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Gg-101 : Principles of Geomorphology

Sr. No.	Topic	Subtopics	Learning points	Periods
1.	Fundamentals of Geomorphology	1. Nature and Scope 2. Concepts	1. Definition and history of Geomorphology 1. Uniformitarianism and Catastrophism 2. Geomorphic Scale – Timescale (Cyclic, Graded and Steady) and Spatial Scale 3. Ergodic Principle 4. Process Geomorphology	4
2.	Tectonism and Geomorphology	1.Interior of the Earth. Sources of Knowledge 2.Isostasy 3.Wegener's Continental Drift Theory 4.Plate Tectonics and Sea Floor Spreading 5.Endogenic Forces	1. Inferred Knowledge (Density, Temperature, Pressure) 2. Surface Expressions (Seismic Wave Evidences) Holmes Convection Current Theory 2. Gravity Anomalies and Correction 1. Theory, Supporting Evidences and Validity 1. Palaeomagnetism 2. Oceanic Relief 3. Sea Floor Spreading 4. Plate Boundaries, 5. Mechanics and Movements of Plates 6. Zone of Collision and Associated Landforms 1. Epiorogenic and Orogenic Movements 2. Compression, Tension 3. Folds, Types and Landforms 4. Faults, Types and Landforms	12
3.	Climatic Geomorphology	1.Denudational Processes 2.Weathering and Mass movement	1. Weathering 2. Mass Movement 3. Erosion 4. Definitions and Comparison of these processes 1. Types of Weathering 2. Types of Mass Movement	5
4.	Fluvial Processes	Work of River	1. Drainage Basin and Drainage Patterns 2. Davisian Cycle of Erosion and Concept of Peneplanation	

			3. Mechanics of Erosion , Transportation and Deposition 4. Erosional Landforms 5. Depositional Landforms	5
5.	Glacial Processes	Work of Glacier	1. Types of Glaciers 2. Mechanics of Erosion, Transportation and Deposition 3. Erosional Landforms 4. Depositional Landforms	3
6.	Arid and Semi Arid Processes	1. Work of Water in Desert 2. Work of Wind in Desert	1. Landforms produced by Water in the Desert 2. Concept of Pediplanation 3. Mechanics of Erosion , Transportation and Deposition 4. Erosional Landforms 5. Depositional Landforms	4
7.	Coastal Processes	Work of Waves and Tides	1. Mechanics of Erosion , Transportation and Deposition 2. Erosional Landforms 3. Depositional Landforms	4
8.	Slope Morphology	Slope Profiles: Elements Facets and Segments	Models of Slope Evolution: Slope Decline Slope Replacement Parallel Retreat	3

Reference Books:

1. Thornbury, W. D. (I960): Principles of Geomorphology, John Wiley and Sons, New York.
2. Chorley, R. J., Schumm, S. A. and Sugden, D. E. (1984): Geomorphology, Methuen, London.
3. Kale, V. S. and Gupta, A. (2001): Introduction to Geomorphology, Orient Longman, Calcutta.
4. Savindra Singh (2002): Geomorphology, Prayag Pustak Bhawan, Allahabad
5. Spark B. W. (1972): Geomorphology, Longman, New York
6. Steers, A. (1958). The Unstable Earth, Methuen, London
7. Ollier, C. D. (1981) Tectonics and Landforms, Longman , London
8. Strahler A. H and Strahler, A. N. (1992) : Modern Physical Geography, John Wiley, New York
9. Wooldridge and Morgan: Geomorphology
10. Holmes: Physical Geology
11. Fairbridge, R. W. (1968): Encyclopedia of Geomorphology, Reinholdts, New York.

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Gg-102 : Principles of Climatology

Sr. No.	Topic	Subtopics	Learning Points	Periods
1.	Introduction	Nature and Scope	Weather, Climate, Subdivisions of Climatology. Development of Modern Climatology. Tropical Climatology	2
2.	Earth`s atmosphere	1.Composition 2. Vertical structure	Physical properties, Chemical composition Temperature changes, Vertical variations in the composition, Ionosphere and aurora	4
3.	Insolation and Heat Balance	1. Solar radiation 2. Distribution 3. Effect of Atmosphere 4.Terrestrial Radiation	Electromagnetic spectrum, Factors affecting insolation. Latitudinal and Seasonal, variation of insolation Scattering, Diffusion Absorption Reflection, Albedo Green House Effect. Heat Budget Latitudinal Heat Balance Atmospheric window.	5
4.	Temperature	Basic concepts	Difference between Heat and Temperature Controls of temperature Horizontal and Vertical distributions, Inversion of temperature	4
5.	Air pressure and wind	**Basic concepts**	Pressure measurement and Units, Factors affecting air pressure, Pressure changes with altitude, Observed distribution of surface pressure. Wind observation and measurement, Factors affecting wind. Geostrophic wind, Gradient wind	7
6.	Circulation of the Atmosphere	1.Scales of Atmospheric Motion 2. Models of general circulation	Primary, Secondary, Tertiary. Local winds, Idealized circulation, Observed global circulation. Tri-cellular theory, Eddy theory Jet stream and it's effect on the surface weather conditions.	6
7.	Humidity	1. Basic Concepts 2. Hydrological Cycle 3. Condensation 4. Evaporation	Humidity measurement Changes of state of water Factors affecting Condensation Factors affecting Evaporation	4
8.	Stable	1. Lapse rate	Normal, environmental, dry and	2

	and unstable Atmosphere	2. Stability	wet adiabatic Absolute stability, Absolute instability, Conditional instability.	
9.	Air masses and Fronts	Basic Concept	Source region ; classification of air masses Modifications: (a) Mechanical (b) Thermodynamic. Characteristics and Types of Fronts	4
10.	Weather Forecasting	Methods of Forecasting	Any Two Methods	2

Reference Books:

1. Frederick K. Lutgen, Edward Tar buck: "The Atmosphere An Introduction to Meteorology" Prentice Hall, Englewood Cliffs ,New Jersey 0762 ,1998
2. D. S. Lal: Climatology. Sharda Pustak Bhawan ,11 , University road Allahabad- 211002 Edition 2003
3. Trewartha : Introduction to Weather and Climate.
4. H.J. Critchfield (1993): General Climatology. Prentice Hall, New Delhi

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Gg-103 : Principles of Economic Geography

Sr. No.	Topics	Subtopics	Learning points	Periods
1.	Introduction	Nature and Scope	Definition, nature and scope, Recent trends in Economic Geography	3
2.	Hypotheses in Economic Geography	Types of Hypotheses	Elaboration and Testing of hypotheses	3
3.	Economic Landscape	1.Historical Evolution 2. Location of economic activity	Homestead, Tribal and Village economy, Modern economic landscape. Von Thunen and Weber's models.	7
4.	Resources	Natural and Human Resources	Significance of Natural and Human resources in Economic Development.	3
5.	Factors of Production and related aspects.	1.Land, Labour and Capital 2. Transportation Demand Economies of scale.	Significance of land, labour and capital in different economic activities, Spatial variation in the factor cost, Variation in cost of transportation, spatial variation in demand, Internal and external economies of scale.	8
6.	Economic Development	Spatial and Temporal aspects	Measures of economic development classification of countries. Rostow's and Myrdal's models	7
7.	International Trade	Spatial and Temporal aspects	Factors influencing the International trade, structure, problems and prospects. Ricardo's classical theory.	5
8.	Economic Development in India	1. Regional disparity 2. History of development	Natural and Cultural factors Pre and Post-independence. Impact of Green Revolution, Privatization, Globalization.	4

Reference Books:

1. Hartshorne, T.A. and J.W. Alexander (1988) –Economic Geography, Prentice Hall.
2. Janaki. V.A. (1985) –Economic Geography, Concept Publishing Co.
3. Lloyd, P.and P. Dicken (1972) –Location in space : A theoretical approach to Economic Geography, Harper and Row, New York.
4. McCarty, H.H. and J.B. Lindberg (1966) – A Preface to Economic Geography, Englewood Cliffs, N.J. Prentice.
5. Thomas, Conkling and Yeates (1974) – Geography of Economic Activity, Mc Graw Hill, New York..
6. Knox, P. and J. Agnew (1998) – The Geography of the World Economy. Arnold, London
7. Hanink, D. M. (1997). Principles and Applications of Economic Geography, Economy, Policy, Environment, John Wiley and Sons, New York.

8. Dreze, J. and Sen, A. (1996) – Economic Development and Social Opportunity. Oxford University Press, New Delhi.

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Gg-104 : Principles of Settlement and Population Geography

Unit No.	*Topic*	Sub Topics	Learning Points	No. of periods
1	Introduction	Evaluation of Settlement & Population Geography	1. Evaluation of Settlement Geography 2. Evaluation of Population Geography 3. Changes in the approaches to the study of Population and Settlement	04
2.	**Man-environment Relationship**	Factors influencing the growth and distribution of Settlements.	1. Physical 2. Economic 3. Societal	02
3.	**Settlement Patterns**	Changes in the Shelter and Patterns of Settlement.	1. Various patters of settlement. 2. Effects of technology on shelter and pattern from Neolithic to Modern period.	04
4.	**Dispersion and Nucleation**	Factors influencing the dispersion and nucleation	1. Physical 2. Social 3. Economic 4. Method of Measuring degree of dispersion, Nearest Neighbors Method.	04
5.	**Concepts related to Settlement**	1. Various Concepts 2. Settlement Theory	1. Nodality 2. Centrality 3. Range 4. Threshold & Hierarchy 5. Rank-size distribution 1. Christaller and Losch's Models	04
6.	Concentration of Population and Levels of Urbanization	1. Urbanization 2. Factors of Urban Growth	Concept of Urbanization 1. Improvement in transportation & Communication. 2. Changes in Industrial Production. 3. Industrialization 4. Food supply and Public hygiene	06
7.	Population Distribution	Factors influencing the Distribution of Population	1. Physical 2. Economic 3. Social 4. Political	04
8.	Theories of Population Growth	1. Thomas Malthus 2. Ricardo 3. Demographic Transition Model	1. Concept 2. Scope 3. Applications 4. Relevance	08

9.	Population as a resource	Various aspects of population	1. Size 2. Growth 3. Age 4. Education 5. Health	04

Reference Books:

1. Beaujeu Garnier J. – Geography of Poluation, Longman Group Ltd.
2. Chandna R. C. (2000) – A Geography of Population, Concepts, Determinants and Patterns, Kalyani Publishers, New Delhi
3. Clark J. I. (1973) – Population Geography, Pergamon Press Ltd., Oxford
4. Clark J. I. Geography of Population Approaches and Applications, Pergamon Press Ltd., Oxford
5. Michel Chisholm – Studies in Human Geography.
6. Hudson, Settlement Geography.
7. Mishra, R.S. : Economics of Growth and Development , Somaiya Publication Pvt. Ltd.
8. Bhende Asha and Kanitkar T. – Principles of Population Studies, Himalaya Publishing House, Bombay. 1993.
9. Singh R. L. – Readings in Settlement Geography. The National Geographical Society of India.

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Gg-105 : Practicals in Physical Geography

10.

Sr. No.	Topics	Subtopics	Learning points	Practicals (3 hours duration)	No. of sheets
a. Geomorphology					
1	Drainage Network	1. Stream Ordering	1. Horton and Strahler methods of stream ordering (*for a 3 to 5 order drainage basin)* 2. Relationship between stream order and number; Bifurcation ratio	2	2
2	Drainage basin	2. Basin relief analysis	Relief analysis (*for a 3 to 5 order drainage basin; based on grid method*) 1. Absolute relief map 2. Relative relief map 3. Slope map (degrees) 4. Dissection index map 5. Hypsometric integral 6. Basin cross profiles 7. Block Diagram (multiple section)	5	7
3	Sediment analysis	1. Sediment size 2. Graphical representation of particle size	1. Wentworth and Phi scale (Table) 2. Particle size distribution, size parameters (on probability graph paper)	3	2
b. Climatology					
4.	Scientific notation & the metric system of units	1. To express numbe scientific notation. 2. To Convert number expressed in British system into the metric system	1. To calculate temperature conversions in Fahrenheit, Celsius, and Kelvin scales 2. To calculate relative humidity. 3. To calculate temperature lapse rate and drawing of temperature profile.	2	2
5.	Climatic elements	Preparation of climatic diagrams	1.Climatograph 2. Climograph 3. Simple windroses 4. Hythergraph	4	4
6.	Classification of Climate	1.Climatic classificati of Koppen and Thornthwaite 2. Water budget	1.Determination of climatic type by using Koppen's and Thornthwaite's scheme of classification. Construction of water budget diagram using Precipitation &	4	3

			potential evapo-transpiration data		
7.	Field visit up to 7 days	Study of Geographic features	To prepare field report	4	2

Reference Books:

1. King, C. A.M (1966): Techniques in Geomorphology, Edward Arnold, London
2. Monkhouse, F. J. and Wilkinson, H. R., (1976). Maps and Diagrams, Methuen & Co.
3. Savindra Singh (2002): Geomorphology, Prayag Pustak Bhawan, Allahabad
4. Miller, Austin (1953): The skin of the Earth, Methuen & Co. Ltd. London
5. Strahler: Physical Geography

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Gg-201 Quantitative Techniques in Geography

Sr. No.	Topic	Subtopics	Learning Points	Periods
1.	Geographi--cal data	1. Nature 2. Scales of measurement 3. Types of statistics	1. Spatial and Temporal 2. Discrete and Continuous data 3. Grouped and Ungrouped data Nominal, ordinal, Interval and ratio scales Descriptive and Inferential	4
2.	Descriptive statistics	Analytical methods	Meaning, description and calculation of mean, median, variance, standard deviation, skewness and kurtosis.	6
3	Concept of probability	Methods of Determination	1. Normal probability distribution, central limit theorem, Confidence interval for means 2. Determination of the probability of a continuous random event using normal distribution. 3. Determination of the probability of a discrete random event using Binomial and Poisson distributions.	8
4.	Time series analysis	Meaning, and Definition of time series, Methods of analysis	1. Properties of a time series, trends and periodicity. 2. Calculation and plotting of running means (3 and 5) 3. Curve fitting by method of least squares.	6
5.	Bivariate analysis	Correlation and Regression	1. Concept of bivariate correlation and regression 2. Calculation of Pearson's product moment correlation coefficient 3. Calculation, plotting and interpretation of linear regression equation 4. Concept of residuals and explained variance	6
6.	Inferential statistics	1. General requirements for conducting an inferential Statistical test 2. Testing of hypothesis	1. Population and sample, Meaning of unbiased random sample 2.Standard error estimates of mean and standard deviation. Meaning and Definition of : 1.Null and Alternative hypothesis. 2. Level of significance (Rejection level) 3. Degrees of freedom 4.. Parametric and Non parametric tests Application of following tests : 1. Non- parametric test, chi squared test a. Two or more samples, b. Using relative frequency table 2. Parametric tests,	2 8

			a Student's test (comparison of sample means) b. ANOVA(Analysis of variance)	

(Note: Use of calculator is allowed at the time of Examination)

Reference Books:

1. Ebdon David (1989). Statistics for Geographers
2. King, (1975). Statistical Geography
3. Norcliffe G.B. (1977). Inferential statistics for Geographers (Hutchinson, London)
4. Rogerson P.A. (2001). Statistical methods for Geography (SAGE pub., London, New Delhi)
5. Shaw G. & Wheller D. (1985). Statistical Techniques in Geographical Analysis, John Wiley & Sons, New York.

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Gg-202 : Practicals in Human Geography

Sr. No.	Topics	Subtopics	Learning Points	Practicals (3 hours duration)	No. of Sheets
a. Economic Geography					
1.	Crop Combination	Methods	1. Weaver's method 2. Thomas' method	2	2
2.	Agricultural Efficiency	Methods	1. Kendall's method 2. Bhatia's method	2	2
3.	Measures of Network Structure	Network indices	1. Ratio measure 2. Alpha, beta, gamma, etc. 3. Associated number, cyclomatric number	2	2
4.	Location Quotient	Location Quotient	Calculation	1	1
5.	Lorenz Curve	Lorenz Curve	Calculation and plotting	1	1
6.	Use of Logarithmic Graph Papers	1. Semi-log 2. Double-log	1. Plotting of suitable economic data on semi-log graph paper 2. Plotting of suitable economic data on double-log graph paper	2	2
b. Settlement and Population Geography					
7.	Population Geography	Indices and Projection	1. Age-sex pyramid 2. Child-women ratio 3. Dependency ratio 4. Infant mortality rate 5. Age specific mortality 6. Population growth rate 7. Population projection	4	7
8.	Settlement Geography	Methods for calculation of Urban data and Dispersion	1. Rank size rule 2. Calculation of centrality 3. Functional classification of towns - H. J. Nelson's method 4. Methods used to calculate degree of dispersion by Demangeon, Bernard, Debouverie 5. Nearest Neighbour analysis 6. Gravity model	6	9
C. Computer Application					
9.	Computer Application	Data Analysis by Computer	Use of GIS Software	06	05

Reference Books:

1. Carter Harold (1977): The study of Urban Geography
2. Hans Raj (1978): Fundamentals of Demography
3. Hudson F.S. (1976): Geography of Settlements
4. Michael E. and E. Hurse: Transportation Geography

5. Pollard A. H. and Farhat Yusu: Demographic Techniques
6. Singh, R. L. Reading in Rural Settlement Geography
7. Yeats, M. H. (1974). An introduction to Quantitative Analysis in Human Geography
8. Singh, J. and Dhillon (1984): Agricultural Geography.
9. Liendsor, J. M. (1997): Techniques in Human Geography, Routledge.
10. Lloyd, P. and B. Dicken (1972): Location in Space - A theoretical approach to economic geography. Harper and Row, New York

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Gg-203 : Practicals in Surveying and Map Projections

Sr. No.	Topic	Subtopics	Learning Points	Practicals (3 hours duration)	No. of Sheets
1.	Surveying	Geodetic Surveying	Definition and methods, triangulation, benchmarks, spot heights and reduced levels, interpolation, contouring.	1	1
2.	Transit Theodolite	The Instrument and its use	1. Various components and least count of the instrument. 2.Methods of surveying and preparation of at least two contour maps by intersection and tachometry	5	3
3.	Dumpy level	The instrument and its use	1. Various components : Methods of surveying and leveling. 2. Field surveying and leveling by rise and fall method and block contouring.	5	3
4.	Map projections	Fundamental concepts	1.Defination and necessity of projections 2. Developable and non - developable surfaces 3. Types- Perspective and non-perspective, conventional 4. Classification based on i) Developable surfaces used ii) Position of source of light iii) Properties	1	3
5	Construction	Graphical construction	Graphical construction and uses of following projections 1.Polyconic projection 2. International map projection (Modified polyconic) 3. Universal Transverse Mercator (UTM) projection 4. Mollweide projection.	8	4

Reference Books :

1. Singh & Kanujia : Map work and Practical Geography.
2. Maslov A.V. Gordeev A.V.,Batrakov Yu.G. Geodetic surveying,1984, Mir Publishers, Moscow
3. Kanetakar T.P. & Kukarni S.V. 1986. Surveying & leveling, Pune Vidyarthi Griha Prakshan, Pune
4. V. Natarajan P., Adler Ron K. Advanced Surveying, B.1 Publ. Bombay
5. Richardus P., Adler Ron K.: Map projections, 1972, North Holland publ. Co.Amsterdam
6. Maling D.H. ,1973 Co ordinate systems and map projections, George Philip, London.

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Gg 210: Tropical Geomorphology

Sr. No.	Topic	Subtopics	Learning Points	Periods
1.	Introduction to Tropics	1. Tropical Environment 2. Climatic and Environmental Factors	1.Definition 2. Peculiarities of tropical climate 3. Classification of Tropics 4. Morphogenetic regions 1.Temperature, rainfall, humidity vegetation	6
2.	Tropical Weathering	1.Processes and products 2. Weathering Profiles 3. Tropical Soils	1. Factors influencing the weathering- climatic, geomorphic, biotic, geologic, chronological and site factors 2. Solubility and Mobility of minerals in Tropics. Deep weathering profiles - nature, development and distribution Process of soil formation in Tropics, Clay minerals	6
3.	Duricursts and Laterites	1.Duricrusts and Laterites 2. Types 3. Classification 4. Lateritic Profiles 5. Formation 6. Landforms 7. Distribution	1. Definition, various terms used 2. Indurated laterites: Properties and world distribution 3. Classification by site, Morphology and chronology 4. A complete account of various division of Lateritic Profile 5. Theories of origin of iron in laterites 6. Landform development on laterites 7. Distribution of laterites in India	6
4.	Denudation in Tropics	1.Mechincal denudation 2. Chemical denudation 3. Stream erosion and Deposition	1. Mass movement: Types & Processes 2. Slope wash 1.Process of chemical denudation 1.Tropical rivers, process of erosion and deposition	6
5.	Tropical Landscape	The nature of Tropical Terrain	1. Relief characteristics 2. Slope and valley forms 3. Domed and boulder inselbergs 4. Hillslopes and Pediments 5. Tropical coasts	6
6.	Tropical Planation	Concepts and Processes	1.Formation and Types of planation surfaces 2. Morphology of planation surfaces 3. Peneplains, Pediplains, Etchplains, double surface of planation	6
7.	Landform development in	Role of tectonics and climatic change	Nature of changes during Quaternary - changes in climate, vegetation and	4

	Tropics		sea level	

Reference Books :

1. Thomas, M. F. 1994. Geomorphology in the Tropics, John Wiley and Sons, Chichester
2. Thomas M.F., 1974, Tropical geomorphology, McMillan, London
2. Tricart J., 1972, Landforms of the humid tropics, forests and Savanna, Longman, London
3. Feniran A. 7 Jeje L.K., 1983, Humid tropical geomorphology
4. Douglas j. & Spencer, 1985, Environmental change & Tropical geomorphology, George Allen & Unwin,
5. Budel J. ,1982, Climatic geomorphology, Princeton University Press
6. Andrew Goudie, 1987, Environmental change
7. Andrew Goudie, 1985, Duricrusts in tropical and subtropical landscapes, Allen Unwin, London.

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Gg 211 : Synoptic Climatology

Sr. No.	Topics	Subtopics	Learning points	Periods
1.	Introduction	Nature and Scope	Levels of climatological synthesis	1
2.	Approaches	Techniques	1. Analytical approach 2. Synoptic approach	2
3.	Weather analysis	Procedures	1. Observing, reporting, Collecting and displaying systems of weather data by India Meteorological Services. 2. Meteorological code and data exchange 3. Analysis of weather charts	4
4.	Tropical Weather Systems	Tropical Disturbances	1. Types-Easterly waves, Tropical cyclones 2. Easterly waves – formation and characteristics 3. Tropical cyclones - formation, life cycle, structure and dissipation	5
5.	Severe Tropical Weather System	Thunderstorms	1. Thunderstorms – origin, structure stages of development 2. Tornados – development and occurrence, prediction 3. Hurricanes – profile, formation and decay 4. Environmental impact of severe weather systems.	4
6	Extra-Tropical Weather Systems	Air masses and Fronts	1. Airmasses of North America Asia and Europe. 2. Types of Fronts-warm, cold, stationary and occluded 3. Frontogenesis and Frontolyses Principle zones of Frontogenesis	4
7	Extra-Tropical cyclones	Wave Cyclone	1. Rossby Waves 2. Life cycle of wave cyclone 3. Idealized weather of a wave cyclone 4. Western disturbances	4
8.	Weather Pattern	Local Weather	1. Clouds – Classification, formation 2. Precipitation – Theories of rain formation 3. Types of precipitation – Convective, Frontal, Orographic 4. Fog – formation process 5. Heat waves and Cold waves.	5
9.	Weather Interpretation	Weather Forecasting	1. Short, medium and long range forecasting 2. Methods of forecasting analogue synoptic and numerical 3. Satellites in weather forecasting	6
10	Application of Synoptic Climatology	Benefits of Weather Forecasting	1. Modeling of pollutant distribution 2. Marine activities 3. Aviation 4. Disaster prevention and preparedness 5. Agriculture and Agro-climatological service	5

Reference Books :

1. Barry and Petty-Synoptic Climatology.
2. Fredrick K.Lutgens and Edward J Tarbuck (1979) –The Atmosphere
3. A.A. Rama Sastry (1984) Weather and Weather forecasting
4. Lestie F Musk (1989) Weather Systems
5. Morris Neiburger (1971)Understanding our Atmospheric
6. James G. Edinger Environment
7. William a Bonner.

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Gg 212 : Agricultural Geography

Sr. No.	Topics	Subtopics	Subunits	Periods
1.	Introduction to Agricultural Geography	1. Nature, scope and approaches 2. Origin and dispersal of agriculture	1. Nature scope and significance. 2. Approaches-systematic : commodity, regional, recent.	5
2.	Significance of Agriculture	Place of agriculture in Different Economies	1. Significance of agriculture in world regions 2. Importance of agriculture in the Indian Economy.	4
3.	Determinants of Agricultural Patterns	Influence of Physical, Economic and Technological Factors.	1. Relief, climate, soil 2. Land holding, marketing, transport 3. Irrigation 4. Mechanization. 5. Biochemical inputs	7
4.	Agricultural Types	Subsistence and Commercial agriculture	1. Shifting cultivation 2. Intensive subsistent farming. 3. Mixed farming 4. Plantation agriculture 5. Commercial grain farming	10
5.	Problems & Prospects of Agriculture	Semi-arid & arid regions	1. Definition and characteristics of arid and semi-arid regions. 2. Droughts and famines 3. Role of irrigation and dry farming.	4
6.	Agricultural regionalization	Methods of Regionalization	1. Views of Baker Whittlesey Hann. 2. Crop combination techniques, Weaver and Thomas method. 3. Agricultural efficiency, Kendall's ranking-coefficient, Bhatia's method 4. Agricultural regions of India.	7
7.	Land use	General Land use Agricultural Land use	1. Land use surveys 2. Land Classification in Great Britain and India.	3

Reference Books:

1. Grigg. D.G.(1964) – An Introduction to Agricultural Geography Hutchinson & Co.Ltd.,
2. Morgan. W.B. & S.C. Monton (1971) – Agricultural Geography Methuen, London.
3. Singh. J. and Dhillon S.S. (1994) – Agricultural Geography. Tata McGraw Hill, Publishing Co. Ltd.

4. Symons, Leslie (1970) – Agricultural Geography, G. Belt and Sons Ltd., London.
5. Tarrent, J.R. (1970) – Agricultural Geography, David and Charles, Newton Abbot.
6. Grigg. D.G. (1974) – The Agricultural Systems of the world An Evolutionary Approach.
7. Illbery, B.W. (1985) – Agricultural Geography, Social & Economic Analysis, Oxford University Press.
8. Aiyer, A.K.Y.N.(1949) – Agricultural and Allied Arts in Vedic India.
9. Randhawa, M.S. (1980) – An History of Agriculture in India Vols. I, II, III,IV ICAR, New Delhi.

UNIVERSITY OF PUNE

Gg-213 : Population Geography

Sr. No.	Topic	Subtopics	Learning points	Periods
1.	Introduction	1. Nature and Scope 2 Approaches	1. Definition, nature and scope. 2. Evolution of Population Geography. 3. Recent trends in Population Geography 1.Approaches to the study of Population Geography 2. Population Geography and other disciplines	4
2.	Growth of Population	1. Spatial variation 2. Temporal variation	1. Factors 1. Factors 2. Historical to modern	3
3.	Population Theory	Various theories	1. Malthus Population Theory 2. Marx's Population Theory 3. Optimum Population Theory 4. Demographic Transition Theory.	5
4.	Population Distribution	Distribution of world population.	1.Density of Population 2. Physical factors 3. Socio-economic and Political factors. 4. Demographic factors	4
5.	Fertility	1. Levels and trends of fertility 2. Recent and current fertility differences within countries (developed and developing)	1. Areas of low and high fertility 2. Factors affecting fertility 3. Causes of low & high fertility. 1. Urban Rural status. 2. Educational status 3. Economic status 4. Occupational groups 5. Religious and Ethnic groups	4
6.	Mortality	Levels and trends	1. Recent mortality levels 2. Factors related to High Mortality in the past 3. Foetal and Infant Mortality 4. Factors in mortality trends in developed countries 5. Factors in mortality levels and trends in developing countries.	4
7.	Migration	Definition and Types	1. Definition Types- inter-regional, inter-state, rural-urban, international. 2. Causes and consequences of migration. 3. Lee's Theory of Migration 4. Laws of migration.	4
8.	Population Composition	Various compositions	1. Sex ratio and sex composition. 2. Age composition 3. Age and Sex pyramid 4. Literacy 5. Economic 6. Occupation composition 7. Urban and Rural 8. Religion	4

			9. Language	
9.	Population projection	Population projections in historical perspective	1. Use of population projections in planning. 2. Industrial development 3. Agricultural development 4. Education 5. Health 6. Housing. 7. Regional and Urban development 8. Regional and World projections.	4
10.	Population Policies	Population Policies – Post - World War II	1. Population policies after World War II 2. Population policies – with special reference to India	4

Reference Books:

1. Agarwala, S.N. : India's population Problems, Tata McGraw Hill publishing Co. Ltd. , New Delhi.1977
2. Bose Ashis et.al. :Population in India's Development Vikas Publishing House, New Delhi, 1974.
3. Chandna R.C.:Geography of Population : concepts, Determinants and Patterns, Kalyani Publishers, New Delhi, 1986.
4. Clarke J.I : Population Geography, Pergamon Press, Oxford,1973.
5. Clarke J.I. (Ed) :Geography and Population -Approaches and Applications, Pergamon Press. Oxford , 1984.
6. Crook Nigel :Principles of Population and Development, Pergamon Press New York, 1997.
7. Garnier B.J. :Geography of Population, Longman, London, 1970.
8. Pathak, K.B. and F.Ram : Techniques of Demographic analysis. Bombay: Himalaya Publishing house. 1992.
9. Sundaram K.V. and Sudesh Nangia (Ed): Population Geography, Heritage Publications, Delhi,1986.
10. U N D P: Human Development Report, Oxford, 2002.
11. Woods R.: Population Analysis in Geography, Longman, London, 1970.
12. Zelinsky Wilbur : A Prologue to Population Geography Prentice Hall, 1966.

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Gg-214 : Geoinformatics-I

Sr. No.	Topic	Subtopics	Learning Points	Periods
1.	Introduction to GIS	Basics of GIS	Definition, Potential of GIS, Concept of space & time, Spatial Information Theory, History of GIS, Objectives of GIS, Elements of GIS, Hardware & software requirements, GIS applications, GIS tasks – Input, Manipulation, Management, Query & Analysis, Visualization	8
2.	Database	Spatial Non-spatial	Spatial relationship, Functional Relationship, Logical relationship Nominal,, Ordinal, Ratio and Cyclic	4
3.	Data Models	Spatial Non-spatial	Geometric primitives, Raster, Vector, Quadtree Tessellation, Comparative overview of raster and vector models, Layers and Coverage DBMS: Advantages, Conceptual models, Implementational models – Hierarchical, Network and Relational	8
4.	Structuring of spatial data	Digitizing	Digitizers: Manual, Semi-automatic & Automatic Editing: Error Detection & Correction Topology Building	4
5.	Data Analysis (I)	Attribute databases	Operations from Algebraic Theory, Operations from Set Theory SQL: Attribute Query	8
6.	Data Analysis (II)	Spatial databases	Map Algebra, Grid Operations: Local, Focal SQL: Spatial Query	8

Reference Books:

1. P. A. Burrough and R. A. McDonnell, Principles of Geographical Information System, 2000, Oxford University Press.
2. C.P.Lo and AlbertK. W. Yeung, Concepts and Techniques of Geographic Information System, 2002Prentice –Hall, India.
3. Paul A. Lonfley, Michel F. Goodchild, D J. Maguire and D.W. Rhind, Introduction to Geographic Information Systems and Science, 2002, John Wiley and Sons Ltd.
4. Kang – tsung – Chang, Introduction to Geographical Information System, 2002, McGraw Hill.
5. George Joseph, Fundamentals of Remote Sensing, 2004, Universities Press Pvt. Ltd., Hyderabad.
6. J.R. Jensen, Remote Sensing of Environment, An Earth Resource Perspective, 2003, Pearson Education Pvt. Ltd., New Delhi.
7. Lillesand T.M. and Kiefer R.W., 2002, Remote Sensing and Image Interpretation, John Wiley and Sons, New Delhi.

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Gg-220 Fluvial Geomorphology

Sr. No.	Topic	Subtopics	Learning Points	Periods
1.	Introduction to Fluvial Geomorphology	1. Fluvial geomorphology 2. Drainage basin and network	1. Definition and scope 1.The Drainage basin as a geomorphic unit 2. Glock's model 3. Horton's laws of drainage composition 4. Laws of allometric growth	7
2.	Mechanics of Fluvial Erosion	1. Overland flow, Throughflow and Channel flow	1. Surface and subsurface wash 2. Horton overland flow 3. Belt-of-no-erosion	2
3.	Open channel Hydraulics	1. Types of flows; Regimes of flow; Stream energy	1. Laminar and turbulent 2. Uniform and non-uniform 3. Steady and unsteady 4. Isovels 5. Shear stress and stream power	6
4.	Hydraulic Geometry	1. At-a-station 2. Downstream	1. Relation of discharge with width, depth, velocity and gradient	3
5.	Sediment Transport	1. Entrainment 2. Model of sediment transport 3. Sediment load and yield	1. Capacity and Competence 2. Tractive force 3. Suspended and bedload	4
6.	Channel Morphology	1. Cross section morphology and Reach morphology 2. Channel patterns 3. Channel types 5. Concept of Grade	1. Form ratio, channel capacity, wetted perimeter, hydraulic radius, gradient 2. Meandering, braided and anabranching channel patterns 3. Gradient and variation in bed and bank material and discharge 4. Sand bed, gravel bed and bedrock channels 5. Long profile: below, near and above grade conditions	10
7.	Fluvial Erosion	1. Types of erosion and erosive Processes; factors 2. Erosional features	1. Vertical, lateral and headward erosion 2. Abrasion, cavitation and attrition 3. Erosional features : gorges, canyon waterfalls, potholes, etc.	2
8.	Fluvial Deposition	1. Fluvial landforms 2. River terraces	1. Alluvial fans, flood plains and associated features 2. Terraces : types and combinations	3
9.	River Metamorphosis	Definition, environmental change	1. Long-term and Short-term adjustments 2. Quaternary fluvial systems	3

Reference Books:

1. Leopold, L. B., Wolman, M. G. and Miller, P. (1954) Fluvial processes in Geomorphology, Freeman and Co., San Francisco.
2. Schumm, S. A. (1977). Fluvial Systems. Wiley, New York.
3. Richards, K. (1982). River: Forms and processes in alluvial channels. Methuen and Co. London
4. Morisawa, M. (1985). Rivers: Forms and Processes, Longman
5. Dr. Kale, V. S. and Gupta, A. (2001). Introduction of Geomorphology, Orient Longman, Kolkata.

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Gg-221 : Monsoon Climatology

Sr. No.	Topics	Subtopics	Learning points	Periods
1.	Introduction	Background	1.Development of Monsoon climatology 2. Definition 3. Environmental and economic importance	2
2.	Origin of Monsoon	Concepts	1.Thermal 2. Aerological 3. Fohn's concept	2
3.	The Asian Monsoon	Regional aspects	1. Monsoon of East Asia 2. Monsoon of South Asia	2
4.	Indian Monsoon	Theories	1. Classical theory of Indian Monsoon 2. Summer Monsoon 3. Winter Monsoon	3
5.	Monsoon Model	Driving Mechanism	1. Differential heating of land and sea 2. Compressibility of atmosphere 3. Effects of rotation and moisture 4. Annual cycle of Summer Monsoon	6
6.	Features of Summer Monsoon	Monsoon Climatology	1. Sea level pressure patterns – The heat low , Monsoon trough 2. Surface winds and upper winds. 3. Temperature at the surface and aloft.	4
7.	Regional aspects	1. Monsoon season 2. Main Rainbearing systems 3. Semi-permanent system	1. On-set of Monsoon 2. Withdrawal of Monsoon 1. Monsoon depressions 2. Mid-troposphere cyclone 3. Off-shore trough along west coast of India 1. Easterly Jet 2. Tibetan Anticyclone	7
8.	Monsoon variability	Rainfall	1. Intra-seasonal Active and break Monsoon situations 2. Inter – Annual – Drought and floods 3. Decadal and Centurial – long period trends in Indian rainfall	4
9.	Teleconnection	Nino Regions	1. ENSO 2. Walker circulation 3. Eurasian snow cover 4. Role of Ocean and upper atmosphere	4

10.	Forecasting	Different time scales	1. Historical perspective 2. Features of the predictors 3. Regional conditions 4.ENSO Indicators 5.Cross equatorial flow 6. Global/hemispheric conditions 7.Parametric and Multiple power regression model	6

Reference Books :

1. G.B.Pant and Rupa Kumar (1997) -Climates of South Asia
2. Y.P.Rao (1976) -Meteorological Monograph Synoptic Meteorology No- 1 Southwest Monsoon.
3. P.K.Das (1968) - The Monsoon.
4. K.N.Keshavamurthy (1992) - The Physics of Monsoon
5. Jay S. Fein Pamela - Monsoon

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Gg-222 : Industrial Geography

Sr. No.	Topic	Subtopic	Learning points	Periods
1	Introduction	Basic concepts	1.Definition, Nature, Scope 2. Manufacturing and Regional economics	4
2.	Industrial Location	1. Locational factors 2. Centralization and Decentralization	1. Geographical 2. Economical 3. Political 4. Socio-cultural 1. Characteristics of centralization 2. Characteristics of decentralization	4
3.	Models and concepts	1. Application of models	1. Weber's model 2. Losch's model 3.Greenhut's model 4. Israd's model 5. Agglomeration of industries 6.Industrial Linkages	10
4.	Locational Analysis and distribution	Changing pattern and Distribution of industries	1. Iron and steel 2. Cotton textile 3. Automobile 4. Chemical	10
5.	Industrial regions	Definition, problems and prospects	Study of two industrial regions in 1. Western Europe 2. Anglo-America 3. Japan	6
6.	Industrial regions of India	Definition, problems and prospects	1. Nature of industrial regions in India 2. Regional development of Industries 3. Locational factors for industries 4. Characteristics of industrial regions	4
7.	Recent trends in manufacturing	IT industries	1. Nature of software industry 2. Role of software industry in India 3. Problems and Prospects	2

Reference Books:

1. Alexaderson, G. (1967) : "Geography of Manufacturing", Prentice Hall, New Jersey
2. Alexander, J.W. (1973) : " Economic Geography", Prentice Hall, New Jersey
3. Estall and Buchanan (1969) : "Industrial Activity and Economic Geography"
4. Smith, David, M, (1971) : "Industrial Location- An Economic Geographical Analysis", John Wiley and Son, New York.

5. Miller, E.C. (1977) : “Manufacturing-A study of Industrial Location”, Penn State University, University Park, U.S.A.
6. Shaw, E.B. (1979) : “An Anglo-America- A Regional Geography”
7. Riley, R.C. (1973) : Industrial Geography, Progress Publication, Moscow
8. Watts, H.D. (1989) : Industrial Geography, Longman Group Ltd. Hong Kong
9. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandriali (2003) : Fundamentals of Software Engineering” , Pearson Edu. Pte. Ltd. New Delhi
10. Richard, E. Fairley (2999) : “Software Engineering- Concepts” Tata Mc-Graw Hill Publishing Company, New Delhi.

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Gg-223 : Geography of Rural Settlement

Sr. No.	Topics	Units	Learning points	Periods
1.	Introduction	1.Definition and Evolution of settlements 2. Place names	1 Definition in different parts of the world 2 Sequence of occupancy from Neolithic 3. Modern periods. 1. Historical 2. Cultural and Geographical aspects of settlements reflected in place names.	2
2.	Growth and Distribution	1. Site, situation, location 2. Growth of Settlements	1. Various factors affecting settlement site and distribution 2. Depression and nucleation, factors affecting dispersion and nucleation- Methods of the measuring degree of dispersion. 1. Factors affecting growth of settlements- 2.System of land division, water rights system of agriculture, land tenancy system	6
3.	Theories of Rural Land Use	1. Factors Affecting 2.Theories	1.Intensity of Land use 2. Labour cost 3. Marketing of product 1.Von Thunen 2. Ricardo	5
4.	Rural Economic Activities	Rural Service Centers	1.Functional analysis of service village and Trading Center 2. Centrality and Hierarchy of Rural Service centers 3. Central Place Theory.	5
5	Morphogenesis of Rural Settlements and Transformation	1. Morphogenesis 2. Functional growth	1. Social 2. Cultural 3. Economic organization within villages. 1. Functional growth 2. Socio-economic transformation in rural areas.	5
6.	Demographic Characteristics of Rural Settlement	1.Demographic aspects 2. Migration	1. Age-Sex, Education, Occupation, Caste 1. Causes & Consequence of migration in rural areas 2. Seasonal migration. 3. Commuting patterns	4
7.	Rural House	Analysis of rural	1. Primitive, Vernacular and Modern high rise	

	Types	house types	2. Physical, Social, Cultural and Economic factors affecting rural house types. 3. Size, functional use and architectural style. 5. Building material	5
8.	Rural Settlements in Maharashtra	1. Patterns 2. House types	1. Various patterns 1.House types and Settlement patterns in Maharashtra	4
9.	Rural Development Planning	Various aspects of rural planning	1. Land use 2. Transport 3. Amenities 4. Population 5. Environment and water	4

Reference Books:

1. Alam S.M. et.al. :Settlement System of India Oxford and IBH PublicationCo., New Delhi 1982.
2. Chisholm M. : Rural Settlement and Land use. John Wiley, New York , 1967
3. Clout H.D.: Rural Geography , Pergamon , Oxford, 1977.
4. Doniel P and Hopkinson M : The Geography of settlement Oliver & Byod, Edinburgh, 1986.
5. Grover N. Rural Settlement – A Cultural Geographical Analysis. Inter India Publication, Delhi, 1985
6. Hudson F.S. :A Geography of Settlements. Macdonald and Evans, New York, 1976.
7. Ramchandran H.: Village clusters and Rural Development. Concept Publication, New Delhi, 1985
8. Rao R.N.. Strategy for Integrated Rural Development. B.R. Publication, Delhi, 1986.
9. Rapoport A. House Form and Culture, Prentice Hall, New Jersey, 1969
10. Sen L.K.(ed) Readings in Micro-level Planning and Rural Growth Centers, National Institute of Community Development, Hyderabad. 1972.
11. Srinivas M.N: Village India, Asia Publication House, Bombay,1968.
12. Wanmati S.: Service Centers in Rural India, B.R. Publication Corporation , Delhi, 1983.
13. Singh R. L. Reading in Rural Settlement Geography.

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Gg-224 : Geoinformatics - II

Sr. No.	*Topics*	Sub Topics	Learning Points	Periods
1.	Data sources	1. Primary and Secondary	1. Fieldwork and Surveys 2. Published data and Reports and maps 3. Remotely sensed data 4. GPS coordinates	1
2.	Introduction to Remote Sensing (RS)	Principles of RS EMR	1. Definition, Historical Perspective-National & International Scenario 2. Spectrum, Spectral Quantities, Theories of EMR, Laws of Radiation, Concept of Blackbody radiation , Spectral Signatures	5
3.	**Interaction of EMR**	Atmosphere and Surface	1. Scattering, Absorpation, Refraction, Path Radiance Reflection, Transmission, Absorption Scattering 2. Surfaces, Atmospheric Windows and Types of RS	5
4.	**Aerial Photography**	Basics of Ariel Photography Ariel Camera	1. Scale, Resolution, Projection, Flight Planning, Overlaps 2. Optical accepts – Spherical Aberrations, Astigmation, Chromatic Aberrations Components of camera	6
5.	Aerial Photography (AP)	Measurement	1. Geometric characteristics of AP, Measurement of scale and height on AP	4
6.	Satellite RS	Platforms Orbits Scanning Sensors	1. Group – base , Air-borne, Space- borne 2. Geosychronous, Susynchronous 3. Across- track and Along –track 4. Spectral, Spatial, Radiometric and Temporal characteristics, Types of Sensor – Landsat: MSS, TM, ETM, SPOT,: HRV, IRS : LISS,PAN, WiFS, OCM	8
7.	Data Products	Types	1. Reference Scheme, Photographic Products, 2. Digital Products: Data Formats	4
8.	Visual Interpretation	Elements	1. Factors governing the interpretability 2. Elements of Interpretation of satellite images and aerial photographs	3
9.	GPS	1. Fundamental Concepts 2. Receivers	1. Space Segment, Control segment and User Segment 1. Components and Types, GSP Signals	4

Reference Books:

1 P.A. Burroughs and R.A. McDonnell, Principles of Geographical Information System, 2002, Oxford University Press.

2 C.P.Lo and AlbertK. W. Yeung, Concepts and Techniques of Geographic Information System, 2002Prentice Hall, India

3 Paul A. Lonfley, Michel F. Goodchild, D J. Maguire and D W. Rhind, Introduction to Geographic Information Systems and Science, 2002, John Wiley and Sons Ltd.
4 Kang- tsung-Chang, Introduction to Geographical Information System, 2002, McGraw Hill.
5 George Joseph, Fundamentals of Remote Sensing, 2004, Universities Press Pvt. Ltd., Hyderabad.
6 J. R. Jensen, Remote Sensing of Environment, An Earth Resource Perspective, 2003, Pearson Education Pvt. Ltd., New Delhi.
7 Lillesand T.M. and Kiefer R. W., 2002, Remote Sensing and Image Interpretation, John Wiley and Sons, New Delhi.