Department of Geography

Savitribai Phule Pune University

M.A/M.Sc. Geography course Syllabus Structure

Revised SyIlabus_2020_21

Course Code	Course Title	Credits/Course	Core/ elective	Can be offered to outside students
	Semester I			
Gg 111	Fundamentals of Geomorphology	3	Core	
Gg 112	Fundamentals of Climatology	3	Core	
Gg 113	Fundamentals of Economic Geography	3	Core	
Gg 114	Fundamentals of Population and Settlement Geography	3	Core	
Gg 115	Practicals in Physical Geography	4	Core	
Gg 116	Practicals in Human Geography	4	Core	
	Semester II			
	Any one of the following Special course			
Gg 211	Coastal Geomorphology	3	Elective	
Gg 212	Synoptic Climatology	3	Elective	
Gg 213	Agricultural Geography	3	Elective	
Gg 214	Population Geography	3	Elective	
	Any one of the following Special course			
Gg 221	Coastal Geomorphology : Practical	2	Elective	
Gg 222	Synoptic Climatology : Practical	2	Elective	
Gg 223	Agricultural Geography : Practical	2	Elective	
Gg 224	Population Geography : Practical	2	Elective	
	Any one of the following Special course			
Gg 231	Fluvial Geomorphology	3	Elective	
Gg 232	Applied Climatology	3	Elective	
Gg 233	Geography of Tourism	3	Elective	
Gg 234	Settlement Geography	3	Elective	
	Any one of the following Special course			
Gg 241	Fluvial Geomorphology: Practical	2	Elective	
Gg 242	Applied Climatology and Agro-Meteorology : Practical	2	Elective	
Gg 243	Geography of Tourism : Practical	2	Elective	
Gg 244	Settlement Geography : Practical	2	Elective	
	Compulsory Courses			
Gg 251	Surveying : Concepts and Methods	3	Core	Other
Gg 252	Statistical Methods: Concepts and Methods	4	Core	
Gg 253	Remote Sensing : Concepts and Methods	3	Core	Other
Gg 254	Seminar Course	2	Core	

	Semester III			
	Any one of the following Special course			
Gg 311	Tropical Geomorphology	3	Elective	
Gg 312	Monsoon Climatology	3	Elective	
Gg 313	Geography of Development	3	Elective	
Gg 314	Geography of Migration	3	Elective	
	Any one of the following Special course			
Gg 321	Tropical Geomorphology : Practical	2	Elective	
Gg 322	Monsoon Climatology : Practical	2	Elective	
Gg 323	Geography of Development : Practical	2	Elective	
Gg 324	Geography of Migration : Practical	2	Elective	
	Compulsory Courses			
Gg 331	GIS : Concepts and Methods	3	Core	other
Gg 332	Geographical Thought	3	Core	
Gg 333	Research Methodology: Concepts and Methods	3	Core	
Gg 334	Project Work	2	Core	
	Any two of the following courses			
Gg 341	Multivariate Statistics : Concepts and Methods	3	Elective	
Gg 342	Geography of South Asia	3	Elective	
Gg 343	Computer Programming : Introduction to Python	3	Elective	
Gg 344	Regional Planning	3	Elective	
Gg 345	Geography of India	3	Elective	Other
Gg 346	Geography and Sustainable Development	3	Elective	
	Semester IV			
	Any one combination of the following			
Gg 411	Applied Geography - I	2	Elective	
Gg 412	Applied Geography - II	2	Elective	
Gg 413	Biogeography - I	2	Elective	
Gg 414	Biogeography - II	2	Elective	
	Any combination of the following courses for 8 credits			
Gg 421	Social and Cultural Geography	4	Elective	
Gg 422	Advanced Survey : Concepts and Methods	4	Elective	
Gg 423	Oceanography	4	Elective	
Gg 424	Dissertation	4	Elective	
	Any one of the following courses			
Gg 431	Advance Course in RS and GIS : Concepts and Methods	3	Elective	Other
Gg 432	Geography of Health	3	Elective	

Gg433	Environmental Geography : Concepts and Issues	3	Elective	
Gg434	Agro-Meteorology	3	Elective	
	Any one of the following courses			
Gg 441	Watershed Management : Concepts and Methods	3	Elective	
Gg 442	Political Geography and Contemporary issues	3	Elective	
Gg 443	Geography of Soils	3	Elective	
Gg 444	Interpretation of Topographical Maps	3	Elective	
	Additional Compulsory Credits			
	Human Rights Education	2		
	Cyber Security	4		
	Soft skills Development Program	4		
	Introduction to the Indian Constitution	2		

Semester-I

Code: Gg 111	**Fundamentals of Geomorphology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction to Geomorphology: Basic Concepts, Approaches, Paradigms and Geological Time Scale	3
2	Interior of the Earth	3
3	Holme's Convection Current Theory, Theory of Isostasy, Wegener's Continental Drift Theory	5
4	Palaeomagnetism, Seafloor Spreading, Plate Tectonics	8
5	Diastrophism, Folds, Faults	4
6	Weathering, Mass Movement and Hillslopes	7
7	Fluvial Processes and Landforms	3
8	Coastal Processes and Landforms	3
9	Deserts Landforms: Work of Wind	3
10	Glacial Processes and Landforms	3
11	Karst Processes and Landforms	3

Books:

1. Kale, V. S., & Gupta, A. (2010). *Introduction to Geomorphology*. Hyderabad: Universities Press.
2. Ollier, C. D. (1981). *Tectonics and Landforms*. London: Longman.
3. Singh, S. (2002). *Geomorphology*, Allahabad: Prayag Pustak Bhawan.
4. Strahler, A. H., & Strahler, A. N. (1992). *Modern Physical Geography*, New Jersey: John Wileyand Sons.
5. Tarbuck, E. J., & Lutgens, F. K. (2009). *Earth Science*. New Jersey: Prentice Hall.

Code: Gg 112	**Fundamentals of Climatology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	The Atmospheric Sciences: Meteorology and Climatology, Nature and Scope of Climatology, Development of Climatology	4
2	Earth's Atmosphere: Evolution, Structure and Chemical Composition of Atmosphere, Ionosphere, the Ozone Issue, Acid Precipitation	8
3	Solar and Terrestrial Radiation, Electromagnetic Spectrum, Latitudinal and Seasonal Variation, Effect of Atmosphere, Green House Effect and Heat Budget, Mechanisms of Heat Transfer	8
4	Temperature Measurements and Controls, Lapse Rate, Temperature Inversion, Types of Inversion	4
5	Atmospheric Pressure and Winds: Pressure Measurement and Distribution; Wind Observation, Measurement, Factors Affecting Wind; Geostrophic Wind and Gradient Wind, Local Winds, Models of General Circulation of the Atmosphere, Jet Stream, Cyclones and Anticyclones	8
6	Atmospheric Moisture: Hydrological Cycle, Forms of Condensation, Precipitation, Types of Precipitation, Measurement of Humidity	6
7	Air Masses and Fronts: Introduction	2
8	Climate Change: The Climate System, Detection of Climate Change, Natural Causes, Anthropogenic Causes	5

Books:

1. Lal, D. S. (1998). *Climatology*. Allahabad: Chaitanya Publishing House.
2. Lutgens, Frederic K. & Tarbuck, Edward J. (2010). *The Atmosphere: An Introduction to Meteorology.* New Jersey: Pearson Prentice Hall.
3. Oliver, John E. & Hidore, John J. (2003). *Climatology: An Atmospheric Science.* Delhi: Pearson Education.
4. Singh, S. (2005). Climatology. Allahabad: Prayag Pustak Bhawan.

Code: Gg 113	**Fundamentals of Economic Geography**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Definition, Nature and Scope of Economic Geography	2
2	Approaches to the Study of Economic Geography	2
3	Concepts and Principles in Economic Geography	5
4	Economic Landscape and Economic Systems	4
5	Evolution of World Economy	3
6	Factors of Production (Industrial Location)	3
7	Modes of Transport and Cost of Transport	4
8	Trade Theories	5
9	Models of Industrial Location	6
10	Industrial Regions	4
11	Measurement of Development	3
12	Economic Geographies of the Contemporary World	4

Books:

1. Hartshorne, T. A., & Alexander, J. W. (2010). *Economic Geography*. New Delhi: PHI Learning.
2. Knox, P., Agnew, J., & McCarthy, L. (2008). *The Geography of the World Economy*. London: Hodder Arnold.
3. Lloyd, P., & Dicken, B. (1972). *Location in Space: A Theoretical Approach to Economic Geography*. New York: Harper and Row.
4. Siddhartha, K. (2000). *Economic Geography: Theories, Process and Patterns*, New Delhi: Kisalaya Publications.
5. Smith, D. M. (1971). *Industrial Location: An Economic Geographical Analysis*, New York: John Wiley and Sons.

Code: Gg 114 Fundamentals of Population and Settlement Geography		
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
Part A		
1	Introduction to Human Geography	4
2	Population Geography: Definition, Scope, Nature, Relation with Other Branches, Growth and Distribution of Population	7
3	Study of Branches in Population Geography	4
4	Basic Models in Population Geography	7
Part B		
6	Settlement Geography: Definition, Scope, Nature, Relation with Other Branches, Classification of Settlement, Site and Situation	6
7	Study of Branches in Settlement Geography	4
8	Basic Models in Settlement Geography	7
9	Development and Recent Trends in Population and Settlement Geography in Less Developed Countries and More Developed Countries	6

Books:

1. Bhende, A. & Kanitkar, T. (2008). *Principles of Population Studies*. Mumbai: Himalaya Publishing House.
2. Chandana, R. C. & Sidhu, M. S. (1980). *Introduction to Population Geography*. New Delhi: Kalyani.
3. Clarke, J. F. (1965). *Population Geography*. Oxford: Pergamon Press.
4. Garnier, B. (1966). *Geography of Population*. London: Longman.
5. Hussain, M. (1999). *Human Geography*. Jaipur: Rawat Publication.
6. Mandal, R. B. (1979). *Introduction to Rural Settlement*. New Delhi: Concept Publishing Company.
7. Sawant, S. B. (1994). *Population Geography*. Pune: Mehta Publishing House.
8. Sivaramakrishnan, K. C., Kundu, A., & Singh, B. N. (2005). Handbook of urbanization in India: an analysis of trends and processes. Oxford University Press.
9. Singh, R. Y. (1994). *Geography of Settlement*, Jaipur: Rawat Publication.

Code: Gg 115	**Practicals in Physical Geography**	
No. of Credits: 04		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
Section A: Geomorphology		
1	Profile Analysis: Longitudinal, Superimposed, Projected and Composite, Intervisibility of Terrains	2
2	Block Diagrams	1
3	Slope and Aspect Maps	2
4	Area-Height Relationship, Hypsometric Curve and Integral	1
5	Use of Google Earth for Landform Identification and Surface Profiles	1
Section B: Climatology		
6	Wind Rose Diagram, Climographs	1
7	Circular Graphs: Climatograph	1
8	Measurement of Temperature: Maximum and Minimum Thermometers, Conversion in Different Scales, Identification of Heat waves and Cold waves	2
9	Water Budget Diagram	2
10	Modified Köppen - Geiger Climatic Classification	2

Note: a) Each practical is equivalent to 4 hours. b) Each practical will be 2 hours twice a week.
c) The concerned teacher may add some points related to the subject.

Books:

1. King, C. A. M. (1966). *Techniques in Geomorphology*. London: Edward Arnold Ltd.
2. Lutgens, F. K., & Tarbuck, E. J. (2010). *The Atmosphere: An Introduction to Meteorology*. New Jersey: Pearson Prentice Hall,
3. Miller, A. A. (1953). *The Skin of the Earth*. London: Methuen and Co. Ltd.
4. Monkhouse, F. J., & Wilkinson, H. R. (1964). *Maps and Diagrams: Their Compilation and Construction*. London: Metheun and Co. Ltd.
5. Singh, S. (1998). *Geomorphology*, Allahabad: Prayag Pustak Bhawan.
6. Strahler, A. N. (1964). Part II. Quantitative geomorphology of drainage basins and channel networks. *Handbook of Applied Hydrology: McGraw-Hill, New York*, 4-39.

Code: Gg 116	**Practicals in Human Geography**	
No. of Credits: 04		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
Section A		
1	Methods of Representing and Mapping of Population and Settlement Data	3
2	Methods of Field Study : Preparation of Questionnaire /Interview Schedules	2
3	Application of Models Using Data	2
Section B		
4	Methods of Representing and Mapping of Economic Data	3
5	Measures of Transport Network	3
6	Methods of Field Study : Preparation of Questionnaire for Land Use	2

Note: a) Each practical is equivalent to 4 hours.
b) Each practical will be 2 hours twice a week.
c) The concerned teacher may add some points related to the subject.

Books:

1. Chorley, R. J., & Hagget, P. (1972). *Socio-economic Models in Geography*. London: Mathuen and Co.
2. Liendsor, J. M. (1997). *Techniques in Human Geography*. London: Routledge.
3. Lloyd P., & Dicken, B. (1972). *Location in Space: A Theoretical Approach to Economic Geography*. New York: Harper and Row.
4. Monkhouse, F. J., & Wilkinson, H. R. (1971). *Maps and Diagrams*. London: Methuen and Co.
5. Wood, A., & Roberts, S. (2011). *Economic Geography: Places, Network and Flows*. London: Routledge.

Semester-II

Code: Gg 211 Coastal Geomorphology

No. of Credits: 03 **No. of Lectures: 45**

Sr. No.	Topic	Lectures
1	Introduction: Coasts and Coastal Systems and Shore Zones	8
2	Sea Waves: Generation, Characteristics	5
3	Tides: Generation, Classification and Theories	5
4	Currents: Ocean and Coastal	2
5	Coastal Sediments: Types, Properties and Transportation	3
6	Coastal Processes and Landforms: Rocky Coasts	6
7	Coastal Processes and Landforms: Sandy, Muddy Coasts	6
8	Coastal Processes and Landforms: Coral Coasts	2
9	Coastal Hazard Management	4
10	Coastal Management: Land, Water and Ecosystem	4

Books:

1. Bird, E. C. (2000). *Coastal Geomorphology: An Introduction*. Chichester: John Wiley and Sons.
2. Bloom, A. L. (2002). *Geomorphology: A Systematic Analysis of Late Cenozoic, Landforms*. New Delhi: Prentice-Hall of India.
3. Goudie, A. S. Encyclopedia of Geomorphology,(2004). Roultedge.
4. Ivan, V. (2006). *Global Coastal Change*. Oxford: Blackwell publishing.
5. King, C. A. M. (1972). *Beaches and Coasts*. London: Edward Arnold.
6. Masselink, G. Hughes, M. Knight, J. (2011). *Introduction to Coastal Processes and Geomorphology*. London: Hodder Education.
7. Pethick, J. (1984). *An Introduction to Coastal Geomorphology*. London: Arnold-Heinemann.

Code: Gg 212	**Synoptic Climatology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction and Scope of Synoptic Climatology, Weather Observations and Analysis	4
2	Synoptic Scale Motion: Laws of Motion	3
3	Synoptic Charts and Maps, Atmospheric Stability: Dry Adiabatic Lapse Rate and Saturated Adiabatic Lapse Rate, Changes in Stability	7
4	Air Masses: Characteristics, Identification and Modification	5
5	Fronts: Frontogenesis, Frontolysis, Frontal Types and Frontal Weather	4
6	Cyclones and Anticyclones: Wave Cyclone, Tropical Cyclone, Rossby Waves and Western Disturbances, Anticyclones: Cold and Warm Core Systems, Anticyclonic Weather	7
7	Weather Patterns: Precipitation Processes, Heat and Cold Waves, Thunderstorms	6
8	Synoptic Scale Forecasting: Types and Methods	4
9	Application of Synoptic Climatology in Pollution Studies, Aviation and Navigation	5

Books:

1. Barry, R. G., & Perry, A. H. (1973). *Synoptic Climatology: Methods and Applications*. London: Methuen and Co. Ltd.
2. Navarra, J. G. (1979). *Atmosphere, Weather and Climate*. Philadelphia: W. B. Saunders Company.
3. Petterson, S. (1969). *Introduction to Meteorology*. New York: McGraw Hill.
4. Rama Sastry, A. A. (1984). *Weather and Weather Forecasting*. Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi
5. Stringer, E. T. (1972). *Foundations of Climatology*. New York: W. H. Freeman and Company.

Code: Gg 213	**Agricultural Geography**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Nature, Scope and Significance of Agricultural Geography, Various Approaches to Study of Agricultural Geography	3
2	Origin and Dispersal of Agriculture	3
3	Physical and Economic Factors Affecting Agriculture, Land Classification	6
4	Basis of Agricultural Classification, Agricultural Types: Intensive, Subsistence, Extensive, Commercial and Plantation Agriculture	6
5	New Perspectives on Types of Agriculture	4
6	Agricultural Regionalization	4
7	Measures of Agricultural Productivity	4
8	Agricultural Land Use Models: Critical Review, Contemporary Perspective	6
9	Crisis of Agriculture, Aspects of Food Security and World Patterns of Hunger	6
10	Globalization and Agriculture	3

Books:

1. Grigg, D. (1995). *An Introduction to Agricultural Geography*. London: Routledge.
2. Hussain, M. (1978). *Agricultural Geography*. Jaipur: Rawat Publication.
3. Singh, J., & Dhillon, S. S. (1994). *Agricultural Geography*. New Delhi: Tata McGraw Hill Publishing Co. Ltd.
4. Symons, L. (1970). *Agricultural Geography*. London: G. Bell and Sons Ltd.
5. Vaidya, B. C. (1997). *Agricultural Land use in India*. New Delhi: Manak Publications.

Code: Gg 214	**Population Geography**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction: Definitions, Nature and Scope, Historical Development, Approaches to Study of Population Geography	4
2	Population Structure and Characteristics	4
3	Theories of Population Growth	6
4	Concepts and Theories of Mortality and Fertility	8
5	Concepts and Theories of Migration	6
6	Population Projection and Population Policies in India, Initiatives at Global Level	6
7	Population Issues: India and World Scenario	4
8	Role of Population Resource in Geography	3
9	Technology and Population Development	2
10	Research Areas in Population Geography	2

Books:

1. Aggarwal, S. M. (1974): India's Population Problems, McGraw Hill Publishing Co. Ltd., New Delhi
2. Berelson, B. (1974): Population Policy in Developed Countries, MacMillan, London
3. Bhende, A. A. and Kanitkar, T. (2011): Principles of Population Studies, Himalaya Publishing House, Mumbai
4. Chandana, R. C. (2013): Population Geography, Kalyani Publications, Delhi
5. Coale, A. J. and Hoover, E. M. (1958): Population Growth and Economic Development in Low Income Countries, Amit Publishers, New Delhi
6. Desoza, A. A. (1983): Indian Population Problem in Perspective and Social Action, Concept Publications, New Delhi
7. Hazel, B. R. (1994): Population Geography, Singapore Publishers Pvt. Ltd., Singapore
8. Rao, V. K. R. V. (1966): Education and Human Resource Development, Allied Publishers, Bombay
9. Stockwell, E. G. (1968): Population and People, Quadrangle Books, Chicago
10. UN (1962): Demographic Aspects of Manpower, Report 1, Sex and Age Patterns of Participation in Economic Activities, Population Studies No. 33, New York

Code: Gg 221	**Coastal Geomorphology: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Study of Coastal Landforms Using Topographic Maps and Satellite Images	2
2	Wave Analysis, Recording of Waves in the Surf Zone	3
3	Tide Data Analysis and Classification	3
4	Beach/ Dune/ Sand Bar Profiles	3
5	Coastal Sediments: Sample Collection and Analysis	2
6	Observations and Recording of Human Activities in Coastal Areas	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Bloom, A. L. (2002). *Geomorphology: A Systematic Analysis of Late Cenozoic, Landforms*, New Delhi: Prentice-Hall of India.
2. Carter, R. W. G. (1988). *Coastal Environments*, London: Academic press ltd.
3. Dackombe, R. V., & Gardiner, V. (1983). *Geomorphological Field Manual*, London: George Allen and Unwin.
4. Goudie, A. (1990). *Geomorphological Techniques*. London: Routledge.
5. King, C. A. M. (1972). *Beaches and Coasts*, London: Edward Arnold.
6. Pethick, J. (1984). *An Introduction to Coastal Geomorphology*. London: Arnold-Heinemann.
7. Smith, M. J., Paron, P., & Griffiths, J. (2011). *Geomorphological Mapping*. Amsterdam: Elsevier.

Code: Gg 222	**Synoptic Climatology: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Scientific Notation and Conversion in Different Units, Temperature Profile, Atmospheric Stability and Humidity	3
2	Instrumentation and Measurement Techniques of Weather Elements and Processing of Weather Data	5
3	Station Model: Coding, Decoding and Plotting of Synoptic Data	3
4	Climatic Map Analysis: Daily Weather Reports	2
5	Field Work	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Navarra, J. G. (1979). *Atmosphere, Weather and Climate*, Philadelphia: W. B. Saunders Company.
2. Jarraud, M. (2008). Guide to meteorological instruments and methods of observation (WMO-No. 8). World Meteorological Organisation: Geneva, Switzerland, 29.

Code: Gg 223	**Agricultural Geography: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Methods of Crop Concentration and Diversification	5
2	Crop Combination Techniques	5
3	Measurement of Agricultural Efficiency	5

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Ali, M. (1979). *Dynamics of Agricultural Development in India*. New Delhi: Concept Publication.
2. Hussain, M. (1978). *Agricultural Geography*, Jaipur: Rawat Publication.
3. Singh, J., & Dhillon, S. S. (1994). *Agricultural Geography*. New Delhi: Tata-McGraw Hill Publication.
4. Yeats, M. H. (1978). *An Introduction to Quantitative Analysis in Human Geography*, Chicago: John and John Company.

Code: Gg 224	**Population Geography: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Rate of Population Change, Population Projection	3
2	Basic Measures of Fertility and Mortality	3
3	Construction of Life Table	3
4	Singulate Mean Age at Marriage	2
5	Measures of Human Activity, Human Development Index, Gender Related Development Index	2
6	Collection of Data on a Given Problem and Report Writing	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Agarwala, S. N. (1962). *Age at Marriage in India*, Allahabad: Kitab Mahal Pvt. Ltd.
2. Barclay, G. W. (1958). *Techniques of Population Analysis*, New York: John Wiley and Sons.
3. Mandal, R. B., Uyanga, J., & Prasad, H. (2007), *Introductory Methods in Population Analysis*, New Delhi: Concept Publishing Company.
4. Pathak, K. B., & Ram, F. (2013). *Techniques of Demographic Analysis*, Mumbai: Himalaya Publishing House.
5. Shryock, H. S. (1970). *The Methods and Materials of Demography*, New York: Academic Press.
6. Siegel, J. S., & Swanson, D. A. (2004). *The Methods and Materials of Demography*. Boston: Academic Press.
7. Taylor, P. J. (1977). *Quantitative Methods in Geography*. Boston: Hughton Miffin Co.
8. Wilkinson, F. J., & Monkhouse, H. R. (1966). *Maps and Diagrams: Their Compilation and Construction*. London: Metheun and Co.

Code: Gg 231	**Fluvial Geomorphology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Drainage Basin and Network: Laws of Drainage Composition	3
2	Mechanics of Fluvial Erosion: Overland Flow, Throughflow and Groundwater Flow; Hydrographs	5
3	Open Channel Hydraulics: Type of Flows, Stream Energy Hydraulic Geometry	8
4	Sediment Transport: Suspended and Bedload	5
5	Channel Geometry: Bedrock and Alluvial Rivers	8
6	Concept of Grade: Graded Profile, Dynamic Equilibrium	3
7	Fluvial, Erosional and Deposition Processes; Flood Plains, River Terraces	8
8	River Metamorphosis and Quaternary Fluvial Systems	3
9	River Channel Management	2

Books:

1. Charlton, R. (2008). *Fundamentals of Fluvial Geomorphology*. Oxon: Routledge.
2. Downs, P. W., & Gregory, K. J. (2004). *River Channel Management*, London: Arnold.
3. Fryirs, K. A., & Brierley, G. J. (2013). *Geomorphologic Analysis of River Systems*, Chichester: Wiley-Blackwell.
4. Kale, V. S., & Gupta, A. (2010). *Introduction to Geomorphology*. Hyderabad: Universities Press.
5. Leopold, L. B., Wolman, M. G., & Miller, J. P. (1964). *Fluvial Processes in Geomorphology*. San Franscisco: W. H. Freman,
6. Robert, A. (2003). *River Processes- An Introduction to Fluvial Dynamics*. London: Arnold.
7. Schumm, S. A. (1977). *Fluvial Systems*. New York: Wiley.

Code: Gg 232	**Applied Climatology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Nature and Scope of Applied Climatology: Atmospheric Concern and Awareness	4
2	Climate and the Physical Environment	6
3	Climate and the Biological Environment	5
4	Climate and Industrial and Commercial Activities	4
5	Climate and Transport Services	4
6	Climate and Human Comfort	4
7	Climate and Tourism	3
8	Climate and the Energy Sector	3
9	Urban Climate and Global Environment Change: Adaptation and Mitigation	6
10	Climate Change: Data Sources, Methods and Theories. Past, Present and Future Scenarios, Impacts, Future Strategies and Adaptations	6

Books:

1. Doorenbos, J. (1977). Guidelines for predicting crop water requirements. FAO (United Nations)
2. Oliver, J. E. (1973). *Climate and Man's Environment: An Introduction to Applied Climatology*, New York: John Wiley and Sons.
3. Thompson, R.D., & Allen, P. (1997). *Applied Climatology: Principles and Practice*. London: Routledge.

Code: Gg 233	**Geography of Tourism**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Definition, Nature and Scope of Geography of Tourism, Relation between Geography and Tourism	3
2	Factors Affecting Tourism	2
3	Types of Tourism	6
4	Infrastructure and Support System for Tourism	6
5	Development and Planning for Tourism	6
6	Economic, Social, Physical and Cultural Impacts of Tourism	6
7	Theories in Tourism Studies	6
8	Tourism Development in India	6
9	Globalization and Tourism	4

Books:

1. Bhatia, A. K. (1991). *International Tourism - Fundamentals and Practices*. New Delhi: Sterling Publisher.
2. Bhatia, A. K. (1996). *Tourism Development: Principles and Practices*. New Delhi: Sterling Publisher Ltd.
3. Das, M. (1999). *India: A Tourist Paradise*. New Delhi: Sterling Publishers.
4. Lew, A. A., Hall, C. M., & Williams, A. M. (ed) (2014). *Tourism*. Hoboken: Wiley-Blackwell.
5. Pearce, D. G. (1987). *Tourism Today: A Geographical Analysis*. Harlow: Longman.
6. Robinson, H. (1996). *A Geography of Tourism*. London: Macdonald and Evans.
7. Smith, L. J. S. (2010). *Tourism Analysis: A Handbook*. Sydney: Halstead Press.

Code: Gg 234	**Settlement Geography**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction: Definitions, Nature, Scope and Approaches to Study of Settlement Geography	5
2	Evolution and Development of Settlement in World and India	6
3	Size, Spacing, Types and Patterns of settlements	5
4	Fundamental Concepts in Settlement Geography	7
5	Theories and Models in Settlement Geography	6
6	Changing Morphology and Segregation of Rural and Urban settlements	5
7	Rural Dwelling and House Types in India, Urban Forms	4
8	Current Trends in Settlement Geography	3
9	Problems and Prospects of Settlements	2
10	Role of RS and GIS in Rural and Urban Settlement Planning	2

Books:

1. Alam, M., & Gopi, K. N. (1982). *Settlement System of India*. New Delhi: Oxford and IBH Publication.
2. Bose, A. (1980). *India's Urbanisation*. New Delhi: Tata McGraw Hill.
3. Carter, H. (1979). *The Study of Urban Geography*. London: Arnold Heinemann.
4. Haggett, P. (1965). *Locational Analysis in Geography*. London: Edward Arnold.
5. Hall, T. (2006). *Urban Geography*, London: Routledge.
6. Mandal, R. B. (2001). *Introduction to Rural Settlement*. New Delhi: Concept Publishing Company.
7. Maurya S. D. (2014). *Settlement Geography*. Allahabad. Sharda Pustak Bhavan.
8. Pacione, M. (2009). *Urban Geography*. New York: Routledge.
9. Ramchandran, R. (1997). *Urbanization and Urban Systems in India*. New Delhi: Oxford University Press.
10. Sivaramakrishnan, K. C., Kundu, A., & Singh, B. N. (2005). Handbook of urbanization in India: an analysis of trends and processes. Oxford University Press, USA.
11. Siddharth, K., & Mukherjee, S. (2013). *Cities, Urbanization and Urban System*, New Delhi: Kisalaya Publishing.
12. Singh, R.Y. (1994). *Geography of Settlements*, Jaipur: Rawat Publications.

Code: Gg 241	**Fluvial Geomorphology: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Drainage Basin and Network Morphometry, Longitudinal Profile and Hack's Stream Gradient Index	4
2	Calculation of Hydraulic Geometry Equations	2
3	Calculation of Runoff, Sediment Load and Sediment Yield	2
4	Calculation of Velocity and Discharge Using Manning Equation Estimation of Unit Stream Power and Shear Stress	2
5	Study of Fluvial landforms using Topographic Maps and Satellite Images	2
6	Mapping of Landscape Materials: Zingg's Shape Analysis. Measurement of Channel Cross-Section in the Field, Sedimentary sequences, Sedimentary Facies, Study of Erosional and Depositional Features in the Field	3

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Charlton, R. (2008). *Fundamentals of Fluvial Geomorphology*, Oxon: Routledge.
2. Kondolf, G. M., & Piegay, H. (2003). *Tools in Fluvial Geomorphology*. Chichester: Wiley.
3. Leopold, L. B., Wolman, M. G., & Miller, J. P. (1964). *Fluvial Processes in Geomorphology*. San Franscisco: W. H. Freman.
4. Robert, A. (2003). *River Processes - An Introduction to Fluvial Dynamics*. London: Arnold.
5. Schumm, S. A. (1977). *Fluvial Systems*, New York: Wiley.

Code: Gg 242 Applied Climatology and Agro-Meteorology: Practical		
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Climatic Classification: Thornthwaite	3
2	Climate and Architectural Analysis, Comfort Indices	3
3	Statistical Analysis of Climatic Data	3
4	Estimation of Reference Crop Evapotranspiration, Crop Coefficient and Calculation of Crop Evapotranspiration, Crop Phenological Stages and Crop Weather Calendar	4
5	Computation of Irrigation Scheduling	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Doorenbos, J. (1977). Guidelines for predicting crop water requirements. FAO (United Nations)
2. Oliver, J. E. (1973). *Climate and Man's Environment: An Introduction to Applied Climatology*, New York: John Wiley and Sons.
3. Thornthwaite, C. W., & Mather, J. R. (1957). Instructions and tables for computing potential evapotranspiration and the water balance, Drexel Institute of Technology, Laboratory of Climatology

Code: Gg 243	**Geography of Tourism: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Source of Data	3
2	Perception Studies	3
3	Evaluation of Tourism Potential / Carrying Capacity Analysis	4
4	Analysis of Tourism Impacts and Report Writing	5

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Kaul, R. K. (1985). *Dynamics of Tourism and Recreation*, New Delhi: Inter India.
2. Pearce, D. (1987). *Tourism Today: A Geographical Analysis*, New York: Longman Scientific and Technical.
3. Smith, L. J. S. (2010). *Practical Tourism Research*, CABI, Wallinford
4. Smith, L. J. S. (2010). *Tourism Analysis: A Handbook*, Sydney: Halstead Press.

Code: Gg 244	**Settlement Geography: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Methods of Concentration and Dispersion of Settlements	2
2	Measurement of Shape (Pattern) of Settlements, Determinants of Spacing and Methods of Size and Spacing, Pattern Variation of Settlements	5
3	Basic Measures for Urbanization and Calculation of CBD by Vance and Evan's Method	3
4	Index of City Distribution, Methods of Urban Renewal and Calculation of Urban Sprawl	3
5	Collection of Data on a Given Problem and Report Writing	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Haggett, P. (1965). *Locational Analysis in Human Geography*. London: Edward Arnold.
2. Hall, T. (2006). *Urban Geography*. London: Routledge.
3. Mandal, R. B. (2001). *Introduction to Rural Settlement*. New Delhi: Concept Publishing Company.
4. Pacione, M. (2009). *Urban Geography- A Global Perspective*. London: Routledge.
5. Pathak, K. B., & Ram, F. (2013). *Techniques of Demographic Analysis*. Mumbai: Himalaya Publishing House.
6. Ramachandran, R. (1997). *Urbanization and Urban Systems in India*. Delhi: Oxford University Press.
7. Siddharth, K., & Mukherjee, S. (2013). *Cities, Urbanization and Urban System*, New Delhi: Kisalaya Publishing Pvt. Ltd.
8. Wilkinson, F. J., & Monkhouse, H. R. (1966). *Maps and Diagrams – Their Compilation and Construction*. London: Metheun and Co.

Code: Gg 251	**Surveying: Concepts and Methods**	
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Introduction to Surveying and Leveling	1
2	Dumpy Level Survey: Rise and Fall Method, Collimation Level Method, Profile Drawing and Contouring	6
3	Theodolite Survey: Intersection Method, Tacheometric Method, Contouring	6
4	GPS: Road Mapping	2

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Basak, N. N. (1994). *Surveying and Levelling*. Delhi: Tata McGraw-Hill Education.
2. Bhavikatt, S. S. (2009). *Surveying and Levelling*. New Delhi: I. K. International.
3. Kanetkar, T. P., & Kulkarni, S.V. (I960). *Surveying and Leveling- Part I and II*. Pune: A. V. Ghriha Prakashan.
4. Pugh, J. C. (1975). *Surveying for Field Scientists*. London: Methuen and Co.
5. Roy, S. K. (2004). *Fundamentals of Surveying*. New Delhi: PHI Learning.

Code: Gg 252	**Statistical Methods: Concepts and Methods**	
No. of Credits: 04		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Univariate Analysis: Measures of Central Tendency, Measures of Dispersion	2
2	Bivariate Analysis: Covariance, Correlation and Regression (Linear, Exponential, Power- Law, Logarithmic), Explained Variance, Residuals, Mapping of Residuals	5
3	Probability: Normal, Binomial and Poisson Distributions	3
4	Inferential Statistics: Sample and Population, Sampling Distribution, Hypothesis Testing: Formulation, Rejection Rule, One and Two-Tailed Tests, Significance Level, Degrees of Freedom, Type I and Type II Errors	1
5	Student's T-Test, ANOVA: One-Way, Two-Way (Single and Multiple Entry), Chi-Square Test: One-Way and Two-Way	4

Note: a) Each practical is equivalent to 4 hours.
b) Each practical will be 2 hours twice a week.
c) The concerned teacher may add some points related to the subject.

Books:

1. Frank, H., & Althoen, S. C. (1994). *Statistics: Concepts and Applications*. Cambridge: Cambridge University Press.
2. Hammond, R., & McCullagh, P. (1991). *Quantitative Techniques in Geography*. Oxford: Clarendon Press.
3. Mann, P. S. (2007). *Introductory Statistics*. New Delhi: John Wiley and Sons.

Code: Gg 251	**Remote Sensing: Concepts and Methods**	
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
Part A		
1	Introduction to Remote Sensing, Characteristics of Electromagnetic Radiation (EMR): EMR Spectrum, Blackbody, Radiation Laws	2
2	Interaction of EMR with Atmosphere and Earth's Surface: Reflection, Absorption, Transmission, Scattering and Refraction. Atmospheric Windows	1
3	Fundamentals of Aerial Photography, Aerial Cameras, Geometric Characteristics of Aerial Photographs	2
4	Photo Scale, Image Displacement, Parallax and Stereoscopy, Elements of Photo Interpretation	2
5	Introduction to Digital Photogrammetry	1
6	Basics of Satellite Remote Sensing: Definition, Principle, Stages and Types, Platforms and Orbits	1
7	Sensors and Scanning Systems, Sensor Performance Parameters, MSS and DEM Images, FCC and TCC	1
Part B		
8	Determination of Scale of Aerial Photographs	1
9	Interpretation of Stereo Pair of Aerial Photographs	2
10	Introduction to Reference System of IRS Satellites, Data Products and Formats, Interpretation of Satellite Images	2

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Campbell, J. B. (2002), *Introduction to Remote Sensing*. London: Taylor and Francis.
2. Joseph, G. (2003). *Fundamentals of Remote Sensing*, Hyderabad: University Press.
3. Ollier Lillesand, T. M., & Ralph, K. W. (2008). *Remote Sensing and Image Interpretation*. Singapore: John Wiley and Sons.
4. Sabins, F. F. (1996). *Remote Sensing: Principles and Interpretation*, San Francisco: W. H. Freemanand Company.
5. Tempfi, K., Kerle, N., Huurneman, G., & Janssen, L. F. (Eds) (2009). *Principles of Remote Sensing – An Introductory Text Book*. Netherlands: The International Institute for Geoinformation Science.

Semester-III

Code: Gg 311	**Tropical Geomorphology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction to Tropics: Tropics as Part of Gondwana, Its Special Features and Major Landforms; Tropical Hydrology: Climate; Rainfall Erosivity, Temperature, Winds, Tropical Disturbances and Water Balance; Role of Vegetation, Climatic Geomorphology and Morphogenetic Regions, Geomorphology in the Tropics	6
2	Weathering Processes and Profiles in Humid Tropical Environment	6
3	Duricrusts and Types: Laterite - Processes, Profiles and Landforms	6
4	Hillslopes, Pediments and Gullies	3
5	Rivers in Tropics: Discharge, Sediment Load, Cross Sectional Characteristics and Floodplain Morphology	3
6	Tropical Coasts and Deltas	3
7	Distribution and Types of Karst in Tropics	2
8	Tropical Planation: Etchplain, Peneplain, Pediplain and Inselbergs	5
9	The Arid Tropics: Hydrology, Landforms and Aeolian Geomorphology	5
10	Quaternary Climate Changes and Landforms in Tropics	3
11	Anthropogenic Alteration of Geomorphic Processes in Tropics	3

Books:

1. Budel, J. (1982). *Climatic Geomorphology*. Princeton: Princeton University Press.
2. Faniran, A., & Jeje, L. K. (1983). *Humid Tropical Geomorphology*. London: Longman.
3. Goudie, A. (1985). *Duricrusts in Tropical and Sub Tropical Landscapes*. Australia: Alien Unwin.
4. Goudie, A. S. (2004). (Eds.), *Encyclopedia of Geomorphology*, London: Routledge.
5. Gupta, A. (2011). *Tropical Geomorphology*. London: Cambridge University Press.
6. Thomas, M. F. (1994). *Geomorphology in the Tropics: A study of Weathering and Denudation in Low Latitudes*. Chichester: John Wiley and Sons.

Code: Gg 312	**Monsoon Climatology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction and Scope of Monsoon Climatology, Historical Background and Economic Importance	3
2	Different Concepts Regarding Origin of Monsoon, the Asian Monsoon: East and South Asian Monsoon, Classical Theory of Indian Monsoons	6
3	Monsoon Model: Driving Mechanism, Realistic Monsoon Model	5
4	Monsoon Climatology: Normal Temperature, Wind and Pressure, Dates of Onset and Withdrawal, Monsoon Rainfall	5
5	Regional Aspects of Indian Monsoon: Semi-Permanent Systems – Heat Low, Monsoon Trough, Easterly Jet, Tibetan High	6
6	Interseasonal Variation: Active and Break Period, Depressions, Trough of Low Pressure, Mid – Tropospheric Disturbances, Offshore and Onshore Vortices, Effect of Orography	6
7	Interannual Variation: Variability of Summer Monsoon Rainfall, Snow Cover, Meteorological Teleconnections: ENSO, IOD, NAO; Walker Circulation, the Role of Ocean and Upper Atmosphere	8
8	Monsoon Forecast: Different Time Scales, Factors for Forecasting, Power Regression and Parametric Model, MONEX and IIOE	6

Books:

1. Das, P. K. (1991). *Monsoons*. New Delhi: National Book Trust.
2. Fein, J. S., & Stephens, P. L. (1987). *Monsoons*, New York: John Wiley and Sons.
3. Keshavmurty, K. N. (1992). *The Physics of Monsoons*. New Delhi: Allied Publishers Limited.
4. Pant, G. B., & Rupa Kumar, K. (1997). *Climates of South Asia*. Chichester: John Wiley and sons.
5. Thornthwaite, C. W., & Mather, J. R. (1957). Instructions and tables for computing potential evapotranspiration and the water balance.

Code: Gg 313	**Geography of Development**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Definition, Nature and Scope Relation between Geography and Development	4
2	Concepts and Principles of Development	6
3	Developed and Developing Economies	4
4	Culture and Development	4
5	Rural Agricultural Development	4
6	Urban Industrial Development	4
7	Poverty	4
8	Geographies of Inequities and Uneven Development	5
9	Strategies of Development	4
10	Theories of Development	6

Books:

1. Desai, V., & Potter, B. R. (Eds.) (2011). *The Companion to Development Studies*. London: A Hodder-Viva Edition.
2. Dutta, R., & Sundaram, K. P. M. (2002), *Indian Economy*. New Delhi: S. Chand Publications.
3. Haynes, J. (2008). *Development Studies*. Polity Short Introduction Series.
4. Hodder, R. (2000). *Development Geography.* London: Routledge.
5. Peet, R. (2005). *Theories of Development*. Jaipur: Rawat Publications.
6. Potter, R. B., Binns, T., Elliot, J. A., & Smith, D. (1999). *Geographies of Development*. Landon: Longman.
7. UNDP (2002*). Human Development Report*. Oxford University Press. Oxford.

Code: Gg 314	**Geography of Migration**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction: Definition, Nature, Scope, Significance and Concepts	4
2	Determinants of Migration: Push and Pull Factors, Incentives for Migration: Empirical Evidence and Current Significance	4
3	Process of Migration and Application of Theories	8
4	Types of Migration: Internal Migration and International Migration	6
5	Consequences of Migration and Current Issues	6
6	Migration and Its Geographical and Demographic Significance	5
7	International Migration: Problems and Prospects, Pattern of Migration, International Laws and Conventions, Environmental Issues and Migration	5
8	Refugee Migration: Global and National Pattern in Refugee Migration, International Laws and Conventions	4
9	Recent Development in Migration in Developed and Developing Countries	3

Books:

1. Brown, A.A. ed. (l977). *Internal Migration: A Comparative Perspective*, New York: Academic Press.
2. Cohen, Robin (1996). *Theories of Migration*, Cheltenham: Edward Elga.
3. Demko, G. et. al (1977). *Population Geog: A Reader*. New York: McGraw Hill.
4. Harvey, David (1973). *Social Justice and City*. Baltimore: Edward Arnold and The Johns Hopkins University Press.
5. Jackson. J. A. (1969). *Migration*. Cambridge: University Press.
6. Jones,E.ed. (1975). *Readings in Social Geography*. Oxford: Oxford University Press.
7. Khadaria, B. (2010). *India Migration Report 2009: Past, Present and Future Outlook*. New Delhi: Cambridge University Press.
8. Kosinki, L.A. et.al.eds (1975). *People on The Mov.*, London: Methuen.
9. Oberai, A.S., & Singh, H.K.M. (1983). *Causes and Consequences of Internal Migration: A Study in the Indian Punjab*. Delhi: Oxford University Press.
10. O'Neill, B. C. O. (2001). *Population and Climate Change*. Cambridge: Cambridge University Press.

Code: Gg 321	**Tropical Geomorphology: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Bowen's and Golditch's Weathering Reaction Series Calculation and Interpretations of Chemical Weathering Indices	2
2	Clay Mineralogy, Listing of Important Clay Minerals and Their Properties	1
3	Universal Soil Loss Equation (USLE)	3
4	Sediment in Sections (Miall's Lithocode)	2
5	Field Study of Landscapes, Weathering Profiles, Laterite Profiles and Lithosections	4
6	Textural Analysis of the Sediments Collected During the Field Trip	3

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Budel, J. (1982). *Climatic Geomorphology*. Princeton: Princeton University Press.
2. Faniran, A., & Jeje, L. K. (1983). *Humid Tropical Geomorphology*. London: Longman.
3. Goudie, A. (1985). *Duricrusts in Tropical and Sub Tropical Landscapes*. Australia: Alien Unwin.
4. Goudie, A. S. (2004): (Eds.), Encyclopedia of Geomorphology, Routledge, London System for the ARIES AUV, Monterey, California: Naval Postgraduate School; Springfield
5. Gupta, A. (2011). *Tropical Geomorphology*. London: Cambridge University Press.
6. Thomas, M. F. (1994). *Geomorphology in the Tropics: A study of Weathering and Denudation in Low Latitudes*. Chichester: John Wiley and Sons.

Code: Gg 322	**Monsoon Climatology: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Study of Indian Daily Weather Report (IDWR), Preparation of Report About the Monsoon Activity During A Particular Week with Respect to Temperature, Rainfall, Semi-Permanent System and Their Outlook. Note: Based on Map Discussion	4
2	Preparation of Temperature and Pressure Distribution Maps	2
3	Preparation of Rainfall Distribution Maps for Meteorological Subdivisions	2
4	Tephigram: Computation of Total Precipitable Water and Various Meteorological Parameters	4
5	Areal Precipitation: Thiessen Polygon Method	1
6	Field Work	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Daily and weekly weather reports of India Meteorological Department

Code: Gg 323	**Geography of Development: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Indices of Human Development	4
2	Indices of Regional Development	3
3	Collection of Demographic and Socio-Economic Data at Household Level from Primary and / or Secondary Sources and Preparation of an Analytical Survey Report to Assess the Development of an Area	8

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Lawson, V. A. (2007). *Making Development Geography*. London: Hodder Arnold.
2. Liendsor, J. M. (1997). *Techniques in Human Geography*. New York: Routledge.

Code: Gg 324	**Geography of Migration: Practical**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Direct Estimates of Net Migration: Place of Birth and Last Residence, Duration of Residence and Place of Residence on a Specific Date before the Census	3
2	Basic Measures of Migration	2
3	Indirect Estimates of Net Migration: National Growth Rate Method and Residual Method Survival Rate Method: Life Table Survival Rate (LTSR) and Census Survival Rate Method	4
4	Inter-Censal Net Migration by Residual Method, Inter-Censal Cohort Component Method, Inter-Censal Component Method for Foreign Born Population, Estimates of Net Immigration of Alien Population, Estimates of National Abroad	4
5	Collection of Data on a Given Problem and Report Writing	2

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Jacob S. Siegel & David, a. Swanson, (2004). *The Methods and Materials of Demography*, Second Edition, USA: Elsevier Science.
2. John Weeks (2005). *Population: An Introduction to Concepts and Issues*, Wordsworth Learning.Singapore 9th edition.
3. Mitra R. G., (2002). Understanding Patterns of Migration from Census 2001 Data, Population Stabilization and Development, Council of Cultural Growth and Cultural Relations, Cuttack
4. Shryock, Henry S. Jacob S. Siegel and Associate, (1980). *The Methods and Materials of Demography* Vol.1 U.S. Bureau of the Census, Washington D.C.
5. Todaro, Michael P. (1976). *Internal Migration in Developing Countries*, International Labour Office, Geneva
6. United Nations, (1974). *Methods of Measuring Internal Migration*, Manual VI, UN, New York.
7. United Nations, (1979). Trends and Characteristics of International Migration since 1950" Demographic Studies No. 64, UN, New York
8. United Nations, (1983). Determinants and Consequences of Population Trends, Vol 1, UN, New York, Chapter-VI.

Code: Gg 331	**GIS: Concepts and Methods**	
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	GIS: Definition and Development	1
2	Elements of GIS	1
3	Types of Databases	1
4	Data Models: Spatial and Non-Spatial	1
5	Map Projection and Scale	1
6	Spatial Data Model Entities: Vector and Raster Properties	2
7	Preparation of Base Map Using Topographical Map or Open Source Data	2
8	Preparation of Thematic Maps: Vector and Raster Based	2
9	Database: Concepts and Queries	2
10	Concept of Map Layout and Visualization	2

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Burrough, P. A., & McDonnell, R. A. (1998). *Principles of Geographical Information Systems*. New York: Oxford University press Inc.
2. Chang, K. T. (2008). *Introduction to Geographic Information Systems*. Avenue of the Americas, McGraw-Hill,
3. Environmental Systems Research Institute, Inc. (1998). *Understanding GIS: The ARC/INFO Method*. Redlands: ESRI Press.
4. Goodchild, M. F. (2003). *Geographic Information Science and System for Environmental Management*. Annual Review of Environment and Resource 28: 493-519

Code: Gg 332	**Geographical Thought**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Geographical Knowledge of the Ancient World: Greek-Roman Period, Contribution of Explorers	6
2	Geography of Medieval Period: Contribution by Arab Geographers	3
3	Contribution of Modern Geographers	8
4	Dichotomy and Dualism	5
5	Conceptual Development: Areal Differentiation, Regional Synthesis, Locational and Spatial Analysis	6
6	Quantitative Revolution; Behavioural, Human and Welfare Approach	4
7	Evolutionary Biology and Geographical Thought, the Political Economy Perspective in Human Geography	4
8	Marxist Geography, Radical Geography, Geography of Gender	3
9	Modern Geographical Thoughts, Geography and Public Policy	6

Books:

1. Arild, H. J. (1999). *Geography: History and Concepts*. London: SAGE Publications.
2. Chorley, R. J. (Ed). *Directions in Geography*, London: Matheun and Co.
3. Dikshit, R. D. (1997). *Geographical Thought: Contextual History of Ideas*. New Delhi: Prentice Halls.
4. Goudie, A. (Ed) (2004). *Encyclopedia of Geomorphology*. London: Routledge.
5. Hussain, M. (1984). *Evolution of Geographical Thought*. Jaipur: Rawat Publications.
6. Richard, P. (1998). *Modern Geographical Thought*, Singapore: Blackwell.
7. Warf, B. (Ed) (2006). *Encyclopedia of Human Geography*. New Delhi: SAGE Publications.

Code: Gg 333	**Research Methodology: Concepts and Methods**	
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Methods of Geographical Studies	1
2	Research: Definition, Types (Pure and Applied), Classification	2
3	Routes of Explanation: Inductive and Deductive	1
4	Hypothesis, Theories, Laws and Models	1
5	Research Question, Objectives and Significance of Research	1
6	Research Design: Data Collection and Analysis	2
7	Recent Trends in Geographical Research: Physical and Human Geography	2
8	Ethics in Scientific Research	1
9	Scientific Journals (Impact Factor, Citation)	1
10	Presentation of Research Findings: Report Writing, Presentation and Formatting	2
11	Research Proposal	1

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Gomez, B., & Jones, J. P. III (2010). *Research Methods in Geography: A Critical Introduction*. John Wiley and Sons.
2. Goudie, A. (Ed) (2004): Encyclopedia of Geomorphology, Routledge, London
3. Gregory, D., Johnston, R., Pratt, G., Watts, M. & Whatmore, S. (2009). *The Dictionary of Human Geography*. Singapore: Wiley-Blackwell.
4. Montello, D. and Sutton, P. (2013). *An Introduction to Scientific Research Methods in Geography and Environmental Studies*. SAGE Publications.
5. Warf, B. (Ed)(2006). *Encyclopedia of Human Geography*. London: SAGE Publications.

Code: Gg 341	**Multivariate Statistics: Concepts and Methods**	
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Geographical Data and Multivariate Analysis, Matrix Algebra: Concepts and Exercises	1
2	Non-Linear Bivariate Relationships, Multivariate Analysis: Multiple Regression and Correlation	3
3	Trend Surface Analysis: Computation of Linear Trend and Ideas of Quadratic and Cubic Surfaces	2
4	Principal Component Analysis, Factor Analysis	4
5	Logistic Model	1
6	Canonical Correlation Analysis	1
7	Dicriminant Analysis: 2 Variables	1
8	Harmonic Analysis: Fourier Series: Basic Idea Computation of First Approximation to Harmonic Analysis	2

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Acevedo, M. F. (2012). *Data Analysis and Statistics for Geography, Environmental Science and Engineering.* London: CRC Press.
2. Johnston, R. J. (1978). *Multivariate Statistics in Geography*. London: Longman.
3. Rogerson, P. A. (2010). *Statistical Methods for Geography*, London: Sage Publications.
4. Summer, G. (1978). *Mathematics for Physical Geographers.* New York: John Wiley.
5. Yeats, M. H. (1974). *An Introduction to Quantitative Analysis in Human Geography*. New York: McGraw-Hill.

Code: Gg 342	**Geography of South Asia**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	South Asia as a Region, Strategic Importance	3
2	Physical Aspects: Physiographic Divisions, Climate, Soil, Natural Vegetation	4
3	Cultural Framework: Language, Religion, Races, Ethnicity	4
4	Population, Poverty and Development	4
5	Agricultural System in South Asia and Contemporary Issues	4
6	Social and Cultural Issues in South Asia.	4
7	Urbanisation Pattern and Contemporary Issues	3
8	Border Related Issues: Territorial and Maritime Disputes Major River System and Trans-Boundary River Water Issues.	6
9	Major Environmental Issues: Challenges to Biodiversity, Climate Change, Disaster Preparedness	6
10	South Asia in Global Economy	4
11	SAARC: Role, Challenges and Potentialities in Regional Integration	3

Books:

1. Bradnock, R. W. (2016). *The Routledge Atlas of South Asian affairs*. London: Routledge Publication.
2. Farmer, B. H. (1993). *An Introduction to South Asia*. London: Routledge Publications.
3. Gonsalves, F., & Jetly, N. (1999). *The Dynamics of South Asia: A Regional Co-operation and SAARC*. New Delhi: Sage.
4. Johnson, B. L. C (1981). *South Asia*. Exeter: Heinemann Educational Books Ltd.
5. Mollinga, P. A. (2000). *Water for Food and Rural Development Approaches and Initiatives in South Asia*, New Delhi: Sage.
6. Shafi, M. (2000). *Agriculture Geography of South Asia*. New Delhi: McMillan India.

Code: Gg 343	**Computer Programming: Introduction to Python**	
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Introduction to Python, Installation, Understanding Modules and Packages	2
2	Python Syntax, Basic data Types, Data Structures, Input and Output	4
3	Understanding Operators, conditional statements, looping structure	3
4	Functions, Understanding Libraries, Data Frames	4
5	Reading and writing files	2

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Lutz, M. (2010). *Programming Python*. O'Relly Media California.
2. (URL: http://itbook.info/book614)
3. https://wiki.python.org./moin/BeginnersGuide/nonprogrammers.
4. Wes McKinney: Python for Data Analysis.
5. BrianK. Jones: Python Cookbook Recipes for Mastering Python.

Code: Gg 344	**Regional Planning**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction: Concepts, Nature and Scope, Role of Geography in Regional Planning	5
2	Historical Development of Regional Planning (Developed, Less Developed and India)	5
3	Regional, Techno-Economic and Diagnostic Surveys	5
4	Salient Features of Indian Five Year Plans, NITI Aayog	6
5	State, District and Block Level Planning	6
6	Regional Planning and Disparities in India	5
7	Natural and Cultural Orientation of Regional Planning in India	5
8	Regional Development and Planning Strategies: Case Studies from Developed and Developing Countries	8

Books:

1. Bhat, L. S. (1973). *Regional Planning in India*. Kolkata: Statistical Publishing Society.
2. Chand, M. and Puri, V. K. (2003). *Regional Planning in India*, New Delhi: Allied Publishers Pvt. Ltd.
3. Chandana, R. C. (2000). *Regional Planning- A Comprehensive Text*. Ludhiana: Kalyani Publisher.
4. Dube, K. N. (1990). *Planning and Development in India*, New Delhi: Asia Publishing House.
5. Friedmann, J., & Alanso, W. (1967). *Regional Development and Planning: A Reader*. New York: MIT Press.
6. Glasson, J., & Marshall, T. (2007). *Regional Planning*. New York: Routledge.
7. Govt. of India (1986). Regional Plan 2001: National Capital Region, NCRPB, Ministry of Urban Development, New Delhi.
8. India Year Book (2014). Publication Division, New Delhi.
9. Mishra, H. N. (2005). *Regional Planning*, Jaipur: Rawat Publication.
10. Mishra, R. P. (1992). Regional Planning, Concepts, Techniques, Policies and Case Studies, New Delhi: Concept Publication.
11. Mishra, R. P. (2002). *Regional Planning in India*. New Delhi: Concept Publication.

Code: Gg 345	**Geography of India**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	India as a Nation: An Overview , Physical and Administrative Divisions	6
2	Major Physical Regions: Geology , Geomorphology and Drainage	6
3	Climatic Regions: Monsoon, Agro-Climatic Zones and Their Importance	6
4	Distribution of Soils and Vegetation in India	6
5	Population in India: Problems and Prospects	5
6	Economic Development in India and Globalization	6
7	Religion, Language and Races	5
8	Contemporary Issues : Environmental, Natural Hazards, Social and Economic	5

Books:

1. Dutta, R., & Sundaram, K. P. M. (2002). *Indian Economy*. S. New Delhi: Chand Publications.
2. Kale, V. S. (2014). *Landscapes and Landforms of India*, Dordrecht: Springer.
3. Khullar D. R. (2011). *India A Comprehensive Geography*, Ludhiana: Kalyani Publishers.
4. Sharma, H. S., & Kale, V. S. (2009). *Geomorphology in India*, Allahabad: Prayag Pustak Bhavan.
5. Shivkumar, A. K., Panda, P., & Ved, R.R. (2013). *Handbook of Population and Development in India*, Oxford: Oxford University Press.
6. Singh, G. (2010). *A Geography of India*, Delhi: Atma Ram and Sons.
7. Singh, R. L. (1993). *India: A Regional Geography*. Varanasi: National Geographical Society of India.
8. Spate, O. H. K. (1954). *A General and Regional Geography*, London: Methuen publisher.

Code: Gg 346	**Geography and Sustainable Development**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Sustainable Development: Introduction, History, Concepts, Strategies and Measurement, Sustainable Development Goals	5
2	Challenges for Sustainable Development: Land Management, Water Crisis, Energy Crisis, Food Security and Agriculture, Poverty and Inequality	8
3	Sustainable Utilisation of Resources: Land, Water and Energy	8
4	Sustainable Agriculture and Food Security	4
5	Inclusive Development: Gender and Economic Equality	6
6	Climate Change and sustainability, Coping with Climate change	3
7	Increasing imperviousness in cities, thermal environment (Urban Heat Island), Urban disaster risk management, Sustainable Smart Cities and Good Governance, Sustainable approaches to Urban Water Management	7
8	Feasibility of Sustainable Development	4

Books:

1. Agyeman, Julian, Robert D. Bullard, & Bob, Evans (Eds.) (2003), *Just Sustainabilities: Development in an Unequal World*. London: Earthscan. (Introduction and conclusion.).
2. Ayers, Jessica & David Dodman (2010). *Climate change adaptation and development I: the state of the debate*. Progress in Development Studies 10 (2): 161-168.
3. Baker, Susan (2006). *Sustainable Development*. Milton Park, Abingdon, Oxon; New York, N.Y.: Routledge. (Chapter 2, "The concept of sustainable development").
4. Roling, N.G., & Wageruters, M.A.E.,(ed.) (1998). *Facilitating Sustainable Agriculture*, Cambridge: Cambridge University Press.
5. Singh, R. B. (Ed.). (2001). *Urban Sustainability in the Context of Global Change: towards promoting healthy and green cities*. Science Pub Incorporated.

Semester-IV

Code: Gg 411	**Applied Geography - I**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Preparation for the Field Visit	2
2	Field Visit of Any One of the Physical Divisions of India	9
3	Field Database Compilation and Processing	2
4	Preparation of Field Report	2

Books:

1. Goudie, A. (1990). *Geomorphological Techniques*, London: Routledge.
2. Pacione, M. (1999). *Applied Geography: Principles and Practice*. London: Routledge.
3. Robinson, G.M. (1998). *Methods and Techniques in Human Geography*. Michigan: John Wiley.

Code: Gg 412	**Applied Geography - II**	
No. of Credits: 02		**No. of Lectures: 30**
Sr. No.	**Topic**	**Lectures**
1	Significance of the Two Mega Features of India, Western Ghats and Himalayas	1
Part I - Western Ghats		
2	Formation of the Deccan Traps and Geology of the Terrain	2
3	Evolution of the Western Ghats Mountain	2
4	Climatic Setup, Orographic Effect and Rainfall Distribution	2
5	Drainage Systems and Water Resources	2
6	Flora and Fauna: Biodiversity Hotspot	2
7	Population Distribution, Structure and Occupation	3
8	Man Environment Interactions in the Region, Issues and Challenges	2
Part II - Himalayas		
9	Evolution of the Himalayas, Physiographic Divisions and Geology	2
10	Climatic Setup, Orographic Effect, Rainfall Distribution and Climate Change Indicators	3
11	Drainage Systems and Water Resources	2
12	Flora and Fauna: Biodiversity Hotspot	2
13	Population Distribution, Structure and Occupation	3
14	Man Environment Interactions, Issues and Challenges	2

Books:

1. Gunnell, Y., & Radhakrishna, B. P. (2001). (Eds.), Sahyadri, The great Escarpment of The Indian Subcontinent, *Geological Society of India*, Bangalore (Memoir 47(1)
2. Gunnell, Y. and Radhakrishna, B. P. (2001): (Eds.), Sahyadri, The great Escarpment of The Indian Subcontinent, *Geological Society of India*, Bangalore (Memoir 47(2)
3. Shroder, J. F. (2004). (Eds), *Himalaya to the Sea, Geology, Geomorphology and Quaternary*, Routledge, Taylor and Francis, UK
4. Valdia, K. S. (1998). *Dynamic Himalayas*, Hyderabad: Universities Press (India) Ltd.

Code: Gg 413	**Biogeography - I**	
No. of Credits: 02		**No. of Lectures: 30**
Sr. No.	**Topic**	**Lectures**
1	Plant Geography: Scope and Evolution of Plants	3
2	Functioning and Development of Ecosystem	2
3	Plants and Their Classification: Taxonomic, Ecological and Climatic. Raunkiaer's and Grime's Classification	6
4	Plants and Their Environment	4
5	Plants and Atmospheric Factors	4
6	Plants and Edaphic Factors	4
7	Major Biomes of the World: Forests, Grasslands and Deserts	4
8	Anthropogenic Effects on Plants	3

Books:

1. Mathur, H. S. (2003). *Essentials of Biogeography*. Jaipur: Pointer Publishers.
2. Pears, N. (1977). *Basic Biogeography*. London: Longman Group.
3. Robinson, H. (1972). *Biogeography*. London: MacDonald and Evans.
4. Seddon, B. A. (1971). *Introduction to Biogeography*. London: Gerald Duckworth and Co.
5. Tivy, J. (1993). *Biogeography: A Study of Plants in the Ecosphere*, London: Longman.

Code: Gg 414	**Biogeography - II**	
No. of Credits: 02		**No. of Lectures: 30**
Sr. No.	**Topic**	**Lectures**
1	Zoogeography: Scope and Evolution of Animals	5
2	Animal Characteristics, Environmental Adaptations; Camouflaging and Luminescence	5
3	Taxonomic Classification of Animals	6
4	Zoo-Geographical Regions of the World	4
5	Dispersal of Mammals, Birds, Reptiles, Fishes	6
6	Anthropogenic Effects on Animals	4

Books:

1. Darlington, P. J. (1957). *Zoogeography: The Geographical Distribution of Animals*, New York: John Wiley and Sons.
2. Mathur, H. S. (2003). *Essentials of Biogeography*, Jaipur: Pointer Publishers.
3. Pears, N. (1977). *Basic Biogeography*, London: Longman Group.
4. Robinson, H. (1972). *Biogeography*, London: MacDonald and Evans.
   Seddon, B. A. (1971). *Introduction to Biogeography*, London: Gerald Duckworth and Co.

Code: Gg 421	**Social and Cultural Geography**	
No. of Credits: 04		**No. of Lectures: 60**
Sr. No.	**Topic**	**Lectures**
Part A		
1	Social Geography: Definition, Nature, Scope, Significance and Concepts	3
2	Tribe: Definition, Nomenclature , Distribution, Developmental Impact and Linguistic Variations	4
3	Religion and Caste in India : Origin, Types and Distribution	6
4	Linguistic Diversity of India and Contemporary Issues	6
5	Power, Identity and Social Geography: Race and Ethnicity; Geography of Gender and Sexuality	4
6	Social Geography and Social Problems: Housing, Space and Society; Crime, Space and Inequality; Geography of Poverty	6
7	Social Basis of Regional Inequalities and Disparities	6
Part B		
8	Cultural Geography: Definition, Nature, Scope and Significance	5
9	Concept of Culture; Cultural Theory; Cultural Landscape	8
10	Cultural Regions of the World Cultural Change: Cultural Adaptation, Cultural Assimilation, Integration	6
11	Cultural Politics	3
12	Globalisation of Culture	3

Books:

1. Ahmad, A. (1993). *Social Structure and Regional Development*. Jaipur: Rawat Publications.
2. Ahmad, A. (2012). *Social Geography of India*, New Delhi: Concept Publishing Company.
3. Anderson, K., Domosh, M., Pile, S., & Thrift, N. (2003). *Handbook of Cultural Geography*, London: SAGE Publications.
4. Jordon, G. (1995). *Cultural Politics*, Oxford: Blackwell.
5. Mike, C. (1998). *Cultural Geography*, London: Routledge.
6. Panelli, R. (2004). *Social Geographies: From Difference to Action*. London: Sage Publications.

Code: Gg 422	**Advanced Survey: Concepts and Methods**	
No. of Credits: 04		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
Part A		
1	Introduction to Total Station: Principle and Function, REM, RDM, Use of Total Station in Topographical Survey	1
2	Introduction to GPS and Differential GPS (DGPS): Principle and Function, Duel and Single Frequency DGPS, RTK and Static Surveys in DGPS, Use of DGPS in Topographical Survey	2
3	Comparison of the Total Station with DGPS in Topographical Surveying	1
4	Introduction to UAS(Unmanned Aerial System), UAV (Unmanned Aerial Vehicle), Drone Survey	1
5	Introduction to Laser Scanning Survey	1
6	New Trends in Surveying	1
Part B		
7	Total Station Survey: Area Selection, Setting Up of the Instrument at the Base Station, Taking Points Using the Reflector	2
8	Total Station Data Processing: Download the Point Data, Import the File into GIS, Creation of Shapefile and Generation of Digital Elevation Model	2
9	DGPS Survey : Area Selection, Setting Up of the Instrument at the Base Station, Taking Points Using Rover and Storing the Data	2
10	DGPS Data Processing: Download the Point Data, Import the File into GIS, Creation of Shape file and Generation of Digital Elevation Model	2

Note: a) Each practical is equivalent to 4 hours.
b) Each practical will be 2 hours twice a week.
c) The concerned teacher may add some points related to the subject.

Books:

1. Jeff, H. (1995). *Differential GPS Explained*, Trimble Navigation
2. Lawrence, L., & Alex, L. (2008). *GPS Made Easy: Using Global Positioning Systems in the Outdoors*. Calgary: Rocky Mountain Books.
3. Mohinder, S. G., Lawrence, R. W., & Angus, P. A. (2001). *Global Positioning Systems, Inertial Navigation and Integration*, New York: John Wiley and Sons Inc.
4. Satheesh, G., Sathikumar, R., & Madhu, N. (2007). *Advanced Surveying: Total Station, GIS and Remote Sensing*, Delhi: Pearson Education.

Code: Gg 423	**Oceanography**	
No. of Credits: 04		**No. of Lectures: 30**
Sr. No.	**Topic**	**Lectures**
1.	Nature and scope, Age and origin of Oceans	2
2	Atmosphere – Ocean – Climate Coupling	5
3	Morphology of Major Ocean bottom	4
4	Ocean water Properties	8
5	Oceanic waves	4
6	Tides: Types and Theories	4
7	Ocean water circulation	4
8	Marine Deposits	4
9	Coral reefs and Mangroves forest	5
10	Marine Resources	5
11	Environment of Open Ocean and Sea: Indian Ocean, Atlantic Ocean, Mediterranean Sea and South China Sea	5
12	Marine Pollution: Causes and Consequences	5
13	Sea Level change and its consequences	5

Books:

1. Garrison, T. (1993). *Oceanography – An Invitation to Marine Science*. California: Wadsworth Publication Co.
2. Gross, G. M. (1990). *Oceanography*. New York: Macmillan Publication.
3. Joseph, W. S., & Parish, H. I. (1974). *Introductory Oceanography*, Tokyo: McGraw Hill.
4. Pinet, P. R. (2009). *Invitation to Oceanography*. Boston: Jones and Bartlett Publishers.
5. Stowe, K. S. (1979). *Ocean Science*, New York: John Wiley and Sons.
6. Thurman, H. V., & Trujillo, A. P. (1997). *Introductory Oceanography*, New Jersey: Prentice Hall.

Code: Gg 431 Advance Course in RS and GIS: Concepts and Methods		
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Types of Scale, Images and Sensors	1
2	Satellite Images: Correction Methods	1
3	Satellite Images: Best Band Combination and Band Ratios	1
4	Image Processing: Supervised and Unsupervised Classification	4
5	GIS Database Preparation: Vector and Raster Databases and Their Applications	2
6	Spatial Analysis Tools: Vector Data	3
7	Spatial Analysis Tools: Raster Data	3

Note: a) For 3 credits 3 hours practical twice a week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Brooks, K. N., Folliott, P. F., & Magner, J. A. (2012). *Hydrology and the Management of Watersheds*, Oxford: Wiley-Blackwell.
2. Cech, T. V. (2003). *Principles of Water Resources: History, Development, Management, and Policy*, New York: John Wiley and Sons.
3. Heathcote, I. W. (2009). *Integrated Watershed Management: Principles and Practice*, New York: John Wiley and Sons.
4. Murthy, J. V. S. (1994). *Watershed Management in India*, New Delhi: Wiley Eastern Ltd.
5. Mutreja, K. N. (1990). *Applied Hydrology*, New Delhi: Tata McGraw-Hill Pub. Co. Ltd.
6. Pranjape, S., Joy, K. J., Machado, T., Varma, A. K., & Swaminathan, S. (1998). *Watershed-Based Development*, New Delhi: Bharat Gyan Vigyan Samithi.
7. Singh, R. J. (2000). *Watershed Planning and Management*. Bikaner: Yash Publishing House.
8. Strahler, A. N. (1964). *Handbook of Applied Hydrology*, Ven Te Chow, Ed., Section 4- II, New York: McGraw-Hill Book Company.

Code: Gg 432	**Geography of Health**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction, Definition, Development and Significance, Dualism between Medical and Health Geography	4
2	Human Ecology of Disease, Landscape Epidemiological Approaches, Social and Spatial Epidemiological Perspectives on Health Transition	6
3	Developmental Changes and Human Health: Context of Population Change, Mobility and Exposure, Ecological Complication, Urbanization and Health, Emerging Diseases	4
4	Geographical Perspective on Health Care Provisions in Developed and Developing Countries, Spatial Aspects of Health Care Planning	5
5	Pollution Syndrome: Toxic Hazards of Natural and Economic Origins, Radioactive Pollution, Globalization and Perception of Health Hazard	5
6	Climate Change and Public Health, Adaptation and Mitigation	5
7	Poverty, Food Security and Health	5
8	Health Policies in India, Reproductive and Child Health, Millennium Development Goals	5
9	Indian Health Care Delivery System: Public and Private Sectors, Accessibility, Utilization and Health Service Planning	6

Books:

1. Brown, T., McLafferty, S., Moon, G. (2010). *A Companion to Health and Medical Geography*, UK: Wiley Blackwell.
2. Curtis, S. (2004). *Health and Inequality: Geographical Perspectives*. London: Sage Publications.
3. Hazra, J. (Ed.) (1997). *Health Care Planning in Developing Countries*. Calcutta: University of Calcutta.
4. May, J. M. (1959). *Ecology of Human Diseases.* New York: M.D. Publications.
5. Meade M., & Earickson R. (2006). *Medical Geography*. Jaipur: Rawat Publications.
6. Misra R. P. (2007). *Geography of Health: a treatise on geography of life and death in India*, New Delhi : Concept Publishing company.
7. Pati, B. and Harrison, M. (2009). *The Social History of Health and Medicine in Colonial India*, London : Routledge.
8. Philips, D. R. (1990). *Health and Health Care in Third world*, London: Longman.
9. Stamp, L. D. (1964). *Geography of Life and Death*, Ithaca : Cornell University.

Code: Gg 433	**Environmental Geography: Concepts and Issues**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction, Scope and Approaches	5
2	Concepts and Principles	5
3	Structure and Function of Ecosystem	5
4	Air, Water and Noise Pollution: Sources, Effects and Remedies	10
5	Human-Environment Relationships: Historical Progression, Adaptation; Environment and Development; Human Rights	10
6	National and International Efforts for Conservation and Protection of Environment	10

Books:

1. Chandna, R. C. (2002). *Environmental Geography*. Ludhiana: Kalyani.
2. Cunninghum, W. P. & Cunninghum, M. A. (2004). *Principles of Environmental Science: Inquiry and Applications*, New Delhi: Tata McGraw Hill.
3. Goudie, A. (2001). *The Nature of the Environment*, Oxford: Blackwell.
4. Miller, G. T. (2004). *Environmental Science: Working with the Earth*, Singapore: Thomson Brooks Cole.
5. Singh, S. (1997). *Environmental Geography*, Allahabad: Prayag Pustak Bhawan.
6. UNEP (2007). Global Environment Outlook: GEO4: Environment for Development, United Nations Environment Programme.

Code: Gg 434	**Agro-Meteorology**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Nature and Scope of Agro-Meteorology, Agro-Climatology of Field Crops	5
2	Plants and Energy Related Agro-Meteorological Elements	5
3	Plants and Moisture Related Agro-Meteorological Elements	5
4	Water Loss and its Measurement	5
5	Climate and Biological Hazards	5
6	Application of RS and GIS in Agro-Meteorology	5
7	Agro-Meteorological Database Management and its Application	5
8	Agro-Climatic Classification	5
9	Drought Intensity Assessment	3
10	Introduction to Dynamic Crop Simulation Modeling	2

Books:

1. Doorenbos, J. & Pruitt, W. O. (1977). *Guidelines for Predicting Crop Water Requirements*. FAO (United Nations)
2. Kakade, J.R. (1985). *Agricultural Climatology*. New Delhi: Metropolitan Book Co.
3. Mavi, H. S. (1996). *Introduction to Agrometeorology*. New Delhi: Oxford and IBH Publishing Co
4. Thornthwaite, C. W. & Mather, J. R. (1957). *Instructions and Tables for Computing Potential Evapotranspiration and Water Balance*. Drexel Institute of Technology, Laboratory of Climatology

Code: Gg 441	**Watershed Management: Concepts and Methods**

No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Watershed: Concept and Delineation	1
2	Watershed / Basin Morphometry, Drainage Morphometry	2
3	Rainfall Distribution	2
4	Runoff Estimation	2
5	Water Budget	2
6	Soil and Vegetation Conservation Techniques: Slope Treatment, Contour Trenching	2
7	Water Conservation Techniques: Drainage Treatment for Water	2
8	Land and Water Resource Appraisal: Demand and Supply	2

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Chang, K. T. (2008). *Introduction to Geographic Information Systems*. Avenue of the Americas, New York : McGraw-Hill.
2. DeBarry, P. A. (1999). GIS Modules and Distributed Models of the Watershed: A Report from ASCE Task Committee on GIS Modules and Distribution, ASCE
3. Drury, S. A. (2001). *Image Interpretation in Geology*, Oxford : Blackwell.
4. Environmental Systems Research Institute, Inc. (1998): Understanding GIS: The ARC/INFO Method, CA: ESRI Press, Redlands
5. Jensen, J. R. (2004). *Introductory Digital Image Processing*. New Jersey: Prentice Hall.
6. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2008). *Remote Sensing and Image Interpretation*. John New Delhi : Wiley and Sons. Wiley India Pvt. Ltd.
7. Navalgund, R. R. and Ray, S. S. (2011). *Hyperspectral Data, Analysis Techniques and Applications*. Dehradun : Indian Society of Remote Sensing.
8. Williams, J. (1995). *Geographic Information from Space: Processing and Applications of Geocoded Satellite Image*s. New York :John Wiley and Sons.

Code: Gg 442	**Political Geography and Contemporary Issues**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Definition, Nature, Scope and Approaches	4
2	Concepts in Political Geography	4
3	State, Nation and Nation-State	4
4	Frontiers and Boundaries	4
5	Global Strategic Views and Issues	8
6	Electoral Studies in Political Geography	4
7	Geographical Basis of Indian Federalism; Emergence of New States, International Boundary of India and Related Issues	8
8	Geopolitics of the Indian Ocean	3
9	Water Dispute in India: Interstate and International	6

Books:

1. Adhikari, S. (1997). *Political Geography*. Jaipur: Rawat Publications.
2. Cox, K. (2002). *Political Geography: Territory, State and Society*. Wiley-Blackwell.
3. Dikshit, R. D. (1994). *Political Geography*. New Delhi: Tata McGraw Hill Publication.
4. Glassner, M. L., De Blij, H. J., & Yacher, L. (1980). *Systematic Political Geography*. John Wiley.
5. John, R. S. (2002). *An introduction to Political Geography*. Taylor & Francis.

Code No: Gg: 443	**Geography of Soils**	
No. of Credits: 3		**No. of Periods:45**
Sr. No.	**Topics**	**Lectures**
1.	Introduction to Soil Geography / Pedology, Soil Origin and profile	3
2	Weathering and Pedogenesis, Soil forming processes and factors, Primary and Secondary Minerals	6
3	Physical properties of Soils: Texture, Structure, Moisture, Colour, Bulk density, Porosity and Permeability, Water holding capacity, Field capacity and Wilting point	6
4	Chemical properties of Soils: Clays minerals, Cation- Anion exchange, Humus, Organic matter, C:N ratio, pH and NPK Factors influencing ion exchange and its significance	10
5	Soil Classification – Genetic and Soil taxonomy	4
6	Soils and environmental problems, Need for Soil conservation and Soil resource management in India	4
8	Laboratory determination of Soils Physical properties: Texture, Colour, Moisture	6
9	Laboratory determination of Soils Chemical properties: pH, Soluble salts, EC, TDS and Organic carbon	6

Books:

1. Birkeland, P. W (1999). *Soils and Geomorphology*. New York: Oxford University Press.
2. Brady, N. C., & Weil, R. R. (2008). *The Nature and Properties of Soils*. New Jersey: Prentice Hall.
3. Bridges, E. M., & Davidson, D. A. (1982). *Principles and Applications of Soil Geography*. London: Longman Group.
4. Daji, J. A. (1970). *A Textbook of Soil Science*. New York: Asia Publication House.
5. Miller, R. W., & Donahue, R. L. (1992). *Soils: An Introduction to Soils and Plant Growth*, New Delhi: Prentice-Hall of India.
6. Pitty, A. F. (1978). *Geography and Soil Properties*, London: Methuen and Co.

Code No: Gg: 444	**Interpretation of Topographical Maps**	
No. of Credits: 3		**No. of Periods:15**
Sr. No.	**Topics**	**Practicals**
1	Introduction to SOI topographical maps: Numbering, Scales, Grid reference, Signs and symbols, Colour system (Old and Digital series)	3
2	Identification and Interpretation of the relationship between Geomorphic and Cultural landforms of SOI topographical maps (at least one Plain, Plateau and Mountain regions) using transect chart	6
3	Introduction to OS and USGS topographical maps: Grid reference, Signs and symbols	2
4	Identification of Cultural Landscape using Ordnance Survey (OS) topographical maps, Identification of Erosional and Depositional landforms using United States Geological Survey (USGS) topographical maps (Fluvial, Glacial, Arid, Coastal and Karst)	3
5	Introduction to Geological Survey Quadrangles	1

Books:

1. Dury, G. H. (1972). Map Interpretation. London: Pitman and Sons.
2. Gupta, K. K., & Tyagi, V. C. (1992). Working with Maps. Survey of India Publication.
3. Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. (2011). Map Use: Reading, Analysis, Interpretation. 7th ed, Esri Press.
4. Ramamurthy, K. (1982). Map Interpretation. Madras: Rex Printer.
5. Singh, G. (1996). Map Work and Practical Geography. New Delhi: Vikas Publication.
6. Tamaskar, B. G., & Deshmukh, V. M. (1974). Geographical Interpretation of Indian Topographical maps. Kolkata: Orient Longman.
7. Scovel, M. J. S., Brien, E. J. O', McCormack, J. C., & Chapman, R. B. (1965). Atlas of Landforms. John Wily and Sons / U.S. Military Academy.
8. Vaidyanadhan, R., & Subbarao, K. V. (2014). Landforms of India from Topomaps and Images. Geological Society of India.
9. Vaidyanadhan, R. & Subbarao, K. V. (2006). Recognition of Landforms from Topographical Maps of India.
10. Vaidyanadhan, R. (1968). Index to a Set of Sixty Topographic Maps: Illustrating Specified Physiographic Features from India. Council of Scientific and Industrial Research, Ministry of Education, Government of India.

Websites:

1. Survey of India: www.surveyofindia.gov.in
2. ISRO Bhuvan 2D Platform: bhuvan.nrsc.gov.in/map/bhuvan/bhuvan2d.php
3. USGS Global Visualization Viewer: www.glovis.usgs.gov