ - निराली प्रकाशन, पुणे .

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Core</b>
<b>Course Code</b>	∴	<b>GEO(S) - 352 - MJ</b>
<b>Course Title</b>	∴	<b>Natural Resource Management</b>
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	04
<b>Workload</b>	∴	(15 ours/ credit) 4 credits x 15 hours = 60 hours in semester

**Objectives of the Course:**

1. To understand the concept, classification, and distribution of natural resources and their significance in human–environment interaction.
2. To analyze issues related to the use, degradation, conservation, and management of land, water, forest, mineral, and energy resources.
3. To develop an understanding of sustainable resource management practices with special reference to India and environmental policy frameworks.

**Topics and Learning Points:**

<b>Topic No.</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1	Fundamentals of Resource Management	i. Concept, meaning, and classification of resources ii. Resource use and human–environment relationship iii. Sustainable development: concept and goals iv. Role of geography in resource management	15
2	Land and Water Resource Management	<b>i. Land Resources</b> a) Land-use and land-cover changes b) Land degradation: soil erosion, salinity, desertification c) Land conservation and management strategies <b>ii. Water Resources</b> a) Sources of water b) Water scarcity and water pollution c) Water conservation and water resource management	15
3	Forest, Mineral and Energy Resource Management	<b>Forest Resources</b> a) Types of forests b) Deforestation: causes and impacts c) Social forestry and joint forest management <b>Mineral and Energy Resources</b> a) Types and distribution of mineral resources (Iron ore, Bauxite, Copper) b) Environmental impacts of mining c) Conventional energy resources (Coal and oil) d) Non-conventional and renewable energy resources (Solar energy and wind energy)	15

Topic No.	Topic Name	Sub Topic	No. of Hours
4	Environmental Issues and Resource Management	i. Major global environmental problems: climate change, global warming, iii. Resource degradation: causes, impacts and consequences of over-exploitation of natural resources v. Environmental conservation measures: policies, community participation and sustainable management practices in India	15

### Course Outcomes:

**By the end of this course, student will be able to:**

- CO1:** Explain the concept, classification, and importance of natural resources and their role in human–environment relationships.
- CO2:** Analyze land and water resource issues including land-use change, land degradation, water scarcity, and their management strategies.
- CO3:** Evaluate forest, mineral, and energy resource distribution and assess the environmental impacts of their exploitation.
- CO4:** Analyze human resource development and environmental issues such as population pressure, pollution, climate change, and biodiversity loss.
- CO5:** Apply knowledge of sustainable resource management to evaluate Indian case studies and recommend appropriate conservation and policy measures.

### References:

1. Singh, S. (2008): *Environmental Geography*, Prayag Pustak Bhawan, Allahabad.
2. Gautam, A. (2010): *Environmental Geography*, Sharda Pustak Bhawan, Allahabad.
3. Singh, R. B. (1998): *Environmental Geography*, Heritage Publishers, New Delhi.
4. Saxena, H. M. (2001): *Environmental Geography*, Rawat Publications, Jaipur.
5. Singh, L. R. (2009): *Fundamentals of Environmental Geography*, Sharda Pustak Bhawan, Allahabad.
6. Miller, G. T. & Spoolman, S. (2012): *Environmental Science*, Cengage Learning, USA.
7. Odum, E. P. (1996): *Ecology and Our Endangered Life Support Systems*, Sinauer Associates, USA.
8. Chandna, R. C. (2010): *Environmental Geography*, Kalyani Publishers, New Delhi.
9. Centre for Science and Environment (CSE) (Latest Edition): *State of India's Environment Report*, New Delhi.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Core</b>
<b>Course Code</b>	∴	<b>GEO(S) - 353 - MJP</b>
<b>Course Title</b>	∴	<b>Practicals in Applied Techniques in Spatial Analysis</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	04
<b>Workload</b>	∴	(30 hours/ credit) 4 credits x 30 hours = 120 hours in semester

**Topics and Learning Points:**

1. To introduce students to the fundamental concepts and techniques of geographical analysis using Survey of India (SOI) toposheets and spatial data tools.
2. To develop skills in toposheet interpretation, spatial data generation, and application of open-source GIS software for geographical analysis.
3. To provide an understanding of statistical techniques, hypothesis testing, and field-based practical approaches in geographical studies.

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction of S.O.I. Toposheet and Relief Representation	i. Indexing of Toposheets ii. Introduction to new Indexing System of SOI iii. Introduction of Survey of India Toposheets: Marginal Information, Conventional Signs and Symbols used in Toposheets.	20
2.	Interpretation of S.O.I. Toposheets	i. Interpretation of SOI toposheets for physical and cultural features in plain, plateau, and mountainous regions (minimum one toposheet from each region) ii. Drawing and tracing of physical and cultural features from toposheets	30
3.	Correlation analysis	i. Concept of Correlation and Regression: ii. Concept of Bivariate correlation and regression iii. Coefficient correlation (Minimum two examples) iv. Parametric and Non-parametric test: Chi square test, Spearman Rank Order Correlation (Minimum two examples for each test )	30
4.	Testing and Application of Hypothesis	i. Meaning, Definition and Types of Hypotheses and Characteristics of Hypothesis :Null and Alternative Hypothesis, Level of Significance, Degrees of Freedom ii. Application of hypothesis testing in geographical analysis	30
5.	Field Excursion	Short tour of two days duration and preparation of tour report <b>OR</b> Long tour of more than five days duration anywhere in India and preparation of tour report	10

## Course Outcomes:

**By the end of this course, student will be able to:**

- CO1:** Explain the basic concepts of SOI toposheets, marginal information, conventional symbols, and map indexing systems.
- CO2:** Interpret and analyze SOI toposheets of plain, plateau, and mountainous regions for geographical understanding.
- CO3:** Apply spatial data generation techniques such as geo-referencing, digitization, and clipping using open-source GIS software.
- CO4:** Analyze and test geographical data using statistical methods including hypothesis testing, correlation, regression, chi-square test, and Spearman rank correlation.
- CO5:** Conduct field-based studies or surveys and prepare systematic reports by integrating observational and analytical geographical techniques.

## References:

1. Ahirrao, D. Y. and Karanjkehele, E.K., 2002. Pratyakshik Bhugol, Sudarshan Publication, Nashik.
2. Buoygoot, J. 1964., An Introduction to Map work and Practical Geography, University Tutorial, London.
3. Burrough, P. A., and McDonnell, R. A., 2000. Principles of Geographical Information System, Oxford University Press.
4. Curran, P. 1989. Principles of Remote Sensing, Logman, London.
5. Dickinson, G.C., 1979, Maps and Air Photographs, Arnold Publisher, New Delhi.
6. Dr.P.G.Saptrashi and Dr.S.R.Jog., 1991, Statistical Methods (Marathi)
7. Ebdon, D., 1977. Statistics in Geography: A Practical Approach, Basil Blackwell, Oxford.
8. Kumbhar, A., 2000. Pratyakshik Bhugol, Sumeru Publications, Mumbai.
9. Lillesand, T. M. and Kiefer, R.W., 2002. Remote Sensing and Image Interpretation, John Wiley and Sons, New Delhi.
10. Lutgens, F. K. and Tarbuck, E.J., 2007. The Atmosphere. Prentice hall, Englewood Cliffs, New Jersey, USA.
11. Monkhouse, F.J. and Wilkinson, H. R. 1971. Maps and Diagrams. Methuen and Co. Ltd. London, UK.
12. Ramamurthy, K., 2006. Map Interpretation, Rex Printers, Madras.
13. Siddhartha, K., 2006. Geography through Maps, Kisalaya Publication, Pvt. Ltd, New Delhi.
14. Singh L. R. and Singh R., 1973. Map Work and Practical Geography, Central Book Depot, Allahabad.
15. Singh R. L. and Dutt, P.K., 1968. Elements of Practical Geography, Students Friends, Allahabad.
16. Singh R. L., 2005. Elements of Practical Geography. Kalyani Publishers, New Delhi.
17. Singh, G., 2005. Map Work and Practical Geography, Vikas Publishing House Pvt. Ltd., New Delhi.
18. Strahler, A. A. and Strahler, A. N., 2002. Physical Geography Science and Systems of the Human Environment, John Wiley & Sons, INC.
19. Strahler, A. H. and Strahler, A. N., 1992. Modern Physical Geography John. Wiley & Sons, INC.
20. डॉ. काळे व्ही.बी. , २०२१, प्रात्यक्षिक भूगोल, प्रशांत पब्लिकेशन, जळगाव.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Elective</b>
<b>Course Code</b>	∴	<b>GEO(S) - 360- MJ</b>
<b>Course Title</b>	∴	<b>Geography of Disaster Management</b>
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(15hours/ credit) 2 credits x 15 hours = 30 hours in semester

**Objectives of the Course:**

1. To provide a basic conceptual understanding of disasters, hazards, risk, and vulnerability in both natural and man-made contexts.
2. To understand the principles, policies, and cycle of disaster management along with mitigation and response mechanisms.
3. To develop skills in disaster preparedness, awareness, and the use of modern technologies such as GIS, Remote Sensing, and IT in disaster management.

**Topics and Learning Points:**

<b>Topic No.</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1	Introduction to Disaster Management	i. Meaning and definition of disaster management ii. Concepts of hazard, disaster, risk, and vulnerability iii. Classification of disasters: natural and man-made disasters iv. Major natural disasters: floods, cyclones, landslides, tsunami, v. Major man-made disasters: industrial accidents, toxic waste water disposal	12
2	Disaster Risk Reduction and Management	i. Principles of disaster management ii. Disaster management cycle: mitigation, preparedness, response, recovery iii. Disaster management policies and institutional framework in India (NDM-NDRF, SDMA-SDRF) iv. Early warning systems and disaster preparedness strategies v. Role of community participation in disaster risk reduction	12

Topic No.	Topic Name	Sub Topic	No. of Hours
3	Tools and Approaches in Disaster Management	i. Role of GIS and Remote Sensing in disaster management ii. Training, awareness programmes, and mock drills iii. Sustainable approaches for disaster management and resilience building	06

### Course Outcomes:

#### By the end of this course, student will be able to:

- CO1: Explain the concepts of disaster, hazard, risk, vulnerability, and classify natural and man-made disasters.
- CO2: Describe the disaster management cycle, principles of disaster management, and the role of national and state disaster management bodies.
- CO3: Analyze various natural and human-induced disasters and their impacts on the environment and society.
- CO4: Evaluate disaster mitigation and management techniques including early warning systems and policy frameworks.
- CO5: Apply GIS, Remote Sensing, and information technology tools for disaster preparedness, response, and awareness programs.

### References:

- Gupta, A. K., Niar, S. S. & Chatterjee, S. (2013): *Disaster Management and Risk Reduction: Role of Environmental Knowledge*, Narosa Publishing House, New Delhi.
- Murthy, D. B. N. (2012): *Disaster Management*, Deep & Deep Publications Pvt. Ltd., New Delhi.
- More, J. C. & Musmade, A. H. (2021): *Geography of Disaster Management*, Nirali Prakashan, Pune.
- National Disaster Management Authority (NDMA) (2005, and updated editions): *Disaster Management Guidelines*, Government of India, New Delhi.
- Carter, N. (2008): *Disaster Management: A Disaster Manager's Handbook*, Asian Development Bank, Manila.
- Coppola, D. P. (2015): *Introduction to International Disaster Management*, Elsevier, USA.
- Sharma, V. K. (2013): *Disaster Management*, I.K. International Publishing House, New Delhi.
- Singh, R. B. (2006): *Natural Hazards and Disaster Management*, Rawat Publications, Jaipur.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Elective</b>
<b>Course Code</b>	∴	<b>GEO(S) - 361- MJ</b>
<b>Course Title</b>	∴	<b>Geoinformatics -II</b>
<b>Type of course</b>	∴	Theory
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(15hours/ credit) 2 credits x 15 hours = 30 hours in semester

**Objectives of the Course:**

1. To introduce the fundamental concepts, principles, and development of Remote Sensing as an essential component of Geoinformatics.
2. To develop an understanding of electromagnetic radiation, spectral signatures, satellite platforms, sensors, and their applications in Earth observation.
3. To familiarize students with the Indian Remote Sensing Programme and enable interpretation of satellite data for geographical analysis.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to Remote Sensing	Definitions, Concepts, History, Developmental Stages, Types, Satellite data, Aerial Photography, Applications of Remote Sensing (RS)	1.
2.	Electromagnetic Radiation (EMR) and Spectral Signature	a) EMR: Characteristics, EMR Spectrum, Blackbody, Radiation Laws b) Interaction with Earth's Atmosphere: Reflection, Absorption, Transmission, Scattering and Refraction., Atmospheric Window c) Spectral Signature for: Snow, Soil, Water and Vegetation	2.
3.	Platforms, Sensors and Indian Remote Sensing Satellites	a) Platforms: Types of Platforms b) Sensors and Orbits: Types of Sensors- Active and Passive, Satellite Orbits c) Indian Remote Sensing Program, Satellite Series, Sensors and Resolution	3.

## Course Outcomes:

### By the end of this course, student will be able to:

- CO1: Explain the basic concepts, definitions, history, development stages, and applications of Remote Sensing in geographical studies.
- CO2: Describe the characteristics of Electromagnetic Radiation (EMR), EMR spectrum, and laws governing radiation, and interpret their role in remote sensing.
- CO3: Analyze the interaction of electromagnetic radiation with the Earth's atmosphere including reflection, absorption, scattering, transmission, and atmospheric windows.
- CO4: Identify and interpret spectral signatures of major Earth features such as snow, soil, water, and vegetation for remote sensing applications.
- CO5: Classify different types of platforms, sensors, and satellite orbits, and evaluate the Indian Remote Sensing Programme and its satellite systems.

## References:

1. Campbell, J. B. (2002): *Introduction to Remote Sensing*, Taylor & Francis, London.
2. Jensen, J. R. (2005): *Introductory Digital Image Processing: A Remote Sensing Perspective*, Prentice Hall, New Jersey.
3. Joseph, G. (2004): *Fundamentals of Remote Sensing*, Universities Press, Hyderabad.
4. Lillesand, T. M., Kiefer, R. W. & Chipman, J. W. (2015): *Remote Sensing and Image Interpretation*, Wiley, USA.
5. Anji Reddy, M. (2008): *Textbook of Remote Sensing and Geographic Information Systems*, B.S. Publications, Hyderabad.
6. Sabins, F. F. (1997): *Remote Sensing: Principles and Interpretation*, W.H. Freeman and Company, USA. Floyd, F. S. (2012): *Remote Sensing of the Environment: An Earth Resource Perspective*, Pearson Education.
7. Curran, P. J. (1985): *Principles of Remote Sensing*, Longman, London.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Elective</b>
<b>Course Code</b>	∴	<b>GEO(S) - 362- MJP</b>
<b>Course Title</b>	∴	<b>Practicals in Applied Economic Geography</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(30hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Topics and Learning Points:**

1. To introduce students to quantitative and statistical techniques used in agricultural, industrial, trade, and transport geography for spatial analysis.
2. To develop skills in analyzing agricultural patterns, industrial concentration, and economic activities using appropriate statistical methods and indices.
3. To enable students to evaluate trade systems and transport networks through mathematical models and network analysis techniques for geographical interpretation.

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Agriculture	a) Crop Combination Analysis: Doi's Method b) Crop Concentration: Location Quotient Method	20
2.	Industry	a) Industrial Concentration: Location Quotient Method b) Coefficient of Localization: Edgar M. Hoover Method c) Industrial Intensity Index	20
3.	Trade & Transport	a) Calculation of breaking-point of trade between two cities: based on Converse's Model b) Transportation Network Efficiency: Detour Index c) Network Analysis: Beta Index, Alpha Index, Gamma Index, Cyclomatic Number	20

## Course Outcomes:

**By the end of this course, student will be able to:**

- CO1:** Apply quantitative and statistical methods such as crop combination and location quotient to analyze agricultural spatial patterns.
- CO2:** Analyze industrial distribution and concentration using appropriate indices such as location quotient, coefficient of localization, and industrial intensity index.
- CO3:** Evaluate spatial organization of economic activities through interpretation of agricultural and industrial data using statistical techniques.
- CO4:** Apply mathematical and model-based approaches such as Converse's breaking-point model to assess trade relationships between regions.
- CO5:** Analyze transport networks using network indices like Beta, Alpha, Gamma, Cyclomatic number and detour index for understanding connectivity and efficiency.

## References:

1. Alexander, J. W. (1963): Economic Geography. Prentice Hall of India.
2. Berry, B. J. L. (1972): Geography of Market Centers and Retail Distribution. Prentice Hall.
3. Clarke, J. I. (1998): Statistical Methods in Geography. Prentice Hall.
4. Coe, N. M., Kelly, P. F., & Yeung, H. W. C. (2020): Economic Geography: A Contemporary Introduction. Wiley-Blackwell.
5. Gautam, A. (2010): Geography of Resources: Exploitation, Conservation and Management. Sharda Pustak Bhawan.
6. Grigg, D. (1995): An Introduction to Agricultural Geography. Routledge.
7. Haggett, P., & Chorley, R. J. (1969): Network Analysis in Geography. Edward Arnold.
8. Hartshorn, T. N., & Alexander, J. W. (1988): Economic Geography. Prentice-Hall of India.
9. Husain, M. (2008): Economic Geography. Rawat Publications.
10. Husain, M. (2008): Geography of India. Tata McGraw Hill.
11. Husain, M. (2014): Systematic Agricultural Geography. Rawat Publications.
12. Isard, W. (1960): Methods of Regional Analysis. MIT Press.
13. Leong, G. C., & Martin, E. (1974): Human and Economic Geography. Oxford University Press.
14. Khullar, D. R. (2010): India: A Comprehensive Geography. Kalyani Publishers.
15. Robinson, H. (1978): Geography of Transport. Macdonald & Evans.
16. Siddhartha, K. (2014): Economic Geography. Kisalaya Publications.
17. Singh, J., & Dhillon, S. S. (2004): Agricultural Geography. Tata McGraw-Hill.
18. Singh, R. L., & Maurya, S. D. (2003): A Textbook of Practical Geography. Concept Publishing Company.
19. Warf, B. (Ed.): (2010): Encyclopaedia of Geography. SAGE Publications.
20. Weber, A. (1929): Theory of the Location of Industries. University of Chicago Press.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Major Elective</b>
<b>Course Code</b>	∴	<b>GEO(S) - 363- MJP</b>
<b>Course Title</b>	∴	<b>Practicals in Remote Sensing</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(30hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Objectives of the Course:**

1. To introduce students to satellite data, aerial photographs, and various geo-platforms for downloading and accessing remote sensing datasets.
2. To develop practical skills in using open-source remote sensing software for image processing and spatial data analysis.
3. To enable students to apply digital image processing and classification techniques for generating thematic maps and land use/land cover (LULC) analysis.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to Open-Source image processing Software's	i. Satellite Data/Imageries, Aerial Photographs ii. Downloading satellite images through Indian Geo-platform of ISRO (e.g. Bhuvan, Bhoonidhi) and Sentinel, and USGS platforms iii. Open-Source Software's: QGIS, SAGA GIS, Google Earth Engine etc	15
2.	Image Processing	i. Loading of Image ii. Georeferencing/Rectification iii. Conversion of Images iv. Image Enhancement v. Layer stacking	15
3.	LULC and Layout / Mapping	a) By using Open-source RS software's classify the satellite images by Applying following methods/techniques. i. Supervised Classification ii. Unsupervised Classification b) Layout Creation: Location Map, LULC Map	30

## Course Outcomes:

**By the end of this course, student will be able to:**

- CO1:** Explain different types of satellite data, aerial photographs, and methods of downloading satellite imageries from geo-platforms such as Bhuvan, Bhoonidhi, Sentinel, and USGS.
- CO2:** Demonstrate the use of open-source remote sensing software such as QGIS, SAGA GIS, and Google Earth Engine for spatial data handling and analysis.
- CO3:** Perform digital image processing operations including image loading, enhancement, layer stacking.
- CO4:** Apply supervised, unsupervised, classification techniques for land use/land cover (LULC) mapping.
- CO5:** Generate thematic maps such as LULC maps, change detection maps, and location maps with proper cartographic layout and presentation.

## References:

1. Richards, J. A, Jia, X. (1999): Remote Sensing and Digital Image Processing, Springer, Verlag Berlin
2. Cha, B., Dattaa, D., Majumdar (2001): Digital Image Processing Analysis, Prentice- Hall of India, New Delhi
3. Joseph, G. (2004): Fundamentals of Remote Sensing, Universities Press, Hyderabad, India
4. [https://docs.qgis.org/3.40/en/docs/training\\_manual/index.html](https://docs.qgis.org/3.40/en/docs/training_manual/index.html)
5. <https://sagatutorials.wordpress.com/training-manual/>
6. <https://developers.google.com/earth-engine/tutorials/community/beginners-cookbook>

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Vocational Skill Course</b>
<b>Course Code</b>	∴	<b>GEO(S) - 371- VSC</b>
<b>Course Title</b>	∴	<b>Practicals Applied Tourism Planning</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(30hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Objectives of the Course:**

1. To provide practical knowledge and hands-on skills in tour planning, tour management, and tourism operations.
2. To familiarize students with essential documentation, booking procedures, and digital tools used in tourism planning and management.
3. To develop competencies in destination assessment, carrying capacity analysis, and preparation of sustainable tourism development plans.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	Introduction to Tour Planning	i. Meaning and Importance of Tour Planning ii. Types of Tours (Domestic, International, Cultural, Adventure, and Eco-tourism). iii. Components of Itinerary (Route, Duration, Cost, Attractions). iv. Principles of Itinerary Preparation. v. Preparation of Simple One Day Tour Plan vi. (Local Area Practical)	15
2.	Tour Packages	i. Elements of Tour Cost (Transport, Accommodation, Food, and Entry Fees). ii. Preparation of Cost Sheet for Tour Package. iii. Practical Exercise: Prepare Budget for 2–3 Days Tour.	15
3.	Travel Documentation	i. Basic Travel Documents (ID Proof, Tickets, Permits). ii. Introduction to Passport and Visa Process. iii. Modes of Transport Booking (Railway, Air, Bus). iv. Hotel Booking Procedures (Online/Offline).	15
4.	Planning and visit	Preparation of one short or long international, national/Local tour plan. Study tour Report Writing.	15

## Course Outcomes:

By the end of this course, students will be able to:

- CO1:** Understand the concept, importance, and types of tour planning including domestic, international, cultural, adventure, and eco-tourism.
- CO2:** Explain the components and principles of itinerary preparation and prepare simple one-day and local tour plans.
- CO3:** Identify the elements of tour costing and prepare cost sheets and budgets for different tour packages.
- CO4:** Understand basic travel documentation such as ID proof, passport, visa, tickets, and permits required for travel.
- CO5:** Demonstrate knowledge of transport and hotel booking procedures through online and offline modes

## References:

1. Bansal, S. K. (2003), Tourism Management, Kalyani Publishers, New Delhi.
2. Gunn, Clare A. & Var, Turgut (2002), Tourism Planning: Basics, Concepts and Cases, Routledge, London.
3. Inskip, Edward (1991), Tourism Planning: An Integrated and Sustainable Development Approach, Van Nostrand Reinhold, New York.
4. Kamra, K. K. (2008), Basics of Tourism, Kanishka Publishers, New Delhi.
5. Muluk, Doke, Musmade, More(2021), Geography of Tourism–II, Nirali Publication, Pune.
6. Pacharne, Patil, Suryavanshi, Chaudhar (2014) Tourism Geography, Atharv Publication.
7. Puranaik, Manjunath (2010), Tourism Planning and Development, Himalaya Publishing House, Mumbai.
8. Ratti, Manish (2005), Tourism Planning and Development, Rajat Publications, New Delhi.
9. Sharma, K. K. (2004), Planning for Tourism, Sarup & Sons, New Delhi.
10. Sinha, Prabhas Chandra (1998), Tourism Planning, Anmol Publications Pvt. Ltd., New Delhi.
11. Tourism Development: Principles and Practices – Bhatia, A. K. (2002), Revised Edition, Sterling Publishers Private Limited, New Delhi.
12. Xie, Philip F. (2015), Handbook on Tourism Planning, Edward Elgar Publishing, Cheltenham, UK.

## Web References:

1. UNWTO (World Tourism Organization): <https://www.unwto.org>
2. Ministry of Tourism India: <https://tourism.gov.in>
3. Maharashtra Tourism Development Corporation: <https://www.maharashtratourism.gov.in>
4. MakeMyTrip: <https://www.makemytrip.com>
5. IRCTC: <https://www.irctc.co.in>
6. Tripadvisor: <https://www.tripadvisor.in>
7. Booking.com: <https://www.booking.com>
8. Lonely Planet: <https://www.lonelyplanet.com>

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	∴	B.Sc.(Geography)
<b>Class</b>	∴	T. Y. B. Sc.
<b>Semester</b>	∴	VI
<b>Name of Vertical Group</b>	∴	<b>Vocational Skill Course</b>
<b>Course Code</b>	∴	<b>GEO(S) - 372- VSC</b>
<b>Course Title</b>	∴	<b>Modern Surveying Techniques</b>
<b>Type of course</b>	∴	Practical
<b>Total Credits</b>	∴	02
<b>Workload</b>	∴	(30hours/ credit) 2 credits x 30 hours = 60 hours in semester

**Objectives of the Course:**

1. To integrate modern GNSS (GPS) and GIS workflows for accurate spatial data collection, positioning, and mapping.
2. To develop practical skills in field surveying techniques including measurement of distance, angles, elevation, and positional data using advanced instruments.
3. To introduce students to photogrammetry, total station, and drone-based surveying techniques for modern geographical analysis and mapping applications.

**Topics and Learning Points:**

<b>Topic No</b>	<b>Topic Name</b>	<b>Sub Topic</b>	<b>No. of Hours</b>
1.	GNSS and GPS	A. Introduction of GNSS and GPS B. Segments of GPS – i) Control segment, ii) Space segment, iii) User Segment C. GNSS System - IRNSS, GPS Perform field setup and operation of a GPS receiver to record way points, track logs, latitude–longitude–elevation data, set datum and projection, download observations, and prepare a basic map using the Global Positioning System (GPS) data.	20
2.	Theodolite Surveying	A. Components and common terms B. Types of Theodolite C. Procedure of the Theodolite Survey D. Measurement of Angles and Plotting E. Methods of Theodolite Surveying: Triangular & Traverse.	20

Topic No	Topic Name	Sub Topic	No. of Hours
3.	Introduction to Total Station, & Drone Survey	<p><b>A. Total Station</b></p> <p>a. Instrument components and setup</p> <p>b. Remote distance measurement (RDM) and Elevation (REM)</p> <p>c. Coordinates take-out and data downloading workflows</p> <p><b>B. Drone Survey</b></p> <p>a. Introduction, Types of Drone and Sensors.</p> <p>b. Role of Aerial Surveying and Mapping</p> <p>c. Flight planning, Ground Control Points(GCPs), aerial image capturing techniques, safety precautions, and basics of photogrammetry with orthomosaic generation.</p>	20

### Course Outcomes:

#### By the end of this course, student will be able to:

- CO1: Explain the concepts, segments, and applications of GNSS and GPS systems for spatial data collection and navigation.
- CO2: Apply GPS techniques to record waypoints, track logs, and generate maps using latitude, longitude, elevation, and projection data.
- CO3: Demonstrate field surveying methods using theodolite for measuring angles, distances, and preparing simple survey plots.
- CO4: Analyze and operate modern surveying instruments such as total station for coordinate measurement, data collection, and map generation.
- CO5: Apply drone-based surveying and photogrammetry techniques for aerial mapping, including flight planning, GCP identification, and orthomosaic generation.

### References:

1. Advanced Surveying: Total Station, GPS, GIS, and Remote Sensing by Satheesh Gopi (Pearson Education) – Excellent for modern instrument workflows.
2. Essentials of GPS, Agarwal, N. K., B S Publications.
3. Gopi S, R. Sathikumar, N. Madhu. 2018. Advances Surveying: Total Station, GPS, GIS and Remote Sensing, Person India Education Services Pvt. Ltd, Noida, Uttar Pradesh, India.
4. Introduction to Surveying and Geomatics Engineering by P. K. Garg (C B S Publishers) – Focuses on digital data acquisition and geomatics
5. Jeff, H.(1995).Differential GPS Explained, Trimble Navigation
6. Lawrence, L., & Alex, L. (2008). GPS Made Easy: Using Global Positioning Systems in the Outdoors. Calgary: Rocky Mountain Books.
7. Maslov, AV., Gordeev, A.V. and Batrakov, Yu.G. (1984): Geodetic surveying, Mir Publishers, Moscow.

8. Mohanty, S.N. Ravindra J.V.R. Narayana G.S. Pattnaik C.R. Sirajudeen Y.M., 2023. Drone Technology Future Trends and Practical Applications, Jhon Wiley & Sons Inc., USA.
9. Mohinder, S. G., Lawrence, R. W., & Angus, P. A.(2001).Global Positioning Systems, Inertial Navigation and Integration, New York: John Wiley and Sons Inc.
10. N. K. Agrawal, (2004), Essentials of GPS, Spatial Network Pvt. Ltd.
11. Rangwala, S.C. (2011): Surveying and Leveling, Charotar Publishing House Pvt. Ltd. Anand, (Gujarat), India.
12. Satheesh, G., Sathikumar, R.,& Madhu, N.(2007).Advanced Surveying: Total Station, GIS and Remote Sensing, Delhi: Pearson Education.
13. Sathish Gopi, (2000), GPS and Surveying using GPS.
14. Surveying & Levelling, Kanetkar, T.P. and Kulkarni, S.V., Pune Vidharthi Griha Prakashan, Pune.
15. Surveying (Vol II & III) by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain (Laxmi Publications) – The gold standard for advanced methods.
16. Surveying (Vol II) by S.K. Duggal (Tata McGraw Hill) – Comprehensive coverage of geodetic and photogrammetric surveying. Surveying: Principles and Applications by Barry Kavanagh and Tom Mastin (Pearson) – Practical guide to field applications.
17. Terry- Karen Steede, (2002), Integrating GIS and the Global Positioning System, ESRI Press.

**Savitribai Phule Pune University, Pune**  
**B.Sc. (Geography) as per NEP 2020**

<b>Name of the Programme</b>	:	B.Sc.(Geography)
<b>Class</b>	:	T. Y. B. Sc.
<b>Semester</b>	:	VI
<b>Name of Vertical Group</b>	:	<b>FP/OJT/ CEP</b>
<b>Course Code</b>	:	<b>GEO(S) - 381- OJT</b>
<b>Course Title</b>	:	<b>On Job Training</b>
<b>Type of course</b>	:	Practical
<b>Total Credits</b>	:	04 OJT
<b>Workload</b>	:	(30hours/ credit) 4 credits x 30 hours = 120 hours in semester

**Objectives of the Course:**

1. To provide hands-on experiential learning through attachment with organizations and institutions related to geography and allied sectors.
2. To develop employability skills by exposing students to real-world professional environments and workplace practices.
3. To enable students to integrate theoretical geographical knowledge with practical applications and develop report writing and analytical skills based on field experience.

**Guidelines**

- For on-job training, the students will be attached with the local institutions and employing establishments, which have laboratory/workshop, other related facilities and where adequate supervision by qualified personnel will be available.
- A student is expected to spend not less than 120 working hours on On-job training and related activities.
- On-job training will be carried in the summer vacation after the students complete their second semester examinations.
- Students need to provide the confirmation letter from the organization or the institute where they have joined for on-job training. The continuous evaluation of the students' performance in the on job-Training will be carried out with the assistance of the personnel of training institutions/employing establishments where this training will be imparted
- The proof of completion of on-job training (work experience certificate and field report) should be submitted during examination to the parent institution, duly issued and signed by the concerned training authority.

## Course Outcomes:

**By the end of this course, student will be able to:**

**CO1:** Apply experiential learning approaches to gain practical knowledge and skills in real-world geographic and professional work environments.

**CO2:** Analyze social, economic, and administrative functioning of organizations involved in geography-related sectors.

**CO3:** Demonstrate professional skills such as time management, multitasking, problem-solving, and workplace discipline in organizational settings.

**CO4:** Develop effective communication and professional networking skills through interaction with supervisors, peers, and industry experts.

**CO5:** Prepare structured field reports and present training outcomes by integrating theoretical knowledge with practical work experience.

\*\*\*\*\*