Curriculum & Credit Framework
for
Four Year Undergraduate Programme in Geography

TO BE EFFECTIVE FROM THE ACADEMIC SESSION 2023-24

West Bengal State University

July, 2023

Curriculum & Credit Framework for Undergraduate Courses in Geography under National Education Policy of 2020

INTRODUCTION: In compliance with directives on the Curriculum & Credit Framework from the University Grants Commission, the undergraduate syllabus for Geography is reframed under the National Education Policy of 2020. In a major deviation from its previous versions, the current syllabus uniquely caters to the students' requirement of education levels that would help them to balance between their professional and educational aspirations.

The four-year curriculum has four exit options that are hierarchically related to the level of education at the end of second, fourth, sixth, and eighth semesters — i.e., at the completion of the first, second, third, and fourth years of the course. These would relate to the award of • certificates, • diplomas, • BSc Major in Geography, and • BSc Honours in Geography, respectively. The course would also provide an opportunity to do research in the final Semester-8 for the meritorious students.

The present curriculum of Geography is designed to give the students a holistic understanding of the subject at every year of exit from the second year onwards, putting equal weightage to the core content and techniques used in Geography. The syllabus also tried to give similar importance to the two main branches of Geography: Physical and Human. Its principal goal of is to enable the students to secure a job at the end of the undergraduate programme. Keeping this in mind and in tune with the changing nature of Geography, adequate emphasis is rendered on applied aspects of the subject such as emerging techniques of mapping and field-based data generation, especially in the honours course.

LEARNING OUTCOMES: The syllabus is designed to impart basic knowledge on geography as a spatial science and train the undergraduates to secure employment in the sectors like geospatial analysis, developmental planning, and environment management.

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1.1 Structure of the 4-year Undergraduate Programme (Honours)

Table 1: Semester-Wise and Course Category-Wise Distribution of Credit

SEM	Major (DSC)	Minor	MDC	AEC	SEC	VAC	Internship	Total Credits
I	DS-1 (5)	MA-1 (5), MB-1 (5)	MD-1 (3)	AE-1 (3)	SE-1 (3)	VA-1 (3)		27
II	DS-2 (5)	MA-2 (5), MB-2 (5)	MD-2 (3)	AE-2 (3)	SE-2 (3)	VA-2 (3)	(4**)	27
Exit with Certificate after 1 Year								(4**)+**54**
III	DS-3 (5)	MA-3 (5), MB-3 (5)	MD-3 (3)	AE-3 (3)	SE-3 (3)			24
IV	DS-4 (5), DS-5 (5), DS-6 (5), DS-7 (5).						(4**)	20
Exit with Diploma after 2 Years								(4**)+**98**
V	DS-8 (5), DS-9 (5), DS-10 (5), DS-11 (5)						2	20
VI	DS-12 (5), DS-13 (5), DS-14 (5), DS-15 (5)						(4**)	20
Credit	**75**	**30**	**9**	**9**	**9**	**6**		
Exit with Major after 3 Years								(4**)+**138**
VII	DS-16 (5), DS-17 (5)	SM-1 (5), SM-2 (5)						20
VIII	DS-18 (5), DS-19 (5), DS-20 (5), DS-21 (5)							20
Credit	**105**	**40**	**9**	**9**	**9**	**6**	**4**	**182**

DS: Discipline specific core course, MA: Minor discipline 1, MB: Minor discipline 2, SM: Special Minor courses from the same discipline, either MA or MB, but of higher level. MDC= multi-disciplinary, AEC= Aptitude enhancement course, SEC= Skill enhancement course, VA= value added course.

Credit (5) distribution: Lab-based Courses: L=3, P=2, Non-Lab based Courses: L=4, Tu=1, Field-based courses: P=5

1.2 Structure of the 4-year Undergraduate Programme (Honours with Research)

Table 2: Semester-Wise and Course Category-Wise Distribution of Credit

SEM	Major (DSC)	Minor	MDC	AEC	SEC	VAC	Internship / Research	Total Credits
I	DS-1 (5)	MA-1 (5), MB-1 (5)	MD-1 (3)	AE-1 (3)	SE-1 (3)	VA-1 (3)		27
II	DS-2 (5)	MA-2 (5), MB-2 (5)	MD-2 (3)	AE-2 (3)	SE-2 (3)	VA-2 (3)	(4**)	27
Exit with Certificate after 1 Year								(4**)+**54**
III	DS-3 (5)	MA-3 (5), MB-3 (5)	MD-3 (3)	AE-3 (3)	SE-3 (3)			24
IV	DS-4 (5), DS-5 (5), DS-6 (5), DS-7 (5).						(4**)	20
Exit with Diploma after 2 Years								(4**)+**98**
V	DS-8 (5), DS-9 (5), DS-10 (5), DS-11 (5)						2	20
VI	DS-12 (5), DS-13 (5), DS-14 (5), DS-15 (5)						(4**)	20
Credit	**75**	**30**	**9**	**9**	**9**	**6**		
Exit with Major after 3 Years								(4**)+**138**
VII	DS-16 (5), DS-17 (5)	SM-1 (5), SM-2 (5)						20
VIII	DS-18 (5), DS-19 (5)						15	25
Credit	**105**	**40**	**9**	**9**	**9**	**6**	**4**	**187**

DS: Discipline specific core course, MA: Minor discipline 1, MB: Minor discipline 2, SM: Special Minor courses from the same discipline, either MA or MB, but of higher level. MDC= multi-disciplinary, AEC= Aptitude enhancement course, SEC= Skill enhancement course, VA= value added course.

Credit (5) distribution: Lab-based Courses: L=3, P=2, Non-Lab based Courses: L=4, Tu=1, Field-based courses: P=5

1.3 Structure of the 3-year Multidisciplinary Undergraduate Programme

Table 3: Semester-Wise and Course Category-Wise Distribution of Credit

SEM	Core Course (A)	Core Course (A)	Core Course (A)	MDC	AEC	SEC	VAC	Internship	Total Credits
I	MA-1 (5)	MB-1 (5)	MC-1 (5)		AE-1 (3)		VA-1 (3)		21
II	MA-2 (5)	MB-2 (5)	MC-2 (5)		AE-2 (3)		VA-2 (3)	(4**)	21
Exit with Certificate after 1 Year									42+(4**)
III	MA-3 (5)	MB-3 (5)	MC-3 (5)		AE-3 (3)	SE-1 (3)			21
IV	MA-4 (5)	MB-4 (5)	MC-4 (5)	MD-1 (3)		SE-2 (3)		(4**)	21
Exit with Diploma after 2 Years									84+(4**)
V	MA-5 (5)	MB-5 (5)	MC-5 (5)	MD-2 (3)		SE-3 (3)		2	21
VI	MA-6 (5)	MB-6 (5)	MC-6 (5)	MD-3 (3)		SE-4 (3)		(4**)	21
Credit	**30**	**30**	**30**	**9**	**9**	**12**	**6**	**4**	(4**)+**126**

MA: Minor discipline 1, MB: Minor discipline 2, SM: Special Minor courses from the same discipline, either MA or MB, but of higher level. MDC= multi-disciplinary, AEC= Aptitude enhancement course, SEC= Skill enhancement course, VA= value added course.

Credit (5) distribution: Lab-based Courses: L=3, P=2, Non-Lab based Courses: L=4, Tu=1, Field-based courses: P=5

1.3 Structure of the 4-year Undergraduate Programme (Honours) offered by Geography

Table 4: Semester-wise and Course category-wise distribution of credits

SEM	Course Code	Course Name	Course Type	Credit	Component	
I	GEOADS01T/ 1P	Physical Geography + Lab	Major	3+2	Th	P
	GEOHM01T	Physical Geography	Minor	4+1	Th	Tu
	GEOMD-01M	Geomatics and Spatial Analysis	Multi-Disciplinary	3		
	AE-1		AEC	3		
	GEOSE-01M	Remote Sensing	SEC	3		
	VA-1		VAC	3		
II	GEOADS02T/ 2P	Human Geography + Lab	Major	3+2	Th	P
	GEOHM02T	Human Geography	Minor	4+1	Th	Tu
	XXXMD-02		Multi-Disciplinary	3		
	AE-1		AEC	3		
	GEOSE-02M	Advanced Spatial Statistical Techniques	SEC	3		
	VA-1 (3)		VAC	3		
	Exit option	with certificate after 1 Year				
III	GEOADS03T/ 3P	Geotectonics and Geomorphology + Lab	Major	3+2	Th	P
	GEOHM03T	General Cartography+ Lab	Minor	3+2	Th	P
	XXXMD-03		Multi-Disciplinary	3		
	AE-1		AEC	3		
	GEOSE-03M	Research Methodology	SEC	3		
	VA-1 (3)		VAC	3		
IV	GEOADS04T/ 4P	Climatology + Lab	Major	3+2	Th	P
	GEOADS05T	Economic Geography	Major	4+1	Th	Tu
	GEOADS06T	Geography of India and West Bengal	Major	4+1	Th	Tu
	GEOADS07T/ 7P	Cartographic Techniques and Thematic Mapping	Major	3+2	Th	P
	Exit option	with diploma after 2 Years				
V	GEOADS08T	Population Geography	Major	4+1	Th	Tu
	GEOADS09T/ 9P	Environmental Geography + Lab	Major	3+2	Th	P
	GEOADS10T	Soil and Biogeography	Major	4+1	Th	Tu
	GEOADS11T/ 11P	Remote Sensing, GIS, and GNSS + Lab	Major	3+2	Th	P
VI	GEOADS12T	Evolution of Geographical Thought	Major	4+1	Th	Tu
	GEOADS13T/ 31P	Hazard Management+ Lab	Major	3+2	Th	P
	GEOADS14T	Social Geography	Major	4+1	Th	Tu
	GEOADS15P	Surveying Techniques and fieldwork Lab	Major	4+1	P	P
	Exit option	with Major after 3 Years				
VII	GEOADS16T	Hydrology and Oceanography	Major	4+1	Th	Tu
	GEOADS17T/ 17P	Statistical Methods In Geography + Lab	Major	3+2	Th	P
	GEOHSM01P	Project Report based on Field Work	Special Minor	4+1	P	P
VIII	GEOADS18T	Advanced Geomorphology	Major	4+1	Th	Tu
	GEOADS19T	Regional Development and Planning	Major	4+1	Th	Tu
	GEOADS20T	Advanced Climatology	Major	4+1	Th	Tu
	GEOADS21T	Rural and Urban Geography	Major	4+1	Th	Tu

Th= Theory, P= Practical, Tu= Tutorial. M= Courses with both theory and practical components.

XXXMD= Multi-disciplinary course offered by another subject apart from Geography

1.3 Structure of the 4-year Undergraduate Programme (Honours with Research) offered by Geography

Table 4: Semester-wise and Course category-wise distribution of credits

SEM	Course Code	Course Name	Course Type	Credit	Component	
I	GEOADS01T/ 1P	Physical Geography + Lab	Major	3+2	Th	P
	GEOHM01T	Physical Geography	Minor	4+1	Th	Tu
	GEOMD-01M	Geomatics and Spatial Analysis	Multi-Disciplinary	3		
	AE-1		AEC	3		
	GEOSE-01M	Remote Sensing	SEC	3		
	VA-1		VAC	3		
II	GEOADS02T/ 2P	Human Geography + Lab	Major	3+2	Th	P
	GEOHM02T	Human Geography	Minor	4+1	Th	Tu
	XXXMD-02		Multi-Disciplinary	3		
	AE-1		AEC	3		
	GEOSE-02M	Advanced Spatial Statistical Techniques	SEC	3		
	VA-1 (3)		VAC	3		
	Exit option	with certificate after 1 Year				
III	GEOADS03T/ 3P	Geotectonics and Geomorphology + Lab	Major	3+2	Th	P
	GEOHM03T	General Cartography+ Lab	Minor	3+2	Th	P
	XXXMD-03		Multi-Disciplinary	3		
	AE-1		AEC	3		
	GEOSE-03M	Research Methodology	SEC	3		
	VA-1 (3)		VAC	3		
IV	GEOADS04T/ 4P	Climatology + Lab	Major	3+2	Th	P
	GEOADS05T	Economic Geography	Major	4+1	Th	Tu
	GEOADS06T	Geography of India and West Bengal	Major	4+1	Th	Tu
	GEOADS07T/ 7P	Cartographic Techniques and Thematic Mapping	Major	3+2	Th	P
	Exit option	with diploma after 2 Years				
V	GEOADS08T	Population Geography	Major	4+1	Th	Tu
	GEOADS09T/ 9P	Environmental Geography + Lab	Major	3+2	Th	P
	GEOADS10T	Soil and Biogeography	Major	4+1	Th	Tu
	GEOADS11T/ 11P	Remote Sensing, GIS, and GNSS + Lab	Major	3+2	Th	P
VI	GEOADS12T	Evolution of Geographical Thought	Major	4+1	Th	Tu
	GEOADS13T/ 31P	Hazard Management+ Lab	Major	3+2	Th	P
	GEOADS14T	Social Geography	Major	4+1	Th	Tu
	GEOADS15P	Surveying Techniques and fieldwork Lab	Major	4+1	P	P
	Exit option	with Major after 3 Years				
VII	GEOADS16T	Hydrology and Oceanography	Major	4+1	Th	Tu
	GEOADS17T/ 17P	Statistical Methods In Geography + Lab	Major	3+2	Th	P
	GEOHSM01P	Project Report based on Field Work	Special Minor	4+1	P	P
VIII	GEOADS18T	Advanced Geomorphology	Major	4+1	Th	Tu
	GEOADS19T	Regional Development and Planning	Major	4+1	Th	Tu
	GEOADS20T	Advanced Climatology	Major	4+1	Th	Tu
	GEOADS21T	Rural and Urban Geography	Major	4+1	Th	Tu
	GEOADSRCM*	Dissertation *	Major	15	M	

Th= Theory, P= Practical, Tu= Tutorial. M= Courses with both theory and practical components.

XXXMD= Multi-disciplinary course offered by another subject apart from Geography

For Honours with Research any two courses to be selected from GEOADS18T/ 19T/ 20T/ 21T. Dissertation *= only for Honours with Research

1.4 Structure of the 3-year Multidisciplinary Undergraduate Programme with Geography as one of the subjects

Table 5: Semester-wise and Course category-wise distribution of credits

Sem	Course Code	Course Name	Course Type	Credit	Component	
I	GEOMC01T	Physical Geography	Core Course	4+1	Th	Tu
	XXBMC01T		Core Course	4+1		
	XXCMC01T		Core Course	4+1		
	AE-1		AEC	3		
	VA-1		VAC	3		
II	GEOMC02T	Human Geography	Core Course	4+1	Th	Tu
	XXBMC02T		Core Course	4+1		
	XXCMC02T		Core Course	4+1		
	AE-1		AEC	3		
	VA-1		VAC	3		
	Exit option	with certificate after 1 Year				
III	GEOMC03T/ 3P	General Cartography + Lab	Core Course	3+2	Th	P
	XXBMC03T		Core Course	4+1		
	XXCMC03T		Core Course	4+1		
	AE-1		AEC	3		
	GEOSE-01M	Remote Sensing	SEC	3		
IV	GEOMC04T	Environmental Geography	Core Course	4+1	Th	Tu
	XXBMC04T		Core Course	4+1		
	XXCMC04T		Core Course	4+1		
	GEOMD-01M	Geomatics and Spatial Analysis	Multi-Disciplinary	3		
	GEOSE-02M	Advanced Spatial Statistical Techniques	SEC	3		
	Exit option	with diploma after 2 Years				
V	GEOMC05T	Soil and Biogeography	Core Course	4+1	Th	Tu
	XXBMC05T		Core Course	4+1		
	XXCMC05T		Core Course	4+1		
	XXMD-02M		Multi-Disciplinary	3		
	XXSE-03M	To be chosen from another subject other than Geography	SEC	3		
VI	GEOMC06T	Regional Development	Core Course	4+1	Th	Tu
	XXBMC06T		Core Course	4+1		
	XXCMC06T		Core Course	4+1		
	XXMD-03M		Multi-Disciplinary	3		
	XXSE-04M	To be chosen from another subject other than Geography	SEC	3		

Th= Theory, P= Practical, Tu= Tutorial. M= Courses with both theory and practical components.

XXXMD= Multi-disciplinary course offered by another subject apart from Geography

XXBMC01T, XXCMC01T= Multi-disciplinary core course of subject B and subject C respectively

Discipline Specific Major Courses for Geography

Minor Courses for Major/ Honours Students of Other Disciplines offered by Geography

Core Courses for the 3-year Multidisciplinary Undergraduate Programme offered by Geography

Skill Enhancement Courses offered by Geography

Code	Course Type	Course name	Page Number
GEOSE-01M	SEC	Remote Sensing	51
GEOSE-02M	SEC	Advanced Spatial Statistical Techniques	52
GEOSE-03M	SEC	Research Methodology	53

Multi-Disciplinary Course Offered by Geography

Code	Course Type	Course name	Page Number
GEOMD-01M	Multi-disciplinary	Geomatics and Spatial Analysis	54

Introductory Level Course 1

Discipline Specific Major Courses for Geography

GEOADS01T – Physical Geography ✧

3 Credits [45 hours of teaching]

Unit I: Geotectonics and Geomorphology

1. Internal Structure of Earth based on Seismic Evidence.
2. Influence of lithology on landforms: Granite and Basaltic landforms.
3. Factors controlling landform development; endogenetic and exogenetic forces.
4. Evolution of landforms under fluvial process
5. Nature and classification of hazards in Indian context

Unit II: Climatology, Soil and Biogeography

6. Nature, composition and layering of the atmosphere
7. Distribution of pressure belts and planetary wind system, jet streams, and index cycle.
8. Factors of soil formation
9. Evolution of an ideal soil profile
10. Concept of ecosystem — basic ecological principles, ecotone, communities, niche, succession, and habitat.
11. Concept of Biomes: study of Tropical rainforest, Taiga, Savannah, Desert, Tundra and Temperate grasslands

Reading List

Coch, N.K. 1994. Geohazards: Natural and Human, Pearson College.

Conserva H. T., 2004: Illustrated Dictionary of Physical Geography, Author House, USA.

Critchfield, H.J., 1983: General Climatology. Prentice Hall India Ltd. (2010 Reprint)

Dash, M.C., 2001. Fundamentals of Ecology, 2nd edition, Tata McGraw-Hill, New Delhi.

Franzmeier, D.P., McFee, W.W., Graveel, J.G., Kohnke, H., 2016: Soil Science Simplified, 5th ed, Waveland Press.

Gabler R. E., Petersen J. F. and Trapasso, L. M., 2007: Essentials of Physical Geography (8th Edition), Thompson, Brooks/Cole, USA.

Garrett N., 2000: Advanced Geography, Oxford University Press.

Goudie, A., 1984: The Nature of the Environment: An Advanced Physical Geography, Basil Blackwell Publishers, Oxford.

Hamblin, W. K., 1995: Earth's Dynamic System, Prentice Hall, N.J.

Husain M., 2002: Fundamentals of Physical Geography, Rawat Publications, Jaipur.

Kormondy, E.J. 1996. Concepts of Ecology, 4th edition, Prentice-Hall, India, New Delhi.

Monkhouse, F. J. 2009: Principles of Physical Geography, Platinum Publishers, Kolkata.

Sharma, P.D. 2011. Ecology and Environment, Rastogi Publications. Singer, M., Munns, D.N. 2005. Soils: An Introduction, 6th ed, Pearson.

Strahler A. N. and Strahler A. H., 2008: Modern Physical Geography, John Wiley & Sons, New York.

Weil, R.R., Brady, N.C. 2022. The Nature and Properties of Soils, 15th ed, Pearson Education.

GEOADS01P – Physical Geography (Lab)✧

2 Credits [60 hours of teaching]

An A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Graphical construction of linear scales: Plain.
2. Altimetric frequency distribution; Demarcation of broad physiographic zones.
3. Denoting drainage, geomorphic, settlement and transport attributes using sketches.
4. Identification of drainage and channel patterns from Survey of India 1:50,000 topographical maps.
5. Construction and interpretation of wind rose diagram
6. Viva voce based on laboratory notebook.

Reading List

Monkhouse F.J., Wilkinson H.R. 1971. Maps and Diagrams, their compilation and construction, 3rd ed (2017 reprint), Alphaneumera.

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied. Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers.

Vaidyanadhan, R., Subbarao, K.V. 2014. Landforms of India from Topomaps and Images, Geological Society of India.

Introductory Level Course 2

GEOADS02T – Human Geography ✧

3 Credits [45 hours of teaching]

Unit I Scope and Approaches

1. Elements of Human Geography: Nature, scope and recent trends.
2. Approaches to Human Geography; Resource, Locational, Landscape, Environmental

Unit II Social and Population Geography

3. Evolution of human societies: Hunting and food gathering, pastoral nomadism, subsistence farming, industrial society and post-industrial urban society.
4. Human adaptation to environment: Eskimo, Masai and Maori
5. Population distribution, density and growth of world population.
6. Demographic Transition Theory

Unit III Economic and Settlement Geography

7. Sectors of the economy: primary, secondary, tertiary and quaternary, quinary
8. Types of agriculture**:** Intensive subsistence rice farming, Plantation agriculture (Tea)
9. Site, situation, types and patterns of Rural Settlements
10. Classification of Urban Settlements after Census of India.

Reading List

Bose, N.K. 2020. Tribal Life In India, 5th ed (updated by Tripathi, C.B.), National Book Trust. Chandna R.C. 2022. Geography of Population, Part 1: Concepts, Determinants and World Patterns, Kalyani Publishers.

Chandna, R.C. (2010) Population Geography, Kalyani Publisher.

Daniel, P.A. and Hopkinson, M.F. (1989) The Geography of Settlement, Oliver & Boyd, London.

Dorrel, D., Henderson, P. 2018. Introduction to Human Geography. University of Georgia Press. Fouberg, E.H., Nash, A.B., Murphy, A.B., de Blij, H., 2015. Human Geography: People, Place, and Culture, 11th ed, Wiley.

Ghosh, S. (2015) Introduction to settlement geography. Orient Black Swan Private Ltd., Kolkata

Gregory, D., Johnston, R., Pratt, G., Watts, K., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley-Blackwell.

Johnston R; Gregory D, Pratt G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication.

Jordan-Bychkov et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.

Knox, P.L., Marston, S.A. 2014. Human Geography, Places and Regions in Global Context, 6th ed, Pearson Education.

Majumdar, P.K. 2013. India's Demography: Changing Demographic Scenario in India, Rawat Publications.

Mercier, M., Norton, W. 2019. Human Geography, 10th ed, Oxford University Press.

Paul, C., Crang, P., Goodwine, M.G. 2014, Introducing Human Geographies, 3rd ed, Routledge. Rubenstein J.M., 2018, Contemporary Human Geography, 4th ed, Pearson.

Short, R.J. 2017. Human Geography: A Short Introduction, 2nd ed, Oxford University Press. Sing, R.Y. 2009, A Geography of Settlements, Rawat Publications

GEOADS02P– Human Geography (Lab) ✧

2 Credits [60 hours of teaching]

An A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Growth rate of population: Arithmetic growth comparing two decadal datasets
2. Density of population of Indian states or West Bengal districts by choropleth method
3. Identification of types of settlements according to sites from Survey of India 1:50,000 topographical maps
4. Correlating physical and cultural attributes using transect chart.
5. Proportional pie-diagrams, and proportional square representing economic data and land use data.
6. Viva voce based on laboratory notebook

Reading List

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Monkhouse F.J., Wilkinson H.R. 1971. Maps and Diagrams, their compilation and construction, 3rd ed. (2017 reprint), Alphaneumera.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers.

WEBSITE:

Census of India: https://censusindia.gov.in/census.website/data/census-tables

GEOADS03T – Geotectonics and Geomorphology ✧

3 Credits [45 hours of teaching]

Unit I: Geotectonics

1. Earth's tectonic and structural evolution with reference to geological time scale, with special reference to the events of the Pleistocene
2. Isostasy: Models of Airy and Pratt, and their applicability.
3. Plate Tectonics as a unified theory of global tectonics: Processes and landforms at plate margins and hotspots
4. Folds and Faults—Formation and classification

Unit II: Geomorphology

5. Degradational processes: Weathering, mass wasting and resultant landforms
6. Development of river network and landforms on uniclinal and folded structures, Surface expression of faults.
7. Coastal processes and landforms
8. Glacial and glacio-fluvial processes and landforms
9. Aeolian and fluvio-aeolian processes and landforms
10. Models on landscape evolution: Views of Davis, Penck and Hack

Reading List

BOOKS:

Bierman, P.R., Montgomery, D.R., 2019. Key Concepts in Geomorphology, 2nd ed, W. H. Freeman. Goudie, A.S. (Ed) 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge.

Billings, M.P. 1971. Structural Geology, Pearson India.

Burbank, D.W. 2011. Tectonic Geomorphology, 2nd ed, Wiley India.

Fossen, H. 2016. Structural Geology, 2nd ed, Cambridge University Press. Kearey, P., Klepeis, K.A., Vine, F.J. 2011. Global Tectonics, 3rd ed, Wiley-India

Frisch, W., Meschede, M., Blakey, R.C. 2022. Plate Tectonics: Continental Drift and Mountain Building, 2nd ed, Springer.

Goudie, A.S. (Ed) 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge.

Gregory, K.J., Lewin, J. 2014. The Basics of Geomorphology: Key Concepts, Sage.

Gupta, A. 2011. Tropical Geomorphology, Cambridge University Press.

Harvey, A. 2022. Introducing Geomorphology: A Guide to Landforms and Processes, 2nd ed, Dunedin Academic Press.

Huggett, R., Shuttleworth, E., 2022. Fundamentals of Geomorphology, 5th ed, Routledge. Kale, V.S., Gupta, A. 2001. Introduction to Geomorphology, Orient Blackswan (2018 reprint). Knighton, A.D. 1998. Fluvial Forms and Processes: A New Perspective, Edward Arnold.

Kale, V.S., Gupta, A. 2001.Introduction to Geomorphology, Orient Longman.

Kearey, P., Klepeis, K.A., Vine, F.J. 2011. Global Tectonics, 3rd ed, Wiley-India.

Knighton, A.D. 1984. Fluvial Forms and Processes, Edward Arnold.

Knoll, A.H. 2021. A Brief History of Earth: Four Billion Years in Eight Chapters, Custom House. Lutgens, F., Tarbuck, E., Tasa, D. 2017. Essentials of Geology, 13th ed, Pearson.

McCullagh, P. 1978. Modern Concepts in Geomorphology, Oxford University Press.

Schumm, S.A., Dumont, J.F., Holbrook, J.M. 2002. Active Tectonics and Alluvial Rivers, Cambridge University Press.

Selby, M.J. 1986. Earth's Changing Surface, Oxford University Press.

Strahler, A. 2016. Introducing Physical Geography, 6th ed, Wiley.

Summerfield, M.J. 2003. Global Geomorphology: An Introduction to the Study of landforms, Longman.

Thornbury, W.D. 1969. Principles of Geomorphology, 2nd ed, Wiley-India / CBS.

WEBSITES:

British Society for Geomorphology: www.geomorphology.org.uk Indian Institute of Geomorphologists: www.indiageomorph.org International Association of Geomorphologists: www.geomorph.org

Geological Society of India: https://www.geosocindia.org

Geological Survey of India: https://www.gsi.gov.in

Plaleomap Project: www.scotese.com & www.youtube.com/user/cscotese 'This Dynamic Earth' (USGS): https://pubs.usgs.gov/gip/dynamic/dynamic.html

GEOADS03P – Geotectonics and Geomorphology (Lab)✧

2 Credits [60 hours of teaching]

An A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Megascopic identification of (a) mineral samples: Bauxite, calcite, chalcopyrite, feldspar, galena, gypsum, hematite, magnetite, mica, quartz, talc, tourmaline; and (b) rock samples: Granite, basalt, dolerite, laterite, limestone, shale, sandstone, conglomerate, slate, phyllite, schist, gneiss, quartzite, marble
2. Interpretation of geological maps with uniclinal structure, folds, unconformity, and intrusions
3. Reference scheme of Survey of India Everest and Open Series Maps; Map margin information. Extraction and interpretation of geomorphic information from Survey of India 1:50,000 topographical maps of plateau region: Construction and interpretation of relief profiles (serial, superimposed, projected and composite)
4. Drainage basin delineation, stream ordering (Strahler) on the delineated drainage basin
5. Morphometric analysis: Preparation of Relative Relief (Smith), Average Slope (Wentworth) and Drainage Density (Horton) on a delineated drainage basin.
6. Construction of hypsometric curve and derivation of hypsometric integer of a drainage basin of a plateau region
7. Determination of channel sinuosity index (channel length/valley length measured through straight line) and braiding index of rivers from topographical maps (c. 10-km reach)
8. Viva voce based on laboratory notebook

Reading List

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Bolton. T. 2009 (reprint). Geological Maps: Their Solution and Interpretation, Cambridge Univ. Press.

Farndon, J. 2012. The Illustrated Guide to Rocks & Minerals, Southwater.

Gupta K.K. and Tyagi, V. C., (1992): Working with Map, Survey of India, DST, New Delhi.

Pillent, C. 2002. Smithsonian Handbooks: Rocks & Minerals, Dorling Kindersley.

Saha, P.K. and Basu, P. (2009): Advanced Practical Geography, Books and Allied (P) Ltd., Kolkata.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed., Orient Blackswan Private Ltd.

Sen, P.K. 1989. Geomorphological Analysis of Drainage Basin: An Introduction to Morphometric and Hydrological Parameters, University of Burdwan.

Sorrell, C.A. Rocks and Minerals: A Guide to Field Identification, St. Martin's Press.

Vaidyanadhan, R., Subbarao, K.V. (2014). Landforms of India from Topomaps and Images, Geological Society of India

GEOADS04T – Climatology✧

3 Credits [45 hours of teaching]

Unit I: Elements of the Atmosphere

1. Insolation: controlling factors. Heat budget of the atmosphere
2. Temperature: horizontal and vertical distribution. Inversion of temperature: types, causes and consequences
3. Greenhouse effect and formation, depletion, restoration, and significance of the ozone layer

Unit II: Atmospheric Phenomena and Climatic Classification

4. Condensation: Process and forms. Mechanism of precipitation: Bergeron-Findeisen theory, collision and coalescence. Forms of precipitation
5. Air mass: Typology, origin, characteristics and modification
6. Types of fronts: warm and cold; frontogenesis and frontolysis
7. Weather: stability and instability; barotropic and baroclinic conditions
8. Atmospheric disturbances: Tropical and mid-latitude cyclones
9. Monsoon circulation and mechanism with reference to India
10. Climatic classification after Köppen, Thornthwaite (1955)

Reading List

Ahrens, C.D. 2012. Essentials of Meteorology: An Invitation to the Atmosphere. 9th Ed, Cengage Learning.

Barry R. G. and Carleton A. M., 2001: Synoptic and Dynamic Climatology, Routledge, UK.

Barry, R.G, Chorley R.J. 2009.Atmosphere Weather and Climate. 9th Ed, Routledge.

Critchfield, H. J. 1983. General Climatology. Prentice Hall India Ltd (2010 Reprint).

Lal, D.S. 2012. Climatology. Sharda PustakBhawan.

Lutgens, F.K., Tarbuck, E.J. 1998. The Atmosphere : An Introduction to Meteorology, 9th Ed, Prentice-Hall Inc.

Oliver, J.E., Hidore J.J. 2002. Climatology: An Atmospheric Science, Pearson Education India

WEBSITES:

India Meteorological Department: https://mausam.imd.gov.in Intergovernmental Panel on Climate Change: https://www.ipcc.ch

World Bank Climate Change Knowledge Portal: https://climateknowledgeportal.worldbank.org World Meteorological Organization: https://public.wmo.int/en

GEOADS04P – Climatology (Lab)✧

2 Credits [60 hours of teaching]

An A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Interpretation of daily weather map of India (any two): Pre-Monsoon, Monsoon and Post-Monsoon
2. Construction and interpretation of hythergraph and climograph (G. Taylor)
3. Construction and interpretation of monthly rainfall dispersion diagram (quartile method). Climatic water budget
4. Viva voce based on laboratory notebook

Reading List

BOOKS

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rd ed (2017 reprint), Alphaneumera-Kolkata.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Singh, R.L., Singh, R.P.B. 2008.Elements of Practical Geography, Kalyani Publishers.

WEBSITES:

India Meteorological Department: https://mausam.imd.gov.in

Climatological tables of observatories of India:

https://www.imdpune.gov.in/library/public/Climatological%20Tables%201991-2020.pdf

GEOADS05T — Economic Geography✧

5 Credits [75 hours of teaching]

Unit I: Concepts and Theories

1. Meaning and approaches to Economic Geography.
2. Concepts in Economic Geography: Goods and services, production, exchange and consumption
3. Concept of economic man, theories of choices
4. Economic distance and transport costs
5. Factors affecting location of economic activity with special reference to agriculture (Von Thünen), and industry (Weber).

Unit II: Economic Activities

6. Primary activities: Agriculture, forestry, fishing and mining
7. Secondary activities: Manufacturing (cotton textile, iron and steel), concept of manufacturing regions, special economic zones and technology parks
8. Tertiary activities: Transport, trade and services
9. Economic globalisation: Concepts and contemporary issues
10. International trade, role of WTO.
11. Emergence of economic blocs (Post WW-II): BRICS: Evolution, structure and significance

Reading List

BOOKS

Adams, F.G., 2011. Globalization: Today and Tomorrow, Routledge. Anderson, W.P. 2012. Economic Geography, Routledge.

Alexander J. W., 1963: Economic Geography, Prentice-Hall Inc., Englewood Cliffs, New Jersey

Aoyama, Y., Murphy, J.T., Hanson, S. 2010. Key Concepts in Economic Geography, Sage.

Coe N. M., Kelly P.F. and Yeung H.W. 2019. Economic Geography: A Contemporary Introduction, 3rd ed, Wiley-Blackwell.

Combes P., Mayer T. and Thisse J. F., 2008: Economic Geography: The Integration of Regions and Nations, Princeton University Press.

MacKinnon, D., Cumbers, A. 2019. An Introduction to Economic Geography: Globalisation, Uneven Development and Place, 3rd ed, Routledge.

Waters M. 2001. Globalization, Routledge.

Wheeler, J.O., Muller, P.O., Thrall, G.I., Fik, T.J. 1998. Economic Geography, 3rd ed, Wiley.

Willington D. E., 2008: Economic Geography, Husband Press.

Wood, A., Roberts, A. 2010. Economic Geography: Places, Networks and Flows, Routledge.

WEBSITES:

BRICS: http://infobrics.org

World Trade Organisation: https://www.wto.orgUnited Nations: www.un.org/en

GEOADS06T – Geography of India and West Bengal ✧

5 Credits [75 hours of teaching]

Unit I: Geography of India

1. Tectonic and stratigraphic provinces, physiographic divisions
2. Climate, soil and vegetation regions
3. Tribes of India with special reference to Gaddi, Toda, Santal and Jarwa
4. Agricultural regions. Green revolution (Phase I and II) and their impacts
5. Mineral and power resources distribution and utilisation of iron ore, coal, petroleum and natural gas
6. Industrial development: Automobile and information technology
7. Regionalisation of India: Physiographic (R.L. Singh) and economic (P. Sengupta)

Unit II: Geography of West Bengal

8. Physical perspectives: Physiographic divisions, forest and water resources
9. Resources: Agriculture, mining, and industry
10. Population: Growth, distribution and human development
11. Regional Issues: Darjeeling Hills and Sundarban

Reading List

Bandyopadhyay, S., Kar, N.S., Das, S., Sen, J. 2014. River system and water resources of West Bengal: A Review. In: Vaidyanadhan, R. (Ed) Rejuvenation of Surface Water Resources of India: Potential, Problems and Prospects, Geological Society of India Special Publication.

Dhara, M.K., Basu, S.K., Bandyopadhyay, R.K., Roy, B., Pal, A.K. (Eds.) 1999. Geology and Mineral Resources of the States of India, Part-1: West Bengal. Geological Survey of India Miscellaneous Publication.

Ghurey, G.S. 1963. The Scheduled Tribes of India, 1980 reprint, Transaction Books.

Johnson, B.L.C. (Ed) 2001. Geographical Dictionary of India, Vision Books.

Khullar, D.R. 2011. India: A Comprehensive Geography, Kalyani Publishers

Mandal, H., Mukherjee, S., Datta, A. 2002. India: An Illustrated Atlas of Tribal World, Anthropological Survey of India.

Pathak, C.R. 2003. Spatial Structure and Processes of Development in India, Regional Science Association-Kolkata.

Sharma, T.C. 2012.Economic Geography of India, Rawat Publications.

Singh, J. 2003. India-A Comprehensive & Systematic Geography, GyanodayaPrakashan.

Singh, R.L. 1971. India: A Regional Geography, National Geographical Society of India.

Spate, O.H.K., Learmonth, A.T.A. 1967. India and Pakistan: A General and Regional Geography, Methuen.

Tiwari, R.C. 2007.Geography of India, PrayagPustakBhawan.

Valdiya, K.S. 2010. The Making of India: Geodynamic Evolution, Macmillan Pubishers India Ltd.

WEBSITES:

Census of India: https://censusindia.gov.in/census.website

Government of India Data Platform: https://data.gov.in

Hierarchy of states:

https://en.wikipedia.org/wiki/List_of_states_and_union_territories_of_India_by_population
https://en.wikipedia.org/wiki/List_of_Indian_states_and_union_territories_by_GDP_per_capita
https://en.wikipedia.org/wiki/List_of_Indian_states_and_union_territories_by_Human_Develop
ment_Index
India Meteorological Department: https://mausam.imd.gov.in

India Meteorological Department Climatological Tables:
https://www.imdpune.gov.in/library/public/Climatological%20Tables%201991-2020.pdf
ISRO Bhuvan 2D Platforms: https://bhuvan-app1.nrsc.gov.in/bhuvan2d/bhuvan/bhuvan2d.php

Planning Commission (West Bengal Development Report 2010):

https://www.scribd.com/document/433016798/sdr-wb1909-pdf

Trending Economics (India's industrial production):

https://tradingeconomics.com/india/industrial- production

UNDP Human Development Report on India (2016):

https://hdr.undp.org/data-center/specific-country-data#/countries/IND https://hdr.undp.org/data-center/country-
insights#/ranks

West Bengal District Statistical Handbooks:
http://wbpspm.gov.in/publications/District%20Statistical%20Handbook

GEOADS07T – Cartographic Techniques and Thematic Mapping✧

3 Credit [45 hours of teaching]

1. Scientific notation, concepts of rounding, logarithm and anti-logarithm, natural and log scales
2. Maps: Classification and types. Components of a map
3. Concept and application of scales: Comparative, diagonal and vernier
4. Coordinate systems: Polar and rectangular
5. Concept of generating globe and UTM projection
6. Map projections: Classification, properties and uses
7. Representation of data: Line, Bar, Isopleths
8. Representation of area data: Dots and spheres, proportional circles and Choropleth
9. Preparation and interpretation of land use land cover maps
10. Preparation and interpretation of socio-economic maps

GEOADS07P – Cartographic Techniques (Lab)✧

2 Credits [60 hours of teaching]

An A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Graphical construction of scales: Comparative, diagonal and Vernier.
2. Construction of projections: Polar Zenithal Gnomonic, Stereographic, Orthographic, Simple Conic with one standard parallel, Bonne's, Cylindrical Equal Area, and Mercator's
3. Preparation of Thematic maps:
   - Age-Sex Pyramid
   - Dots and Sphere diagram showing distribution of rural and urban population.
   - Flow chart.

Reading List

Kennedy, M., Kopp, S. 2001. Understanding Map Projections, Esri Press.

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. Map Use: Reading, Analysis, Interpretation, 7th ed, Esri Press.

Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rd ed (2017 reprint), Alphaneumera-Kolkata.

Pearson II, F. 1990. Map Projections: Theory and Applications 2nd ed, CRC Press.

Robinson, A.H., Morrison, J.L., Phillip, C.M., Kimerling, A.J., Guptill, S.C. 1995. Elements of Cartography, 6th ed, Wiley.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan Private Ltd.

Singh, R.L., Singh, R.P.B. 2008.Elements of Practical Geography, Kalyani Publishers.

GEOADS08T – Population Geography ✧

5 Credits [75 hours of teaching]

Unit I: Population Dynamics

1. Development of Population Geography as a field of specialization. Relation between population geography and demography. Sources of population data, their level of reliability and problems of mapping.
2. Population distribution: density and growth. Classical and modern theories in population distribution and growth, Demographic transition model.
3. World patterns determinants of population distribution and growth. Concept of optimum population.
4. Population distribution, density and growth profile in India.

Unit II: Population and Development

5. Concepts of Age-Sex Composition; Rural and Urban Composition; Literacy and education
6. Measurements of fertility and mortality. Concept of cohort and life table
7. Population composition of India: Urbanisation and Occupational structure.
8. Causes and types of national and international migration with reference to India.
9. Population and development: Problem of declining sex-ratio. Concept of human development index and its components.
10. Population policies in developed and less development countries. India's population policies, population and environment, implication for the future.

Reading List

Barrett, H.R. 1995. Population Geography, Oliver and Boyd.

Bartram, D. Poros, M. Monforte, P. 2014. Key Concepts in Migration. Sage.

Binde, N., Kanitkar, H. 2000. The Principle of Population Studies, Himalaya Publications.

Chandna, R.C. 2016. Geography of Population: Concepts, Determinants and Patterns, Kalyani Publishers.

Dyson,T. 2011. Population and Development: The Demographic Transition, Rawat Publications.

Gregory, D., Johnston, R., Pratt, G., Watts.,Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley.

Hassan, M.I. 2005.Population Geography, Rawat publications.

Hussain, M. 1994. Human Geography. Rawat publications.

Jhingan, M.L., Bhatt, B.K., Desai, J.N. 2014.Demography, Vrinda Publications.

Jones, H. R. 2000. Population Geography, 3rd ed, Chapman.

Lutz, W., Warren, C.S., Scherbov, S. 2004. The End of the World Population Growth in the 21st Century, Earthscan.

GEOADS09T—Environmental Geography✧

3 Credits [45 hours of teaching]

Concepts

1. Geographers' approach to environmental studies
2. Concept of holistic environment and systems approach
3. Ecosystem: Concept, structure and functions
4. Ecosystem Services: Concept, Identifying Ecosystem Services (Provisioning services, Cultural services, Supporting services, Regulating services).
5. Wetland ecosystem with special reference to East Kolkata Wetlands

Environmental problems and policies

6. Rural environmental issues with special reference to sanitation and public health
7. Urban environmental issues with special reference to waste management
8. Ocean environmental issues with special reference to plastic pollution
9. Environmental policies – National Environmental Policy, 2006, Earth Summits (Stockholm, Rio, Johannesburg), National Action Plan on Climate Change
10. Global initiatives for environmental management (special reference to Montreal Protocol, Kyoto Protocol, Paris Climate Summit)

Reading List

Basu, R. and Bhaduri, S. (Eds) 2007. Contemporary Issues and Techniques in Geography, Progressive Publishers.

Chandna, R.C. 2002. Environmental Geography, Kalyani Press.

Chapman, J.L., Reiz, M.J. 1993. Ecology: Principle and Applications, Cambridge University Press.

Cunninghum, W.P., Cunninghum, M.A. 2004. Principals of Environmental Science: Inquiry and Applications, Tata Macgraw Hill.

Gilpin, A., 1994. Environmental Impact Assessment: Cutting Edge for the 21st Century, Cambridge University Press.

Goudie, A. 2001. 2013. The Human Impact on the Natural Environment: Past, Present, and Future, 7th ed, Wiley-Blackwell.

Miller, G.T. 2004. Environmental Science: Working with the Earth, Thomson Brooks.

Odum, E.P.,Barrett, G.W. 2005.Fundamentals of Ecology, Ceneage Learning.

Raven, P.H., Hassenzahl, D.M., Hager, M.C., Gift, N.Y., Berg, L.R. 2015. Environment, 9th ed, Wiley.

Sharma, P.D. 2011. Ecology and Environment, Rastogi Publications.

Singh, S. 2013. Environmental Geography, PrayagPustakBhawan.

Withgott, J.H., Laposata, M. 2017. Environment: The Science behind the Stories, 6th ed, Pearson.

WEBSITES:

BBC – Science & Environment: https://www.bbc.com/news/science_and_environment

Centre for Science and Environment: https://www.cseindia.org

Ministry of Environment, Forest and Climate Change: https://moef.gov.in/en

The Energy and Resources Institute: https://www.teriin.org

The World Bank – Environment: https://www.worldbank.org/en/topic/environment

United Nations Environment: https://unfccc.int/process/bodies/supreme-bodies/conference-of-the-parties-cop

GEOACOR09P—Environmental Geography (Lab)✧

2 Credits [60 hours of teaching]

An A4/ A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Preparation of questionnaire for perception survey on environmental problems
2. Preparation of check-list for Environmental Impact Assessment of an urban / industrial project
3. Quality assessment of water using portable tester: pH, salinity, and hardness
4. Interpretation of changes in air quality using multi-seasonal and multi-city or multi locational (within a single city) CPCB / WBPCB data
5. Viva voce based on laboratory notebook

Reading List

BOOKS:

Clifford, N., Cope, M., Gillespie,.T.W., French, S. (Eds) 2016. Key Methods in Geography, 3rd ed, Sage

Gilpin, A., 1994. Environmental Impact Assessment: Cutting Edge for the 21st Century, Cambridge University Press.

Northey, N., Draper, D., Knight, D.B. 2015. Making Sense in Geography and Environmental Sciences: A Student's Guide to Research and Writing, 6th ed., Oxford University Press.

WEBSITES:

BBC – Science & Environment: www.bbc.com/news/science_and_environment

Central Pollution Control Board: www.wbpcb.gov.in

Centre for Science and Environment: www.cseindia.org

Ministry of Environment, Forest and Climate Change: www.envfor.nic.in

The Energy and Resources Institute: www.teriin.org

The World Bank – Environment: www.worldbank.org/en/topic/environment

United Nations Environment Programme: www.unenvironment.org
West Bengal Pollution Control Board: www.cpcb.nic.in

West Bengal Pollution Control Board: https://www.wbpcb.gov.in/

GEOADS10T– Soil and Biogeography✧

5 Credit [75 hours of teaching]

Unit I: Soil Geography

1. Definition and significance of soil properties: Texture, structure, and moisture
2. Definition and significance of soil properties: pH, organic matter, and NPK
3. Soil profile. Origin and profile characteristics of lateritic, podsol and chernozem soils
4. Soil erosion and degradation: Factors, processes and management measures. Humans as active agents of soil transformation
5. Principles of soil classification: Genetic and USDA. Concept of land capability and its classification

Unit II: Biogeography

6. Concepts of biosphere, ecosystem, biome, ecotone, community, niche, succession and ecology
7. Concepts of trophic structure, food chain and food web. Energy flow in ecosystems
8. Bio-geochemical cycles with special reference to carbon dioxide and nitrogen
9. Geographical extent and characteristic features of: Tropical rain forest, Savanna, Hot desert and Taiga biomes
10. Spatial distribution of world fauna.
11. Phytogeographical regions; Plant species, family and genera
12. Deforestation: Causes, consequences and management

Reading List

Chapman J.L., Reiz, M.J. 1993. Ecology: Principle and Applications, Cambridge University Press.

Chiras, D.D., Reganold, J.P. 2009. Natural Resource Conservation: Management for a Sustainable Future. Pearson.

Cox, B., Moore, P.D., Ladle, R. 2016. Biogeography: An Ecological and Evolutionary Approach, Wiley-Blackwell.

Daji, J.A., Kadam, J.R., Patil, N.D. 1996.A Textbook of Soil Science, Media Promoters and Publishers Pvt Ltd.

Dash, M.C., 2001. Fundamental of Ecology, 2nd edition, Tata McGrawHill, New Delhi

Dey, N. K., Ghosh.P. 1993. India: A Study in Soil Geography, Sribhumi Publishing Company.

Franzmeier, D.P., McFee, W.W., Graveel, J.G., Kohnke, H. 2016. Soil Science Simplified, 5th ed, Waveland Press.

Huggett, R. 1998. Fundamentals of Biogeography, Routledge, London:

Lomolino, M.V., Riddle, B.R., Whittaker, R.J. 2016. Biogeography, 5th ed, Oxford University Press.

MacDonald, G.2001. Biogeography: Introduction to Space, Time, and Life, Wiley

Morgan, R.P.C. 1995. Soil Erosion and Conservation, 2nd edition, Longman.

Santra. A. 2006. Handbook on Wild and Zoo Animals, International Book Distributing Co.

Sharma, P.D. 2011. Ecology and Environment, Rastogi Publications.

Weil, R.R. and Brady, N.C. 2016.The Nature and Properties of Soil, 15th edition, Pearson.

White, R. 2006. Principles and Practice of Soil Science: The Soil as a Natural Resource, Blackwell

GEOADS11T – Remote Sensing, GIS and GNSS✧

3 Credits [45 hours of teaching]

Unit I: Remote Sensing

1. Principles of Remote Sensing (RS): Types of RS satellites and sensors [5]
2. Sensor resolutions and their applications with reference to IRS and Landsat missions [5]
3. Image referencing schemes and acquisition procedure of free geospatial data from NRSC / Bhuvan and USGS [5]
4. Preparation of False Colour Composites from IRS LISS-3 and Landsat TM / OLI data. [5]
5. Principles of image interpretation. Preparation of inventories of land use land cover (LULC) features from satellite images [5]
6. Acquisition and utilisation of free Digital Elevation Model data: CartoDEM, SRTM and ALOS [5]

Unit II: Geographical Information Systems and Global Navigation Satellite System

7. Concept of GIS and its applicability
8. GIS data structures types: Spatial and non-spatial, raster and vector [5]
9. Principles of preparing attribute tables, data manipulation, and overlay analysis [6]
10. Principles and significance of buffer preparation [4]
11. Principles of GNSS positioning and waypoint collection [5]
12. Principles of transferring of GNSS waypoints to GIS. Area and length calculations from GNSS data [5]

Reading List

Bhatta, B. 2011. Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others, CRC Press.

Bhatta, B. 2011. Remote Sensing and GIS, 2nd ed, Oxford Univ. Press.

Bolstad, P. 2016. GIS Fundamentals: A First Text on Geographic Information Systems, 5th ed, XanEdu Publishing.

Brewer, C.A. 2015. Designing Better Maps: A Guide for GIS Users, 2nd ed, Esri Press.

Harvey, F. 2015. A Primer of GIS: Fundamental Geographic and Cartographic Concepts, 2nd ed, The Guilford Press.

Indian Space Research Organisation. 2017. Effective Use of Space Technology.

Jensen, J.R., 2013. Remote Sensing of the Environment: An Earth Resource Perspective, Pearson Education India.

Joseph, G. and Jegannathan, C. 2018. Fundamentals of Remote Sensing, 3rd ed, Universities Press.

Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 7th ed, Wiley.

Sarkar, A. 2015. Practical Geography: A Systematic Approach. 2nd ed, Orient Black Swan Private Ltd.

WEBSITES:

ALOS Global Digital Surface Model: www.eorc.jaxa.jp/ALOS/en/aw3d30/index.htm

International Society for Photogrammetry and Remote Sensing: www.isprs.org

ISRO Bhuvan 2D and 3D Platforms: bhuvan.nrsc.gov.in/map/bhuvan/bhuvan2d.php

bhuvan.nrsc.gov.in/globe/3d.php#

NASA Landsat Science: www.landsat.gsfc.nasa.gov

National Remote Sensing Centre: www.nrsc.gov.in

USGS Global Visualization Viewer: www.glovis.usgs.gov

GEOADS11P – Remote Sensing, GIS and GNSS (Lab)✧

2 Credits [60 hours of teaching]

An A3/ A4-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be represented as computer prints from Q-GIS / Garmin Basecamp or MapSuorce / MS Excel software as applicable. Methods and interpretations are to be handwritten. Note: All exercises to be done using QGIS (2.10 and above)

1. Georeferencing of maps and images
2. Image enhancement. Preparation of FCC and identification of features using standard FCC and other band combinations across different image bands of IRS L3 or Landsat OLI data [15]
3. Supervised image classification, class editing, and post-classification analysis [15]
4. Digitisation of features. Data attachment, overlay and preparation of annotated thematic maps (choropleth, pie chart and bar graphs).
5. Waypoint collection from GNSS receivers and exporting to GIS database [10]
6. Viva-voce based on laboratory notebook (5 Marks)

Reading List

WEBSITES:

Garmin: support.garmin.com/en-US/?productID=52801&tab=manuals

International Society for Photogrammetry and Remote Sensing: www.isprs.org

ISRO Bhuvan 2D and 3D Platforms: bhuvan.nrsc.gov.in/map/bhuvan/bhuvan2d.php

bhuvan.nrsc.gov.in/globe/3d.php#

NASA Landsat Science: www.landsat.gsfc.nasa.gov

National Remote Sensing Centre: www.nrsc.gov.in

Q-GIS: qgis.org/en/site/forusers/index.html

USGS Global Visualization Viewer: www.glovis.usgs.gov

GEOADS12T – Evolution of Geographical Thought✧

5 Credits [75 hours of teaching]

Unit I: Nature of Pre Modern Geography

1. Development of Geography: Contributions of Greek and Chinese geographers
2. Impact of 'Dark Age' in Geography and Arab contributions
3. Geography during the age of 'Discovery' and 'Exploration' (contributions of Columbus, Vasco da Gama, Magellan, James Cook).
4. Transition from cosmography to scientific Geography (contributions of Bernard Varenius and Immanuel Kant). Dualism and Dichotomies (Ideographic vs. Nomothetic, Physical vs. Human, Regional vs. Systematic, Determinism vs. Possibilism,)

Unit II: Foundations of Modern Geography and Recent Trends

5. Evolution of Geographical thoughts in Germany, France, Britain and United States of America
6. Contributions of Humboldt and Ritter
7. Contributions of Richthofen, Hettner, Ratzel and Vidal deLaBlaché
8. Trends of geography in the post-World War-II period: Quantitative Revolution, systems approach.
9. Evolution of Critical Geography: Behavioural, humanistic and radical.
10. Changing concept of time-space in geography in the 21st Century

Reading List

Adhikari, S. 2015. Fundamentals of Geographical Thought, Orient Blackswan.

Clifford, N. Holloway S.L., Rice, S.P., Valentine, G. 2009. Key Concepts in Geography, 2nd ed, Sage.

Couper, P. 2015. A Student's Introduction to Geographical Thought: Theories, Philosophies, Methodologies, Sage.

Cresswell, T. 2013. Geographic Thought: A Critical Introduction, Wiley-Blackwell.

Dikshit, R.D. 2004. Geographical Thought: A Contextual History of Ideas, Prentice Hall India.

Holt-Jensen, A. 2011. Geography: History and Concepts: A Student's Guide, Sage.

Husain, M. 2015. Evolution of Geographical Thought, 6th ed, Rawat Publications.

Gregory, D., Johnston, R., Pratt, G., Watts.,Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley.

Pete, P. 1998. Modern Geographical Thought, Wiley-Blackwell.

GEOADS13T – Hazard Management✧

3 Credits [45 hours of teaching]

Unit I: Concepts

1. Classification of hazards and disasters.
2. Approaches to hazard study: Risk perception and vulnerability assessment. Hazard paradigms.
3. Responses to hazards: Preparedness, trauma and aftermath. Resilience and capacity building.
4. Hazards mapping: Data and geospatial techniques (for hazards enlisted in Unit II and DS14P)

Unit II: Hazard-specific Study with focus on India

5. Earthquake: Factors, vulnerability, consequences and management
6. Landslide: Factors, vulnerability, consequences and management
7. Tropical Cyclone: Factors, vulnerability, consequences and management
8. Flood: Factors, vulnerability, consequences, and management [5]
9. Riverbank erosion: Factors, vulnerability, consequences and management
10. Biohazard: Classification, vulnerability, consequences, and management [5]

Reading List

Coch, N.K. 1994. Geohazards: Natural and Human, Pearson College.

Coenraads, R. (Ed.) 2006. Natural Disasters and How We Cope, Millennium House.

Cutter, S.L. 2006. Hazards Vulnerability and Environmental Justice, Routledge

Government of India. 1997. Vulnerability Atlas of India, Revised ed, Building Materials & Technology Promotion Council, Ministry of Urban Development.

Hyndman,D., Hyndman, D. 2016. Natural Hazards and Disasters, 5th ed, Brooks Cole.

Kapur, A. 2010. Vulnerable India: A Geographical Study of Disasters, Sage.

Keller. E.A., DeVecchio, D.E. 2014. Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 4th ed, Routledge.

Pine, J.C. 2014. Hazards Analysis: Reducing the Impact of Disasters, 2nd ed, CRC Press.

Robbins, P., Hintz, J., Moore, S.A. 2014. Environment and Society: A Critical Introduction 2nd ed, Wiley.

Smith, K. 2013. Environmental Hazards: Assessing Risk and Reducing Disaster, 6th ed, Routledge.

Websites:

AGU landslide Blog: blogs.agu.org/landslideblog

Disaster News Network: secure.disasternews.net

India Meteorological Department Cyclone Page: www.rsmcnewdelhi.imd.gov.in/index.php?lang=en

USGS Earthquake Hazards Programme: www.earthquake.usgs.gov

GEOADS13P – Hazard Management (Lab)✧

2 Credits [60 hours of teaching]

An individual Project Report is to be prepared and submitted based on any one case study among the following disasters of West Bengal incorporating a preparedness plan

1. Earthquake
2. Landslide
3. Land subsidence
4. Thunderstorm
5. Flood
6. Riverbank / Coastal erosion
7. Fire
8. Industrial accident
9. Road / Railway accident
10. Structural collapse
11. Environmental pollution
12. Biohazard

One case study will be done by a group of 5 to 10 students. Different groups may choose different case studies from any one or different types of disasters listed above. The report should be prepared on secondary data and handwritten on A4 page in candidates' own words not exceeding 2000 words excluding references. The report should contain a proper title. The report should incorporate relevant tables, maps, diagrams and references not exceed five pages. Photographs are not required. A copy of the stapled report in a transparent front file, duly signed by the concerned teacher, will be submitted during examination. Without the report the candidates will not be evaluated for DS14P.

GEOADS14T – Social Geography✧

5 Credits [75 hours of teaching]

Unit I: Society, Identity and Crisis

1. Social Geography: Concept, Origin, Nature and Scope
2. Concept of Space, Social differentiation and stratification; social processes
3. Social Categories: Caste, Class, Religion, Race and Gender and their Spatial distribution
4. Basis of Social region formation; Evolution of social-cultural regions of India
5. Peopling Process of India: Technology and Occupational Change; Migration.
6. Social groups, social behaviour and contemporary social environmental issues with special reference to India

Unit II: Social Wellbeing and Planning

7. Concept of Social Well-being, Quality of Life, Gender and Social Well-being
8. Measures of Social Well-being: Healthcare, Education, Housing, Gender Disparity
9. Social Geographies of Inclusion and Exclusion, Slums, Gated Communities, Communal Conflicts and Crime.
10. Social Planning during the Five Year Plans in India
11. Social Policies in India: Education and Health
12. Social Impact Assessment (SIA): Concept and importance

Reading List

Ahmed A., 1999. Social Geography, Rawat Publications.

Casino, V. J. D., Jr., 2009. Social Geography: A Critical Introduction, Wiley Blackwell.

Cater, J. and Jones T., 2000: Social Geography: An Introduction to Contemporary Issues, Hodder Arnold.

Gregory, D., Johnston, R., Pratt, G., Watts.,Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley.

Holt, L., 2011. Geographies of Children, Youth and Families: An International Perspective, Taylor & Francis.

Majumdar, P.K. 2013. India's Demography: Changing Demographic Scenario in India, Rawat Publications.

Mukherji, S. 2013. Migration in India: Links to Urbanization, Regional Disparities and Development Policies, Rawat Publications

Panelli, R., 2004. Social Geographies: From Difference to Action, Sage.

Rachel, P., Burke, M., Fuller, D., Gough, J., Macfarlane, R. and Mowl, G. 2001. Introducing Social Geographies, Oxford University Press.

Smith, D. M., 1994.Geography and Social Justice, Blackwell, Oxford.

Smith, S.J., Pain, R., Marston, S. A., Jones, J. P., 2009. The SAGE Handbook of Social Geographies, Sage Publications.

Valentine, G. 2014. Social Geographies: Space and Society, Routledge.

GEOADS15P – Surveying Techniques and Fieldwork✧

5 Credits [150 hours of teaching]

Unit I: Surveying

1. Open and closed traverse survey using Prismatic Compass; Bowditch correction for closing error adjustment
2. Profile line survey and Radial Contouring using a Dumpy Level; Plotting radial contouring data.
3. Profile survey using Abney level
4. Determination of heights of objects with accessible and inaccessible base by Transit Theodolite (instrument and object not in same vertical plane method).
5. Viva voce based on laboratory notebook

Unit II: Fieldwork

Every student needs to participate in fieldwork and prepare a field report according to the following guideline, failing which he/she will not be evaluated for DS11P.

1. Each student will prepare a report based on primary data collected from field survey and secondary data collected from different sources.
2. Students will select either one rural area (*mouza*) or an urban area (municipal ward) for the study, with the primary objective of evaluating the relation between physical and cultural landscape.
3. The fieldwork should be completed within seven days.
4. The report should be handwritten in English on A4 size paper in candidate's own words within 5,000 words (Introductory Chapter: 1000 words; Physical Aspects: 1500 words; Socio-economic Aspects: 1500 words; Concluding Chapter: 500 words, approximately) excluding tables, photographs, maps, diagrams, references and appendices.
5. Maps and diagrams should not exceed 15 pages.
6. All sections of the report should contain relevant maps, diagrams and photographs using primary and secondary data, clearly citing sources.
7. A copy of the bound report, duly signed by the concerned teacher, will be submitted during examination.

Reading List

Arora, K.R. (2010): Surveying (Volumes I & II), Standard Book House, New Delhi.

Basak, N.N. 2017. Surveying and Levelling, 2nd ed, McGraw Hill Education.

Kulkarni, S.V. and Kanetkar, T.R. (1965): Surveying and Levelling (Volumes I & II), A.V.G. Prakashan, New Delhi.

Sarkar, A. (2008): Practical Geography: A Systematic Approach, Orient BlackSwan, Kolkata.

Singh, R.L. and Singh, P.B. (2009): Elements of Practical Geography, Kalyani Publishers, New Delhi.

Subramanian, R. (2012). Surveying and Levelling, 2nd ed, Oxford University Press.

Lenon, B., Cleves, P. 2015. Geography Fieldwork and Skills, Harper-Collins.

Parsons, T., Knight, P.G. 2015. How To Do Your Dissertation in Geography and Related Disciplines, 3rd ed, Routledge.

Phillips, R., Johns, J. 2012. Fieldwork for Human Geography, Sage.

Thornbush, M.J., Allen, C.D., Fitzpatrick, F.A. (Eds) 2014. Geomorphological Fieldwork, Elsevier.

GEOADS16T – Hydrology and Oceanography✧

5 Credits [75 hours of teaching]

Unit-I: Hydrology

1. Systems approach in hydrology. Global hydrological cycle: Its physical and biological role
2. Run off: controlling factors. Infiltration and evapotranspiration. Run off cycle
3. Drainage basin as a hydrological unit. Principles of water harvesting and watershed management
4. Types of subsurface water, Types of aquifers, Groundwater Flow: Darcy's Law
5. Groundwater: Occurrence and storage. Factors controlling recharge, discharge and movement.

Unit-II: Oceanography

6. Major relief features of the ocean floor: characteristics and origin according to plate tectonics
7. Physical and chemical properties of ocean water
8. Water mass, T–S diagram
9. Air-Sea interactions, ocean circulation, wave and tide
10. Ocean temperature and salinity: Distribution and determinants
11. Coral reefs: Formation, classification and threats [5]
12. Marine resources: Classification and sustainable utilisation
13. Sea level change: Types and causes

Reading List

Dingman, S.L. 2015. Physical Hydrology, 3rd ed, Macmillan Publishing Co.

Fitts, C.R. 2002. Groundwater Science, Elsevier.

Garrison, T. 2016. Oceanography: An Invitation to Marine Science, 9th ed, Cengage Learning.

Kearey, P., Klepeis, K.A., Vine, F.J. 2011. Global Tectonics, 3rd ed, Wiley-India.

Karanth, K.R., 1988: Ground Water: Exploration, Assessment and Development, Tata- McGraw Hill, New Delhi.

Pinet, P.R. 2014. Invitation to Oceanography. 7th ed, Jones and Barlett Publishers.

Pinneker, E.V. 2010. General Hydrogeology, Cambridge University Press.

Pugh, D., Woodworth, P. 2014. Sea-Level Science: Understanding Tides, Surges, Tsunamis and Mean Sea-Level Changes, 2nd ed, Cambridge University press.

Raghunath, H.M. 2006. Hydrology: Principles, Analysis, Design, 3rd ed, New Age International Publishers.

Reddy, P.J.R. 2014. A Textbook of Hydrology, University of Science Press.

Subramanya, K. 2013. Engineering Hydrology, McGraw Hill Education.

Sverdrup, K.A., Armrest, E.V. 2010. An Introduction to the World Oceans, 10th ed, McGraw Hill.

Todd, D.K., Larry, W.M. 2004.Groundwater Hydrology, John Wiley & Sons.

Ward, A.D., Trimble, S.W., Burckhard, S.R., Lyon, J.G. 2016. Environmental Hydrology, 3rd ed, CRC Press.

GEOADS17T – Statistical Methods in Geography✧

3 Credits [45 hours of teaching]

Unit I: Frequency Distribution and Sampling

1. Discrete and continuous data, population and samples, scales of measurement (nominal, ordinal, interval and ratio),
2. Collection of data and formation of statistical tables
3. Sampling: Need, types, and significance and methods of random sampling
4. Theoretical distribution: frequency, cumulative frequency, normal and probability

Unit II: Numerical Data Analysis

5. Central tendency: Mean, median, mode, partition values
6. Measures of dispersion range, mean deviation, standard deviation, coefficient of variation
7. Association and correlation: Rank correlation, product moment correlation
8. Regression: Linear and non-linear, bi-variate analysis and curve fitting — linear, exponential. power relationship; residuals.
9. Time series analysis: Moving average
10. Hypothesis testing: Chi-square test and T-test

Reading List

Acevedo, M.F. 2012. Data Analysis and Statistics for Geography, Environmental Science and Engineering, CRC Press.

Harris, R., Jarvis, C. 2011. Statistics for Geography and Environmental Science, Prentice Hall.

McGrew Jr., J.C., Lembo Jr., A.J.,Monroe, C.B. 2014. An Introduction to Statistical Problem Solving in Geography, 3rd ed, Waveland Press.

Pal S. K., 1998. Statistics for Geoscientists: Techniques and Applications, Concept Pub Co.

Rogerson, P.A. 2015. Statistical Methods for Geography: A Student's Guide, 4th ed, Sage.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

GEOADS17P – Statistical Methods in Geography (Lab)✧

2 Credits [60 hours of teaching]

An A4/ A3-size laboratory notebook, comprising class assignments of the following is to be prepared and submitted. The exercises are to be drawn in pencil. All texts are to be handwritten. All exercises in the laboratory notebook should be duly signed by concerned teacher.

1. Construction of data matrix with each row representing an areal unit (districts / blocks / *mouzas* / towns) and corresponding columns of relevant attributes
2. Based on the above, a frequency table, measures of central tendency and dispersion would be computed and interpreted using histogram and frequency curve
3. From the data matrix a sample set (20%) would be drawn using, random, systematic and stratified methods of sampling and locate the samples on a map with a short note on methods used
4. Based on of the sample set and using two relevant attributes, a scatter diagram and linear regression line would be plotted and residual from regression would be mapped with a short interpretation
5. Viva voce based on laboratory notebook

Reading List

Books:

Acevedo, M.F. 2012. Data Analysis and Statistics for Geography, Environmental Science and Engineering, CRC Press.

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied. Acevedo, M.F. 2012. Data Analysis and Statistics for Geography, Environmental Science and Engineering, CRC Press.

Harris, R., Jarvis, C. 2011. Statistics for Geography and Environmental Science, Prentice Hall.

Mahmood, A. 1999. Statistical Methods in Geographical Studies, Rajesh Publications.

McGrew Jr., J.C., Lembo Jr., A.J., Monroe, C.B. 2014. An Introduction to Statistical Problem Solving in Geography, 3rd ed, Waveland Press.

Pal, S.K. 1998. Statistics for Geoscientists: Techniques and Applications, Concept Pub Co.

Rogerson, P.A. 2015. Statistical Methods for Geography: A Student's Guide, 4th ed, Sage.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Websites:

Government of India data platform: https://data.gov.in

Census of India: https://censusindia.gov.in/census.website West Bengal District Statistical Handbooks:

http://wbpspm.gov.in/publications/District%20Statistical%20Handbook

GEOADS18T – Advanced Geomorphology ✧

5 Credits [75 hours of teaching]

Unit I: Explanation in Geomorphology

1. Principle of Uniformitarianism, Catastrophism, inheritance from the past; Actualism.
2. Systems Analysis in Geomorphology: Feedback mechanisms, Ideas of Equilibrium, Geomorphic thresholds
3. Planetary geomorphology with special reference to Mars.
4. Tectonic and Structural landforms: Structure and form of orogenic belts with reference to the Himalayas: Fore deep basins, thrust belt, metamorphism and tectonics.
5. Tectonic Geomorphology: Basic principles; geomorphic markers ascertaining neotectonic movements, principles of relative and absolute dating.
6. Morphogenetic regions and their importance. Significance of process studies in geomorphology.

Unit II: Geomorphic Processes and Forms

7. Significance of drainage basin as a geomorphic unit; channel initiation.
8. Hydraulics of streamflow: Types of flow, stream velocity and resistance, stream energy. entrainment and bed erosion, bank erosion processes and deposition.
9. Processes of evolution of periglacial landforms
10. Karst processes and landforms in Tropical Humid Environments
11. Coastal morphodynamic variables and their influence on evolution of coastal forms. Bioturbation, Tidal accretion, Storm surge effects.
12. Slope evolution models — King, Wood and Young
13. Applied and anthropogenic geomorphology — emergence and relevance. Geoinformatics in Geomorphology: Utility of satellite images, Digital Elevation Models.

Reading List

Bierman, P.R. and Montgomery, D.R. (2014): *Key Concepts in Geomorphology*. W.H. Freeman and Co.

Charlton, R. (2007): *Fundamentals of Fluvial Geomorphology*. Routledge, USA.

Chorley, R. J., & Kennedy, B. A. (1971): *Physical geography: a systems approach*. Prentice-Hall.

Fryiris, K.A. and Brierley, G.J. (2013): *Geomorphic analysis of river systems: An approach to reading the landscape*. Wiley-Blackwell Chichester, UK.

Goudie, A.S. (ed.) (2004): *Encyclopaedia of Geomorphology*. Routledge, London.

Gutiérrez, M. (2013): *Geomorphology*, CRC Press, Boca Ranton, Florida.

Harvey, A. (2012*): Introducing Geomorphology: A guide to landforms and processes*. Dunedin, London.

McKenna Neuman, C., Ashmore, P., Bennett S.J. (2013): Laboratory and experimental geomorphology: examples from fluvial and aeolian systems. In: Shroder, J. (Editor in Chief), Orme, A.R., Sack, D. (Eds.), *Treatise on Geomorphology*. Academic Press, San Diego, CA, vol. 1, The Foundations of Geomorphology, pp. 325–348.

National Research Council (2010): *Landscapes on the Edge: New Horizons for Research on Earth's Surface*. Washington, DC: The National Academies Press. https://doi.org/10.17226/12700 [pp. 1-12].

Plater, A.J., Daniels, M.D. & Oguchi, T. (2013): Present research frontiers in geomorphology. In: Shroder, J., Orme, A.R.,Sack, D. (Eds.), Treatise on Geomorphology. Academic Press, San Diego, CA, vol. 1, *The Foundations of Geomorphology* [pp. 349–376].

Richter, G. (1981): Recent trends of experimental geomorphology in the field. Earth Surface Processes and Landforms, vol. 6, 215-219.

Sack, D. & Orme, A.R. (2013): Introduction to the Foundations of Geomorphology. In: Orme, A.R. & Sack, D. (eds.), *Treaties on Geomorphology*, Academic Press. San Diego, CA. Vol. 1 Foundations of geomorphology. 10.1016/B978-0-12- 374739-6.00001-4.

Schumm, S. A. (1973): Geomorphic thresholds and complex response of drainage systems. In B.L. Rhoads, & C. E. Thorn (Eds*.), Channel changes: observations and experiments* (pp. 299-310). University of Minnesota Press.

Starkel, L. (1999): *Space and time scales in geomorphology*. Fourth international conference on geomorphology – Italy, 1997 plenary lecture. Suppl. Geogr. Fis. Dinam. Quat. III, T.3 (1999), 61-66.

Summerfield, M.A. (1991): *Global Geomorphology: An Introduction to the Study of Landforms*. Longman, London

Thorn, C. E., & Welford, M. R. (1977): *Equilibrium concepts in geomorphology*. Wiley.

Vitek, J.D. & Giardino, J.R. Ed. (1993): Geomorphology: the research frontier and beyond. Proceedings of the 24th *Binghamton Symposium in Geomorphology*, August 25,1993. Reprinted from Geomorphology, Volume 7, Nos. 1-3 [pp. 1-7; 251-262].

GEOADS19T – Regional Development and Planning

5 Credits [75 hours of teaching]

Unit I: Regional Development

1. Regions: Concept, types, and delineation
2. Concepts of growth and development. Indicators of development: Economic, demographic, and environmental
3. Theories and models for regional development: Cumulative causation (after Myrdal),stages of development (after Rostow), and growth pole model (after Perroux)
4. Underdevelopment: Concept and causes
5. Regional disparities in India: Economic and social

Unit II: Regional Planning

6. Regional planning: Principles, objectives, and approaches
7. Types of planning: Temporal, sectoral, spatial, and non-spatial
8. Centralised and decentralised planning. Multi-level planning in India
9. Planning issues in hill area (as formal region) and city region (as functional region)
10. Planning strategies: Participatory planning and governance

Reading List

Bhargava, G. 2001. Development of India's Urban, Rural, and Regional Planning in 21st Century: PolicyPerspective, Gyan Publishing House.

Chand, M., Puri, V.K. 2000. Regional Planning In India, Allied Publishers Ltd.

Chandana, R.C. 2016. Regional Planning and Development, 6th ed, Kalyani Publishers.

Glasson, J. 2017. Contemporary Issues in Regional Planning, Routledge.

Gore, C. 2011. Regions in Question: Space, Development Theory, and Regional Policy, Routledge.

Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley.

Hall, P., Tewdwr-Jones, M. 2010. Urban and Regional Planning, Routledge.

Higgins, B., Savoie, D.J. 2017. Regional Development: Theories and Their Application, Routledge.

Kulshetra, S.K. 2012. Urban and Regional Planning in India: A Handbook for Professional Practitioners, Sage.

Kumar, A., Meshram, D.S., Gowda, K. (Eds) 2016. Urban and Regional Planning Education: Learning forIndia, Springer.

Misra, R.P. 1992. Regional Planning: Concepts, Techniques, Policies and Case Studies, Concept Pub Co.Ray, J. 2001. Introduction to Development & Regional Planning, Orient Blackswan.

Combes P., Mayer T. and Thisse J. F., 2008: Economic Geography: The Integration of Regions andNations, Princeton University Press.

Wheeler, J.O., Muller, P.O., Thrall, G.I., Fik, T.J. 1998. Economic Geography, 3rd ed, Wiley.

Willington D. E., 2008: Economic Geography, Husband Press.

Wood, A., Roberts, A. 2010. Economic Geography: Places, Networks and Flows, Routledge.

GEOADS20T – Advanced Climatology ✧

5 Credits [75 hours of teaching]

Unit I Atmospheric Dynamics and Climatology of the Tropics

1. Atmospheric temperature; equations for state of ideal gases; First and Second Laws of Thermodynamics.
2. Atmospheric moisture; process of condensation and precipitation; Carnot Cycle, conditions of stability and instability.
3. Concepts and equations of pressure, gravity, centripetal and Coriolis forces; geostrophic and gradient winds.
4. Tropical wet and dry climates; Tropical air masses — characteristics, identification and modification, convergence and divergence.
5. Mechanism of Indian Monsoon and causes of its variability. Hadley and Walker cells, ENSO phenomena
6. Weather hazards: heat and cold waves— genesis and forecasting.

Unit II Climate Change and Applied Climatology

7. Theories of climate change. Scientific evidences of climate change; reconstruction of past climates
8. The climate cycle and climate trends.
9. Bioclimatology: Human comfort in relation to climate.
10. Synoptic Climatology in pollution studies, aviation and navigation
11. Urban climatology with special reference to urban heat island
12. Approaches and techniques of weather forecasting in India: short, medium and long range

Reading List

Ackerman, S.A, and Knox, J.A. (2012). Meteorology: Understanding the Atmosphere. Jones & Bartlett Learning, London.

Atkinson, B.W. (Ed.) (1981). Dynamical Meteorology: An Introductory Selection. Methuen, London.

Barry, R.G., & Chorley, R.J. (2003). Atmosphere, Weather and Climate. Routledge, London.

Barry, R.G., & Chorley R.J. (1973). Synoptic Climatology: Methods and Applications. Methuen & Co Ltd., London, 555p.

Chandrasekar, A. (2010): Basics of Atmospheric Science. PHI Learning Pvt. Ltd., New Delhi.

Holton, J.R. (2004). An Introduction to Dynamic Meteorology (4th Ed.). Elsevier.

Houghton, J. (2002): Physics of Atmosphere. Cambridge University Press, Cambridge.

Jolliffe, I.T., & Stephenson, D.B. Eds. (2011). Forecast Verification: A Practitioner's Guide (2nd Ed.). Wiley & Sons., 296p.

Kossin, J.P., Emanuel, K.A., & Vecchi, G.A. (2017). Introduction to Tropical Meteorology. CRC Press.

Lehr, P.E., & Burnett, R.W., & Zim, S.H. (1987). Weather: Air Masses, Clouds, Rainfall, Storms, Weather Maps, Climate. Golden Guides, UK.

McIlveen, R. (2010). Fundamentals of Weather and Climate. Oxford University Press, Oxford.

Nurmi, P. (2003). Recommendations on the verification of local weather forecasts. ECMWF Tech. Mem. 430.

Rayner, J.N. (2001). Dynamic Climatology - Basis in Mathematics and Physics. Blackwell Publishers Ltd., Oxford.

Rohli, R.V., & Vega, A.J. (2012). Climatology. Jones & Bartlett Learning, London.

Thompson, R.D. (1998). Atmospheric Pressures and Systems. Routledge, London.

Uman, M. A. (1984). Lightning, Dover-Publications. New York.

Wilks, D.S. (2006). Statistical Methods in the Atmospheric Sciences. Int. Geophysics Series, Elsevier, UK.

GEOADS21T – Rural and Urban Geography ✧

5 Credits [75 hours of teaching]

Unit I: Rural Geography

1. Paradigms of rural development: Modernisation paradigm, holistic development paradigm, Gandhian approach to rural development
2. Approaches to Rural Development: Area-based (DPAP) and Target based (NFFWP)
3. Rural Employment policies and programmes in India, PMGSY, SJSY, MNREGA, Jan Dhan Yojana
4. 73rd Constitutional Amendment of India and its implications for governance
5. Participatory rural planning and management with reference to JFM, Watershed Management, SHGs

Unit II: Urban Geography

6. Approaches and recent trends in urban geography
7. Origin of urban places in ancient, medieval, modern, and post-modern periods: Factors, stages, and characteristics
8. Patterns of urbanisation in developed and developing countries
9. Patterns and trends of urbanisation in India
10. Urban issues: urban poverty and crime, housing, and civic amenities

Reading List

BOOKS:

Carter, H. 1995. The Study of Urban Geography, 4th ed, Arnold.

Gilg, A.W. 1985. An Introduction to Rural Geography, Edwin Arnold.

Gottdiener, M., Budd, M. Lehtovuori, P. 2016. Key Concepts in Urban Studies, 2nd ed, Sage.

Jonas, A.E.G., McCann, E., Thomas, M. 2015. Urban Geography: A Critical Introduction, Wiley-Blackwell.

Kaplan, D., Holloway, S. 2014. Urban Geography, 3rd ed, Wiley.

Knox, P.L., McCarthy, L.M. 2011. Urbanization: An Introduction to Urban Geography, 3rd ed,

Pearson.Krishnamurthy, J. 2000. Rural Development: Problems and Prospects, Rawat Publications.

Latham, A., McCormack, D., McNamara, K. McNeill, D. 2009. Key Concepts in Urban Geography, Sage.

Lee, D.A., Chaudhri, D.P. (Eds) 1983. Rural Development and State, Methuen Publishing.

LeGates, R.T., Stout, F. (Eds) 2015. The City Reader, 6th ed, Routledge.

Levy, J.M. 2016. Contemporary Urban Planning, 11th ed, Routledge.

Macionis, J.J., Parrillo, V.N. 2016. Cities and Urban Life, 7th ed, Pearson.

Misra, R.P. (Ed) 2002 (Reprint). Regional Planning: Concepts, Techniques, Policies and Case Studies, Concept Pub. Co.

Misra, R.P., Sundaram, K.V. (Eds) 1979. Rural Area Development: Perspectives and Approaches,Sterling Publishers.

Pacione, M. 2009. Urban Geography: A Global Perspective, Routledge.

Potter, R.B., Lloyd-Evans, S. 2014. The City in the Developing World, Routledge.

Ramachandran, H., Guimaraes, J.P.C. 1991. Integrated Rural Development in Asia: Leaning fromRecent Experience, Concept Publishing.

Ramachandran, R. 1989. Urbanisation and Urban Systems in India, Oxford University Press.

Ramachandran, R., 1992: The Study of Urbanisation, Oxford University Press

Robb, P. (Ed) 1983. Rural South Asia: Linkages, Change and Development, Curzon Press.

Singh, K., Shishodia, A. 2016. Rural Development: Principles, Policies, and Management, 4th ed, Sage.

Singh, R.B. (Ed) 2015. Urban Development, Challenges, Risks and Resilience in Asian Megacities. Advances in Geographical and Environmental Studies, Springer.

Wanmali, S. 1992. Rural Infrastructure, the Settlement System and Development of the RegionalEconomy in Southern India, International Food Policy Research Institute.

Minor Courses for Major/ Honours Students of Other Disciplines offered by Geography /

Core Courses for the 3-year Multidisciplinary Undergraduate Programme offered by Geography (GEOHM/ GEOMC)

GEOHM01T/ GEOMC01T – Physical Geography ✧

5 Credit [75 hours of teaching]

Unit I: Geotectonics and Geomorphology

1. Internal Structure of Earth based on Seismic Evidence.
2. Influence of lithology on landforms: Granite and Basaltic landforms.
3. Factors controlling landform development; endogenetic and exogenetic forces.
4. Evolution of landforms under fluvial process
5. Nature and classification of hazards in Indian context

Unit II: Climatology, Soil and Biogeography

6. Nature, composition and layering of the atmosphere
7. Distribution of pressure belts and planetary wind system, jet streams, and index cycle.
8. Factors of soil formation
9. Evolution of an ideal soil profile
10. Concept of ecosystem — basic ecological principles, ecotone, communities, niche, succession, and habitat.
11. Concept of Biomes: study of Tropical rainforest, Taiga, Savannah, Desert, Tundra and Temperate grasslands

Reading List

BOOKS

Coch, N.K. 1994. Geohazards: Natural and Human, Pearson College.
Conserva H. T., 2004: Illustrated Dictionary of Physical Geography, Author House, USA.
Critchfield, H.J., 1983: General Climatology. Prentice Hall India Ltd. (2010 Reprint)
Dash, M.C., 2001. Fundamentals of Ecology, 2nd edition, Tata McGraw-Hill, New Delhi.
Franzmeier, D.P., McFee, W.W., Graveel, J.G., Kohnke, H., 2016: Soil Science Simplified, 5th ed, Waveland Press.
Gabler R. E., Petersen J. F. and Trapasso, L. M., 2007: Essentials of Physical Geography (8th Edition), Thompson, Brooks/Cole, USA.
Garrett N., 2000: Advanced Geography, Oxford University Press.
Goudie, A., 1984: The Nature of the Environment: An Advanced Physical Geography, Basil Blackwell Publishers, Oxford.
Hamblin, W. K., 1995: Earth's Dynamic System, Prentice Hall, N.J.
Husain M., 2002: Fundamentals of Physical Geography, Rawat Publications, Jaipur.
Kormondy, E.J. 1996. Concepts of Ecology, 4th edition, Prentice-Hall, India, New Delhi.
Monkhouse, F. J. 2009: Principles of Physical Geography, Platinum Publishers, Kolkata.
Sharma, P.D. 2011. Ecology and Environment, Rastogi Publications. Singer, M., Munns, D.N. 2005. Soils: An Introduction, 6th ed, Pearson.
Strahler A. N. and Strahler A. H., 2008: Modern Physical Geography, John Wiley & Sons, New York.
Weil, R.R., Brady, N.C. 2022. The Nature and Properties of Soils, 15th ed, Pearson Education.

GEOHM02T/ GEOMC02T – Human Geography ✧

5 Credit [75 hours of teaching]

Unit I Scope and Approaches

1. Elements of Human Geography: Nature, scope and recent trends.
2. Approaches to Human Geography; Resource, Locational, Landscape, Environmental

Unit II Social and Population Geography

3. Evolution of human societies: Hunting and food gathering, pastoral nomadism, subsistence farming, industrial society and post-industrial urban society.
4. Human adaptation to environment: Eskimo, Masai and Maori
5. Population distribution, density and growth of world population.
6. Demographic Transition Theory

Unit III Economic and Settlement Geography

7. Sectors of the economy: primary, secondary, tertiary and quaternary, quinary
8. Types of agriculture**:** Intensive subsistence rice farming, Plantation agriculture (Tea)
9. Site, situation, types and patterns of Rural Settlements
10. Classification of Urban Settlements after Census of India.

Reading List

Bose, N.K. 2020. Tribal Life In India, 5th ed (updated by Tripathi, C.B.), National Book Trust. Chandna R.C. 2022. Geography of Population, Part 1: Concepts, Determinants and World Patterns, Kalyani Publishers.

Chandna, R.C. (2010) Population Geography, Kalyani Publisher.

Daniel, P.A. and Hopkinson, M.F. (1989) The Geography of Settlement, Oliver & Boyd, London.

Dorrel, D., Henderson, P. 2018. Introduction to Human Geography. University of Georgia Press. Fouberg, E.H., Nash, A.B., Murphy, A.B., de Blij, H., 2015. Human Geography: People, Place, and Culture, 11th ed, Wiley.

Ghosh, S. (2015) Introduction to settlement geography. Orient Black Swan Private Ltd., Kolkata

Gregory, D., Johnston, R., Pratt, G., Watts, K., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley-Blackwell.

Johnston R; Gregory D, Pratt G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication.

Jordan-Bychkov et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.

Knox, P.L., Marston, S.A. 2014. Human Geography, Places and Regions in Global Context, 6th ed, Pearson Education.

Majumdar, P.K. 2013. India's Demography: Changing Demographic Scenario in India, Rawat Publications.

Mercier, M., Norton, W. 2019. Human Geography, 10th ed, Oxford University Press.

Paul, C., Crang, P., Goodwine, M.G. 2014, Introducing Human Geographies, 3rd ed, Routledge. Rubenstein J.M., 2018, Contemporary Human Geography, 4th ed, Pearson.

Short, R.J. 2017. Human Geography: A Short Introduction, 2nd ed, Oxford University Press. Sing, R.Y. 2009, A Geography of Settlements, Rawat Publications

GEOHM03T/ GEOMC03T – General Cartography ✧

3 Credits [45 hours of teaching]

Cartographic Techniques

1. Concept of map scale: Types and Application. Reading distances on a map.
2. Map Projections: Criteria for choice of projections. Attributes and properties of: Zenithal Gnomonic Polar Case, Zenithal Stereographic Polar Case, Cylindrical Equal Area, Mercator's Projection, Bonne's Projection. Concept of UTM projection
3. Survey of India topographical maps: Reference scheme of old and open series. Information on the margin of maps.
4. Representation of Data – Symbols, Dots, Choropleth, Isopleth and Flow Diagrams, Interpretation of Thematic Maps.

Reading List

Dent B. D., 1999: *Cartography: Thematic Map Design*, (Vol. 1), McGraw Hill.

Gupta K. K and Tyagi V. C., 1992: *Working with Maps*, Survey of India, DST, New Delhi.

Mishra R. P. and Ramesh A., 1989: *Fundamentals of Cartography*, Concept Publishing.

Robinson A., 1953: *Elements of Cartography*, John Wiley.

Sharma J. P., 2010: *Prayogic Bhugol*, Rastogi Publishers.

Singh R. L. and Singh R. P. B., 1999: *Elements of Practical Geography*, Kalyani Publishers

Singh R. L., 1998: *Prayogic Bhoogol Rooprekha*, Kalyani Publications.

Steers J. A., 1965: *An Introduction to the Study of Map Projections*, University of London.

GEOHM03P/ GEOMC03P – General Cartography (Lab)✧

2 Credits [60 hours of teaching]

Cartographic Techniques

1. Graphical construction of scales: Plain and comparative. [10]
2. Construction of projections: Zenithal Gnomonic Polar Case, Zenithal Stereographic Polar Case, Cylindrical Equal Area, Mercator's Projection, Bonne's Projection. [30]
3. Construction and interpretation of relief profiles from Survey of India topographical map — superimposed, projected and composite, relative relief map, slope map (Wentworth), and Correlation between physical and cultural features from Survey of India topographical maps using transect chart.

GEOMC04T – Environmental Geography ✧

5 Credits [75 hours of teaching]

Concepts

1. Environmental Geography: Concepts and Approaches;
2. Human-Environment Relationship in equatorial, desert, mountain and coastal regions
3. Concept of holistic environment and system approach
4. Ecosystem: Concept, structure and functions

Environmental problems and policies

5. Environmental Problems and Management: Air Pollution; Water pollution Biodiversity Loss; Solid and Liquid Waste.
6. Environmental problems and management: Desertification and soil erosion
7. Environmental Programmes and Policies: Developed Countries; Developing Countries.
8. New Environmental Policy of India.

Reading List

Casper J.K. (2010) Changing Ecosystems: Effects of Global Warming. Infobase Pub. New York.

Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.

Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.

Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.

UNEP (2007) Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme. University Press, Cambridge.

Wright R. T. and Boorse, D. F. (2010) Toward a Sustainable Future, PHI Learning Pvt Ltd, New Delhi.

Singh, R.B. and Hietala, R. (Eds.) (2014) Livelihood security in Northwestern Himalaya:

Case studies from changing socio-economic environments in Himachal Pradesh, India. Advances in Geographical and Environmental Studies, Springer

GEOMC05T – Soil and Biogeography

5 Credits [90 hours of teaching]

Unit I: Soil Geography

1. Factors or soil formation.
2. Soil profile. Origin and profile characteristics of Lateritic and Chernozem soils
3. Definition and significance of soil properties: Texture, structure and moisture, pH and organic matter
4. Principles of soil classification: Genetic and USDA. Concept of land capability and its classification.

Unit II: Biogeography

5. Concepts of biosphere, ecosystem, biome, ecotone, community, niche and succession.
6. Concepts of food chain and food web. Energy flow in ecosystems
7. Geographical extent and characteristic features of: Tropical rain forest and Grassland biomes
8. Bio-geochemical cycles with special reference to carbon dioxide and nitrogen.

Reading List

Biswas, T.D. and Mukherjee, S.K. 1997: Textbook of Soil Science, TataMcGraw Hill,

Brady, N.C. and Weil, R.R. 1996. The Nature and Properties of Soil, 11th edition, Longman, London :

Chapman J.L. and Reiss, M.J. 1993. Ecology: Principle and Applications, Cambridge University Press, Cambridge:

Dash, M.C., 2001. Fundamental of Ecology, 2nd edition, Tata McGrawHill, New Delhi

Huggett, R. 1998. Fundamentals of Biogeography, Routledge, London:

Kormondy, E.J. 1996. Concept of Ecology, 4th edition, Prentice- Hall, India, New Delhi

Myers, A. A. and Giller, P.S. (editors) 1988. Analytical Biogeography: an Integrated Approach to the Study of Animal and Plant Distribution. Chapman and Hall, London

GEOMC06T – Regional Development

5 Credits [90 hours of teaching]

Concepts of Regions and Regional Planning

1. Definition of Region. Types and Need of Regional planning:
2. Choice of a Region for Planning: Characteristics of an Ideal Planning Region; Delineation of Planning Region
3. Regionalization of India for Planning (Agro Ecological Zones)
4. Strategies/Models for Regional Planning: Growth Pole Model of Perroux; Growth Centre Model in Indian Context.
5. Problem Regions and Regional Planning: Backward Regions and Special Area Development Plans in India.

Regional Development

6. Changing concept of development and underdevelopment;
7. Indicators of development: Economic, social and environmental. Concept of human development
8. Development and regional disparities in India since Independence: Disparities in agricultural development andindustrial development
9. Development and regional disparities in India since independence : Disparities in human resource development in terms of education and health

Reading List

BOOKS

Adell, Germán (1999) Literature Review: Theories and Models Of The Peri-Urban Interface: A Changing Conceptual Landscape, Peri-urban Research Project Team, Development Planning Unit, University College London at

Agriculture Organization of the United Nations (FAO) at

Bhatt, L.S. (1976) Micro Level Planning in India. KB Publication, Delhi

Deshpande C. D., 1992: *India: A Regional Interpretation*, ICSSR, New Delhi.

Dreze J. and A. Sen, Indian Development: Select Regional Perspectives (Oxford: Oxford Heritage Publishers.

Rapley, John (2007) Understanding Development: Theory and Practice in the 3rd World. Lynne Raza, M., Ed. (1988). Regional Development. Contributions to Indian Geography. New Delhi,

Rienner, London.

Schmidt-Kallert, Einhard (2005) A Short Introduction to Micro-Regional Planning, Food and

Sdyasuk Galina and P Sengupta (1967): *Economic Regionalisation of India*, Census of India

Sen, Amratya (2000) Development as Freedom. Random House, Toronto University Press, 1996).

Special Minor Course for Honours Programme of Other Disciplines offered by Geography (GEOHSM)

GEOHSM01P – Project Report based on Field Work

5 Credits [150 hours of teaching]

Project work is compulsory for completing B.A/ B.Sc 3 Year Multi-Disciplinary Course in Geography. Project Work is intended to provide an opportunity to the candidate to field test the learning.

The Project report should be based on field work on some specified topics as suggested by the Department.

Each student will prepare an individual report based on primary and secondary data collected during field work.

The duration of the field work should not exceed 10 days.

The word count of the report should be about **8000** excluding figures, tables, photographs, maps, references and appendices.

The report should include an introduction, literature review, project aims and objectives, methodology, results and discussion and references.

It should not exceed 20 to 25 pages (A4 pages) including maps, diagrams, and photographs etc.

One copy of the report on A 4 size paper should be submitted prior to examination.

Skill Enhancement Courses offered by Geography

(For both Major, Honours and 3 Years Multi-Disciplinary Programmes)

GEOSE-01M – Remote Sensing✧

3 Credits [45 hours of teaching]

1. Principles of Remote Sensing (RS): Classification of RS satellites and sensors
2. Sensor resolutions and their applications with reference to IRS and Landsat missions, image referencing schemes and data acquisition.
3. Preparation of False Colour Composites from IRS LISS-3 and Landsat TM and OLI data. Principles of image rectification and enhancement.
4. Principles of image interpretation and feature extraction. Preparation of inventories of land use land cover features from satellite images.

A project file consisting of four exercises on the above themes is to be submitted

Reading List

Bhatta, B. 2011. Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others, CRC Press.

Jensen, J.R., 2013. Remote Sensing of the Environment: An Earth Resource Perspective, Pearson Education India.

Joseph, G. and Jegannathan, C. 2018. Fundamentals of Remote Sensing, 3rd ed, Universities Press.

Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 7th ed, Wiley.

WEBSITES:

International Society for Photogrammetry and Remote Sensing: www.isprs.org

NASA Landsat Science: www.landsat.gsfc.nasa.gov

National Remote Sensing Centre: www.nrsc.gov.in

USGS Global Visualization Viewer: www.glovis.usgs.gov

GEOSE-02M – Advanced Spatial Statistical Techniques ✧

3 Credits [45 hours of teaching]

1. Probability theory, probability density functions with respect to Normal, Binomial and Poisson distributions and their geographical applications.
2. Sampling: Sampling plans for spatial and non-spatial data, sampling distributions. Sampling estimates for large and small samples tests involving means and proportions.
3. Correlation and Regression Analysis: Rank order correlation and product moment correlation; linear regression, residuals from regression, and simple curvilinear regression. Introduction to multi-variate analysis.
4. Time Series Analysis: Time Series processes; Smoothing time series; Time series components.

Any statistical Software Package (e.g., SPSS, MS Excel, R, etc.) may be used for practice. A project file consisting of four exercises on the above themes is to be submitted.

Reading List

Acevedo, M.F. 2012. Data Analysis and Statistics for Geography, Environmental Science and Engineering, CRC Press.

Harris, R., Jarvis, C. 2011. Statistics for Geography and Environmental Science, Prentice Hall.

McGrew Jr., J.C., Lembo Jr., A.J.,Monroe, C.B. 2014. An Introduction to Statistical Problem Solving in Geography, 3rd ed, Waveland Press.

Pal S. K., 1998. Sstatistics for Geoscientists: Techniques and Applications, Concept Pub Co.

Rogerson, P.A. 2015. Statistical Methods for Geography: A Student's Guide, 4th ed, Sage.

GEOSE-03M –Research Methodology✧

3 Credits [45 hours of teaching]

Unit I: Research Methodology

1. Defining research problem, objectives and hypothesis.
2. Literature review and formulation of research design
3. Research materials and methods
4. Techniques of writing scientific reports: Preparing notes, references, bibliography, abstract and keywords
5. Plagiarism: Classification and prevention

Unit II: Field Methodology

6. Fieldwork in Geographical studies: Role and significance. Selection of study area and objectives. Pre-field academic preparations. Ethics of fieldwork
7. Field techniques and tools: Observation (participant, non-participant), questionnaires (open, closed, structured, non-structured). Interview
8. Field techniques and tools: Landscape survey using transects and quadrants, constructing a sketch, photo and video recording.
9. Positioning and collection of samples. Preparation of inventory from field data.
10. Post-field tabulation, processing and analysis of quantitative and qualitative data
11. Fieldwork: Logistics and handling of emergencies.

An A4-size laboratory notebook, comprising class assignments on a) Preparation of questionnaire schedule for assessment of development and for perception survey, b) A book/ article review within 1000 words (any book/ article related to topics covered during the previous semesters).

Reading List

Clifford, N., Cope, M., Gillespie, T.W., French, S. (Eds) 2016. Key Methods in Geography, 3rd ed, Sage.

Gomes, B., Jones III, J.P. (Eds) 2010. Research Methods in Geography: A Critical Introduction, Wiley-Blackwell.

Lenon, B., Cleves, P. 2015. Geography Fieldwork and Skills, Harper-Collins.

Montello , D.R, Sutton, P. 2012. An Introduction to Scientific Research Methods in Geography and Environmental Studies, 2nd ed, Sage.

Murthy , K.LN. 2004. Research Methodology in Geography: A Text Book, Concept Publishing Co.

Northey, N., Draper, D., Knight, D.B. 2015. Making Sense in Geography and Environmental Sciences: A Student's Guide to Research and Writing, 6th ed, Oxford University Press.

Parsons, T., Knight, P.G. 2015. How To Do Your Dissertation in Geography and Related Disciplines, 3rd ed, Routledge.

Phillips, R., Johns, J. 2012. Fieldwork for Human Geography, Sage.

Riordan, D. 2013. Technical Report Writing Today, 10th ed, Wadsworth Publishing.

Thornbush, M.J., Allen, C.D., Fitzpatrick, F.A. (Eds) 2014. Geomorphological Fieldwork, Elsevier.

Multi-Disciplinary Course Offered by Geography

3 Credits [45 hours of teaching]

GEOMD-01M — Geomatics and Spatial Analysis

Unit I: Cartography

1. Concept and applications of scales and projections. Components and classification ofmaps
2. Map projections: Classification, properties and uses with special reference to simpleconical projection and Universal Transverse Mercator (UTM)
3. Construction of simple conical projection with one standard parallel

Unit II: Surveying

4. Basic concepts of surveying, survey equipment, and their capabilities: Dumpy level,theodolite, total station, and Global Navigation Satellite System (GNSS)
5. Bearing: Magnetic and true, whole-circle and reduced. Concept of geoid and spheroidwith special reference to WGS-84.
6. Traverse survey and plotting UTM coordinates using smartphone GNSS application

Unit III: Remote Sensing

7. Principles of remote sensing (RS). Types of RS satellites and sensors with reference to IRS and Landsat missions
8. Principles of • preparing standard false colour composites (FCCs) and • supervised image classification
9. GIS data types: Spatial and non-spatial (attribute table and metadata), raster and vector
10. Principles of preparing attribute tables, data manipulation, query, and overlay
11. Identification of land use / land cover features from standard FCCs and preparation of inventories
12. Change detection of riverbank or coastline shift from multi-dated maps and images

Reading List

BOOKS:

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Bhatta, B. 2011. Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others, CRC Press.

Bhatta, B. 2020. Remote Sensing and GIS, 3rd ed, Oxford University Press.

Bolstad, P. 2016. GIS Fundamentals: A First Text on Geographic Information Systems, 5th ed, XanEduPublishing.

Joseph, G., Jagannathan, C. 2018. Fundamentals of Remote Sensing, 3rd ed, Orient Blackswan.

Kennedy, M., Kopp, S. 2001. Understanding Map Projections, Esri Press.

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. Map Use: Reading, Analysis,Interpretation, 7th ed, Esri Press.

Lillesand, T.M., Kiefer, R.W., Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 7th ed,Wiley.

Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rded

Robinson, A.H., Morrison, J.L., Phillip, C.M., Kimerling, A.J., Guptill, S.C. 1995. Elements of Cartography, 6th ed, Wiley.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers.

WEBSITES

ISRO Bhuvan 2D and 3D Platforms:
https://bhuvan-app1.nrsc.gov.in/bhuvan2d/bhuvan/bhuvan2d.php https://bhuvan-app1.nrsc.gov.in/globe/3d.php

National Remote Sensing Centre: www.nrsc.gov.in; Survey of India: https://www.surveyofindia.gov.in

USGS Global Visualization Viewer: https://glovis.usgs.gov; USGS Landsat Missions: https://www.usgs.gov/landsat-missions

Multi-Disciplinary Course Offered by Geography

3 Credits [45 hours of teaching]

GEOHMD101M — Geomatics and Spatial Analysis

Unit I: Cartography

1. Concept and applications of scales and projections. Components and classification ofmaps
2. Map projections: Classification, properties and uses with special reference to simpleconical projection and Universal Transverse Mercator (UTM)
3. Construction of simple conical projection with one standard parallel

Unit II: Surveying

4. Basic concepts of surveying, survey equipment, and their capabilities: Dumpy level,theodolite, total station, and Global Navigation Satellite System (GNSS)
5. Bearing: Magnetic and true, whole-circle and reduced. Concept of geoid and spheroidwith special reference to WGS-84.
6. Traverse survey and plotting UTM coordinates using smartphone GNSS application

Unit III: Remote Sensing

7. Principles of remote sensing (RS). Types of RS satellites and sensors with reference to IRS and Landsat missions
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9. GIS data types: Spatial and non-spatial (attribute table and metadata), raster and vector
10. Principles of preparing attribute tables, data manipulation, query, and overlay
11. Identification of land use / land cover features from standard FCCs and preparation of inventories
12. Change detection of riverbank or coastline shift from multi-dated maps and images

Reading List

BOOKS:

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Bhatta, B. 2011. Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others, CRC Press.

Bhatta, B. 2020. Remote Sensing and GIS, 3rd ed, Oxford University Press.

Bolstad, P. 2016. GIS Fundamentals: A First Text on Geographic Information Systems, 5th ed, XanEduPublishing.

Joseph, G., Jagannathan, C. 2018. Fundamentals of Remote Sensing, 3rd ed, Orient Blackswan.

Kennedy, M., Kopp, S. 2001. Understanding Map Projections, Esri Press.

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. Map Use: Reading, Analysis,Interpretation, 7th ed, Esri Press.

Lillesand, T.M., Kiefer, R.W., Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 7th ed,Wiley.

Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rded

Robinson, A.H., Morrison, J.L., Phillip, C.M., Kimerling, A.J., Guptill, S.C. 1995. Elements of Cartography, 6th ed, Wiley.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers.

WEBSITES

ISRO Bhuvan 2D and 3D Platforms:
https://bhuvan-app1.nrsc.gov.in/bhuvan2d/bhuvan/bhuvan2d.php https://bhuvan-app1.nrsc.gov.in/globe/3d.php

National Remote Sensing Centre: www.nrsc.gov.in; Survey of India: https://www.surveyofindia.gov.in

USGS Global Visualization Viewer: https://glovis.usgs.gov; USGS Landsat Missions: https://www.usgs.gov/landsat-missions