

# CENTRAL UNIVERSITY OF KARNATAKA

Curriculum for

## **MSc Applied Geography and Geoinformatics**

Based on Learning Outcomes based Curriculum Framework (LOCF)

*Revised in April, 2021, effective from 2021AY*

Department of Geography School of Earth Sciences Central University of Karnataka  
Kalaburagi, Karnataka Department of Geography MSc in Applied Geography and  
Geoinformatics Syllabus

Learning Outcomes based Curriculum Framework (LOCF)

### **Part A: About MSc in Applied Geography and Geoinformatics Programme**

#### **I. Preamble:**

One of the significant reforms in the undergraduate education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve.

Geography is the study of the Earth – Human interaction in all its complex and inter-connected forms. It embraces the entire spectrum of knowledge from pure science to social sciences to Humanities. In this context the Central University of Karnataka introduced MSc (Applied Geography and Geoinformatics) course in Geography to reduce the disparity between the need and availability of competent professionals to cater the requirements of our nation. This programme is basically an academic programme which focuses on preparing the students for research, as well as, for application of Geographical knowledge in various field settings.

## **II. Vision Statement:**

To emerge as a centre of excellence in the field of Geography in teaching, learning, research, training, practicing and producing human resources of very high standard.

Geography is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them.

## **III. Mission Statements:**

**MS1.** To produce human resources of greater competence and employable skills in Geography at all levels of programmes

**MS 2.** To contribute to the existing knowledge bank in geographical sciences with an integrated and interdisciplinary approach.

**MS 3.** To collaborate with the premier institutions in India and abroad in order to achieve excellence in both teaching and research

**MS 4.** To develop in-depth knowledge and skills in qualitative and quantitative research methods through laboratory, field and web modes of learning.

## **IV. Qualification Descriptors (QDs)**

Once Master program in M.Sc. in Applied Geography and Geoinformatics is completed, the students will be able to

**QD1:** Demonstrate comprehensive knowledge in areas of Geography, and its various field of applications.

**QD2:** Use tools, equipment and techniques required for collecting field data and to analyse them for scientific results.

**QD3:** To obtain the exposure to understand the emerging concepts of the earth system sciences and to do high level of research with leading theoretical and laboratory techniques which are essential to subsidize to acquaintance in research field.

**QD4:** Acquire knowledge and skills to solve the applied aspects of geographical sciences.

**QD5:** Should be able to proficiently communicate geographical concept, ideas and research.

## Mapping Qualification Descriptors (QDs) with Mission Statements (MS)

	MS-1	MS-2	MS-3	MS-4
<b>QD:1</b>	3	2	2	1
<b>QD:2</b>	2	3	1	2
<b>QD:3</b>	3	2	3	1
<b>QD:4</b>	3	2	2	3
<b>QD:5</b>	3	2	3	2

Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Lowlevel' mapping.

### M.Sc. in Applied Geography and Geoinformatics

#### V. Program Learning Outcomes (PLOs)

After completion of this academic program, the students will be able to

**PLO-1:** Demonstrate the ability to identify the geographical features in the field.

**PLO-2:** To develop skills of analysis, collective thinking and synthesis the data through geoscientific method.

**PLO-3:** To solve the geologic problems using the available or collected data from all disciplines of Geography.

**PLO-4:** To comprehend the relation between society and Earth.

**PLO-5:** To become a perfect Geoscientist and able to carry out research as an individual or as team.

**PLO-6:** Demonstrate the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, appreciate environmental and sustainability issues, and adopt objective, unbiased and truthful actions in all aspects of work.

**PLO-7:** Demonstrate the ability to acquire knowledge and skills necessary for learning throughout life, through self-paced and self-directed learning aimed at personal development and meeting the changing trades and demands of work place.

#### Mapping of Program Learning Outcomes (PLOs) with Qualification Descriptors (QDs)

	QD-1	QD-2	QD-3	QD-4	QD-5
<b>PLO-1</b>	3	2	3	3	1
<b>PLO-2</b>	3	2	3	3	3

<b>PLO-3</b>	2	3	1	2	2
<b>PLO-4</b>	2	3	2	3	3
<b>PLO-5</b>	1	2	1	2	3
<b>PLO-6</b>	2	3	2	3	3
<b>PLO-7</b>	2	3	2	3	3

Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Lowlevel' mapping.

## **VI. Other Information**

1. **Name of the Course:** M.Sc. Applied Geography and Geoinformatics (Department of Geography; under School of Earth Sciences)
2. **Duration of the Course:** Two years (Four semesters)
3. **Eligibility and Attendance:** As per University rules.
4. **Intake:** As per University norms
5. **Medium of Instruction and examination:** English
6. **Miscellaneous:** All other matters not referred to specifically shall be governed as per the Ordinances of the University as revised from time to time.
7. **Course structure and credit allocation:** Each credit denotes 1hour for theory and twohours for practicum. Total credits of the programme: 86

**Part B. SCHEME OF STUDY**

**M.SC in Applied Geography and Geo-informatics (2017 onwards)  
(IMSc 7<sup>th</sup> – 10<sup>th</sup> semesters)**

Course Type	Course Code	Course Code (IMSc continue)	Course title	Credits				Assessment	
				L	T	P	Total	IA	ES
<b>SEMESTER-I</b>									
Core Course	CC-01/ PAGTC10001	IGETC70020	Geomorphology	3	1	0	4	40	60
Core Course	CC-02 / PAGTC10002	IGETC70021	Basics of GIS and GNSS	3	1	0	4	40	60
Core Practical	CP-01/ PAGPC10003	IGEPC70022	Practical GIS and GNSS	0	0	2	2	20	30
Core Practical	CP-02 / PAGPC10004	IGEPC70023	Practical Basics of Remote Sensing and Photogrammetry	0	0	2	2	20	30
AECC**	AECC-01 / PAGTA10101	IGETA70105	Principles of Remote sensing	2	1	0	3	30	45
SEC**	SEC-01 / PAGTA10102	IGETA70106	Modern Geographical Thought	2	1	0	3	30	45
GE**	GE-01 / PAGTG10301	IGETG70313	Basics of Geo-informatics	2	1	0	3	30	45
	PAGTG10302	IGETG70314	Disaster Management						
	PAGTG10303	IGETG70315	Sustainable Development						
<b>Total</b>							<b>21</b>	<b>525</b>	
<b>SEMESTER-II</b>									
Core Course	CC-03/ PAGTC20005	IGETC80024	Human Geography	3	1	0	4	40	60
Core Course	CC-04 / PAGTC20006	IGETC80025	Climatology and Oceanography	3	1	0	4	40	60
Core Practical	CP-03 / PAGPC20007	IGEPC80026	Advanced Spatial Analysis	0	0	2	2	20	30
Core Practical	CP-04 / PAGPC20008	IGEPC80027	Digital Image Analysis	0	0	2	2	20	30
AECC**	AECC-02 / PAGTA20103	IGETA80107	Digital Image Processing	3	0	0	3	30	45
SEC **	SEC-02 / PAGTA20104	IGETA80108	Spatial analysis	2	1	0	3	30	45
DSE	DSE -01 / PAGPD20201	IGEPD80207	Basic computer programming	0	0	2	2	20	30
GE**	GE-02 / PAGTG20304	IGETG80316	Applications of Geo-informatics	2	1	0	3	30	45
	PAGTG20305	IGETG80317	Regional Planning and Development						
<b>Total</b>							<b>23</b>	<b>575</b>	

			SEMESTER-III						
Core Course	CC-05 / PAGTC30009	IGETC90028	Regional Planning and Development	3	1	0	4	40	60
Core Course	CC-06 / PAGTC30010	IGETC90029	Geoinformatics Application in Natural Resource Management	3	1	0	4	40	60
Core Course	CC-07 / PAGTC30011	IGETC90030	Geoinformatics Application in Disaster, Urban and Agricultural Studies	3	1	0	4	40	60
Core Practical	CP-05 / PAGPC30012	IGEPC90031	Surveying and Cartography	0	0	2	2	20	30
Core Practical	CP-06 / PAGPC30013	IGEPC90032	Advanced RS and GIS techniques	0	0	2	2	20	30
Core Practical	CP-07 / PAGPC30014	IGEPC90033	Quantitative Techniques in Geography	0	0	2	2	20	30
SEC **	SEC-03 / PAGFA30105	IGEFA90109	Research Methods	2	1	0	3	30	45
			<b>Total</b>				<b>21</b>	<b>525</b>	
SEMESTER-IV (INTERNSHIP) PAGIC40015 / (IMSc Continue code - IGEICX0034)									
The student has to spend about 12 weeks (four months) in any government / non-government institution / organization so as to gain hands-on skill and training in a field of study as decided by the internal guide in consultation with the external guide.  At the end of this period, the student will submit a dissertation which will be graded for 500 marks.									
Dissertation	280 Marks	<b>Total</b>						<b>20</b>	500
Weekly Report	120 Marks								
Presentation	100 Marks								
<b>Grand total of credits</b>							<b>85</b>		2125

\*\* AECC: Ability Enhancement Compulsory Course  
Elective

\*\*SEC: Skills Enhancement course

DSE: Discipline Specific

GE: Generic Elec

## Semester I

### CC- 01 Principles of Geomorphology

#### Unit I:

Fundamental concepts of geomorphology; Theories of origin of earth; Internal structure of the earth Isostasy – Theories of Isostasy by G. Airy, Pratt and Joly; Global isostatic adjustment

#### Unit II:

Continental drift theory; Plate tectonics, Palaeomagnetism and Sea floor spreading; Earth's movements – Endogenetic and exogenetic forces; Folds; Faults; Rift valley; Vulcanicity and Volcanoes – Types of volcanoes; World distribution; Topography by vulcanicity; Earthquakes

#### Unit III :

Rocks; Weathering and Mass movement; Structural geomorphology – Topographic expressions of uniclinal structure, fault structure, folded structure; Inversion of relief; Drainage system and pattern.

#### Unit IV:

Cycle of erosion- Geographical cycle of erosion by Davis; Penk's model of cycle of erosion; Rejuvenation; Poly cyclic reliefs; Cycle of Pediplanation by L.C King; Dynamic Equilibrium theory by J T Hack

#### Unit V

Fluvial process and landforms; Delta; Karst topography; Marine process and landforms ; Aeolian process and landforms; Fluvial desert landforms; Glacial processes and landforms Periglacial processes and landforms

#### References:

1. Thornbury, W. D. (1960): Principles of Geomorphology, John Wiley and Sons, New York
2. Chorley, R. J., Schumm, S. A. and Sugden, D. E. (1984): Geomorphology, Methuen, London.
3. Ollier, C (1981): Tectonics and Landforms, Longman Group Ltd.
4. Sparks, B.W (1972): Geomorphology, Longman Group Ltd.
5. Strahler, A.H and Strahler A.N (1992): Modern Physical Geography, John Wiley and Sons (Asia) Pvt. Ltd.
6. Steers, J.A (1937): The Unstable Earth, Methuen and Co. Ltd. London
7. Kale, V. S. and Gupta, A. (2001): Introduction to Geomorphology, Orient Longman, Calcutta.
8. Savindra Singh (2002): Geomorphology, Prayag Pustak Bhawan, Allahabad
9. Bloom, A. L. (2002). Geomorphology: A systematic analysis of late Cenozoic landforms. Prentice-Hall of India, New Delhi
10. Goudie, A. S. (2004) (Eds.). Encyclopedia of Geomorphology. Routledge, London.

### CC-02 Basics of GIS and GNSS

#### Unit I

Basics of Computer: Hardware, Software, Input Device, Output Device, Computer Language. Introduction to GIS: Definitions of GIS, Components of GIS. Spatial Data - Characteristics and Representation. Spatial Data Models - Raster and Vector, Data Structure. Overview of GIS Software.

#### Unit II

Data in GIS: Sources of GIS Data. Data Quality: Accuracy, Precision, Error and Uncertainty. Sources and Types of Errors in GIS Data, Components of GIS Data Quality, Spatial Data Standards. Concept of Arc, Node, Vertices and Topology.

### Unit III

Database Structure and Types: Hierarchical, Network, Relational and Object Oriented DBMS, SQL. GIS Database: File Geo-Database, Personal Geo-Database, ArcSDE, and Data Access. Methods of Storing Vector and Raster Data: Block Code, Run-Length Encoding, Chain Coding, Quadtree.

### Unit IV

Errors: Types of Error, Sources of Errors, Edit and Correction of Errors, Topology Building. Basic Spatial Analysis: Buffer, Overlay, Point and Line Density. GIS Project Design: Frame The Question, Explore and Prepare Data, Choose Analysis Methods and Tools, Perform The Analysis and Examine and Refine Results.

### Unit V

Basics of GNSS: Introducing Global Navigation Satellite System: GNSS Components, Satellite Orbit, Satellite Position On Orbital Plane, Signals, Reference System and Observation Techniques.

#### Reference:

1. Peter A. Burrough and Rachael A. McDonnell, 2011, Principles of Geographic Information Systems, Oxford University Press.
2. Ian Heywood, Sarah Cornelius and Steve Carver, An Introduction to Geographic Information System, 2010, third edition, Pearson Education Ltd.
3. David O' Sullivan and David J. Unwin, 2010, Geographic Information analysis, second edition, John Wiley & Sons.
4. Paul a. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, 2011, Geographic Information Systems and Science, third edition, John Wiley & Sons.
5. John R. Jenson and Ryan R. Jensen, 2013, Introductory Geographic Information system, Pearson Education.
6. C.P Lo and Albert K.W.Yeung, 2006, Concepts and Techniques of Geographic Information System, Prentice Hall India.
7. <https://www.princeton.edu/~alaink/Orf467F07/GNSS.pdf>
8. N.K. Agarwal, Essentials of GPS.

## CP-01 Practical GIS and GNSS

Ex. no.	No.of classes	Exercises
1	3	Collection of Spatial and Non-Spatial Data for GIS Exercise.
2	4	Georeferencing (using GCP, Image to Image), RMSE, Projection and Transformation.
3	3	Creation of Shape file, Personal Geodatabase and File Geodatabase.
4	6	Creation of Point, Line and Polygon.
5	3	Correction of Topology, Error Identification and Correction.



6	5	Data Conversion: Raster to Vector, Vector to Raster, Line to Polygon, Polygon to Line and Polygon to Point.
7	5	Creation of Attribute Data: Manual Entering, Join and Relate Table, Preparation of Charts Using Attribute Table.
8	5	Vector Based Queries: Spatial, Attribute and Graphic Queries.
9	5	Preparation of Thematic Map: Dot Density Map, Choropleth Map, Location Chart Map, Proportional Symbol Map.
10	5	Proximity Analysis: Buffer (Single Ring, Multiple Ring, Variable Buffer) and Thiessen Polygon.
11	5	Preparation of Final Layout and Export.
12	5	GPS Survey: Collection of POIs, Tracks and Polygons.
13	4	Preparation of Database in GIS using GPS Data.
14	6	Land Survey Using Total Station.
<b>Total Classes = 60</b>		

### **CP-02 Basics of Image Processing and Photogrammetry**

Ex. no.	No. of classes	Exercises
1	4	Indexing of aerial photographs.
2	4	Introduction to vertical aerial photographs and its geometry
3	8	Introduction to stereoscopes i) Orientation & construction of 3-D model under Pocket stereoscope. ii) Orientation & construction of 3-D model under Mirror stereoscope.
4	10	Determination of scale i) By establishing relationship between Photo distance and Ground distance ii) By establishing relationship between Photo distance and Map distance iii) By establishing relationship between Focal length and Flying height iv) Determination of Average Scale of Vertical Aerial Photograph
5	8	Relief Displacement i) Calculation of Relief Displacement ii) Object height determination from relief Displacement
6	8	Parallax

		i) Introduction to Parallax bar ii) Object height determination from Parallax
7	4	Calculation of Photo coverage Area
8	6	Visual Interpretation and Mapping of Aerial photographs
09	4	Annotations of Satellite image
10	8	Visual and Digital interpretation of satellite image
11	8	Land use and Land cover mapping

**Total Classes = 72**

## **AECC-01 Principles of Remote sensing**

### **Unit I:**

Introduction to Remote Sensing: Concepts Definition, Components, History Development, Electro Magnetic Radiation, Electro Magnetic Spectrum, Theories of EMR: Wave and Particle Theory. Types of Remote Sensing: Based on Energy source and Electro Magnetic Spectrum.

### **Unit II:**

Energy Interaction with Earth's atmosphere: Scattering: Rayleigh, Mie and Non selective; Absorption, and Refraction, Atmospheric Windows

Energy Interaction with Earth Surface: Reflection, Absorption Transmission,

Spectral Signature: Interaction with soil, water and vegetation and other features.

### **Unit III:**

Platforms, Sensors, Orbits: Types of platform: Ground Based, Airborne and Space borne Types of sensors: Active and Passive, Resolution and its types: Spatial, Spectral, Radiometric and Temporal, False color composite, Elements of Visual Image Interpretation,

### **Unit IV:**

Aerial photography: Introduction to aerial photography and basic photogrammetry

### **Unit V:**

Data products: Satellite Data Products: Landsat, MODIS, IRS, CartoSat, Spot and others Products

### **References:**

1. Joseph, G. (2004): Fundamentals of Remote Sensing, Universities Press, Hyderabad, India
2. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi
3. Sabins, F. F. (1996): Remote Sensing: Principles and Interpretation, W. H. Freeman and Company, San Francisco
4. Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey
5. Drury, S. A. (2001): Image Interpretation in Geology, Blackwell, Oxford
6. Campbell, J. (2002): Introduction to Remote Sensing, Taylor & Francis, London

7. Anji Reddy, M. (2008): Textbook of Remote Sensing and Geographic Information System, B.S. Publication, Hyderabad

## **SEC – 01 Modern Geographical Thought**

### **Unit I**

Geography, Philosophy and Social Theory; Idea, Concept and theory; Ontology, Epistemology; Reflexivity; Constructivist approach, Realism

### **Unit II**

Paradigms in Science: Objectivity and Subjectivity; Existentialism, Phenomenology, and Humanistic Geography

### **Unit III**

Radical Geography, Marxism; Structuralist approach, structuralism; Colonialism; Locality Studies: concept of Space, place, time and location

### **Unit IV**

Post colonialism; Post structuralism, Post-Marxism; post modernism

### **Unit V**

Feminist Theory and the Geography of Gender

### **References**

1. Peet Richard. 2011. Modern Geographical Thought. Rawat Publication.
2. Agnew John A. and David N. Lingstone. 2011. The sage handbook of Geographical Knowledge. Sage publication.
3. Martin Geoffrey J. 2005. All Possible Worlds: A History of Geographical Ideas. Oxford University Press.

## **GE-01 A. Basics of Geo-informatics**

### **Unit I**

Introduction to Remote Sensing: Characteristics of electromagnetic radiation (EMR), EMR spectrum, blackbody, radiation laws, Interaction of EMR with atmosphere and Earth's surface, reflection, absorption, transmission, scattering and refraction, Atmospheric windows. Basics of satellite remote sensing: definition, principle, stages and types, Platforms and orbits, Sensors and scanning systems.

### **Unit II**

Introduction to GIS: Definition, development, components, objectives, hardware and software. The basis of GIS mapping: map projections, datum and coordinate systems. Data types and data inputs: spatial data and attributes, data input, scanning, digitization, error corrections and topology. Data models: vector and raster, spatial and non-spatial data models. Data visualization: Types of visualization, map layout design and symbology.

### **Unit III**

GPS: Basics of GNSS: Introducing Global Navigation Satellite System: Satellite orbit, Satellite position on orbital Plane, GNSS Components, Signals, reference system and observation techniques, types of GPS

### **Unit IV**

Applications of GIS, Remote Sensing and GPS, and case studies.

### **References:**

1. Nejel Veziroglu – Remote Sensing: Energy, Related Studies – Hemisphere Publishing Corporation, Washington, 1975.
2. Paul Curran – Principles of Remote Sensing, English Language Book Society, London, 1988.
3. Robert, G.R. (Ed), Manual of Remote Sensing vol.I & II, American Society of Photogrammetry, New York, 1978.
4. Swain & Davis, Remote Sensing; The Quantitative approach, Mc Graw Hill, 1978.
5. Thomas M.Lillesand & Ralph W. Kiefer, Remote Sensing & Image Interpretation, John Wiley & Sons, New York 1987.
6. Deekshatalu B.L. & Rajan Y.S. (Ed) Remote Sensing, Indian Academy of Sciences, 1984
7. Sabins, F. F. (1996): Remote Sensing: Principles and Interpretation, W. H. Freeman and Company, San Francisco
8. Tempfi, K., Kerle, N., Huurneman, G. and Janssen, L. F. ( Eds) (2009): Principles of Remote Sensing – An Introductory Text Book, The International Institute for Geoinformation Science - Netherlands
9. Lillesand, T. M. and Ralph, K. W. (2008): Remote Sensing and Image Interpretation, John Wiley and Sons, Singapore
10. Campbell, J. B. (2002): Introduction to Remote Sensing, Taylor and Francis, London
11. Joseph, G. (2003): Fundamentals of Remote Sensing, University Press, Hyderabad

## **GE-01 B. Sustainable Development**

### **Unit I**

Sustainable Development: Definition, Components, Limitations and Historical Background.  
The Millennium Development Goals: National Strategies and International Experiences  
Sustainable Regional Development: Need and examples from different Ecosystems.

### **Unit II**

Inclusive Development: Education, Health; Climate Change: The role of higher education in sustainable development; The human right to health; Poverty and disease; The Challenges of Universal Health Coverage; Policies and Global Cooperation for Climate Change

### **Unit III**

Sustainable Development Policies and Programmes: The proposal for SDGs at Rio+20; Illustrative SDGs; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance; National Environmental Policy, CDM.

### **References:**

1. Agyeman, Julian, Robert D. Bullard and Bob Evans (Eds.) (2003) Just Sustainabilities: Development in an Unequal World. London: Earthscan. (Introduction and conclusion.)
2. Ayers, Jessica and David Dodman (2010) “Climate change adaptation and development I: the state of the debate”. Progress in Development Studies 10 (2): 161-168.
3. Baker, Susan (2006) Sustainable Development. Milton Park, Abingdon, Oxon; New York, N.Y.: Routledge. (Chapter 2, “The concept of sustainable development”).
4. Brosius, Peter (1997) “Endangered forest, endangered people: Environmentalist representations of indigenous knowledge”, Human Ecology 25: 47-69.
5. Lohman, Larry (2003) “Re-imagining the population debate”. Corner House Briefing 28.
6. Martínez-Alier, Joan et al (2010) “Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm” Ecological Economics 69: 1741-1747.
7. Merchant, Carolyn (Ed.) (1994) Ecology. Atlantic Highlands, N.J: Humanities Press. (Introduction, pp 125.)

8. Osorio, Leonardo et al (2005) “Debates on sustainable development: towards a holistic view of reality”. Environment, Development and Sustainability 7: 501-518.
9. Robbins, Paul (2004) Political Ecology: A Critical Introduction. Blackwell Publishing.
10. Singh, R.B. (Eds.) (2001) Urban Sustainability in the Context of Global Change, Science Pub., Inc., Enfield (NH), USA and Oxford & IBH Pub., New Delhi.

## **GE-01 C. Disaster Management**

### **Unit I**

Introduction & Dimensions of Natural & Anthropogenic Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, Volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

### **Unit II**

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response;

### **Unit III**

Remote-Sensing and GIS applications in real time disaster assessment, RS and GIS tools are applied for preparing models or maps for different disasters, disaster emergency response, Case studies.

### **References**

1. Disaster management and preparedness, [Thomas D. Schneid](#), [Larry Collins](#)
2. Facing the unexpected: disaster preparedness and response in the United States
3. Natural disaster Management, Soumitra Roy, Abhijeet Publications, 2004, ISBN: 8188683469,9788188683468
4. Disaster management, Harsh K Gupta, University press.
5. Disaster mitigations, experiences and reflections, Pradeep Shahni, Eastern Economy edition, Prentice Hall India Pvt. Ltd, ISBN 81-203-1914-1
6. Encyclopedia of Diasters:Terrorist, natural and man made, Michael. L, Green Berg, MD.MPH, Johnes and Barlett Publication, ISBN:13-978-07637-37825
7. Geospatialtechnologies in environment management, Nancy Holst-Pullen, Mark W. Patterson (Eds.), Springer, ISBN:978-90-481-9524-4, EISBN: 978-90481-9525-1

## Semester - II

### CC-03 Human Geography

#### Unit I

Introduction to Human Geography-Definition, nature and scope; Fundamental concept in Human Geography (Place, Space and Landscape); Understanding of man nature relationship.

Culture, Language communication and belief.

#### Unit II

Population and Migration: Population distribution and composition, population dynamics and process, Demographic transition theory. Population movement and Migration

human settlement Structure, Types and characteristics; Christaller's Central Place Theory.

#### Unit III

Socio-Economic and political dimension-Languages, religion and races- definition and world distribution; Habitat and economy of selected communities (Santhal, Khasi, Eskimo, Bushmen); Economic Activities: Concept and classification-primary, secondary and tertiary; Concept of Nation and State; Frontiers and Boundaries-Definition and Types

#### Unit IV

Development and Globalization-Concept of development and Sustainable Development; Indicators and measures of development (economic, social and environmental); Global pattern of development: inter-regional variations; Globalization and its Impact.

#### References:

1. Knox, P. L., & Marston, S. A. (2016). *Human geography: places and regions in global context*. Seventh *edition*. Boston: Pearson.
2. Bergwan, Edward E., Human Geography: Culture. Connections and Landscape, Prentice Hall, New Jersey. 1995
3. Carr, M., Patterns, Process and change in Human Geography, MacMillan Education, London, 1987 3. Daniels Peter, Bradshaw Michae, Shaw Davil and Side way James, Human Geography: Issues for the Twenty First Century, Prentice Hall, New Jersey, 2001
4. Fellman, J.L., Human Geography-Landscapes of H u m a n Activities, Brownand Benchman Pub., U.S.A, 1997
5. DeBlij, H.J., Human Geography, Culture, Society and Space John Wiley, New York, 1996
6. James, M. Robenstein, An Introduction to Human Geography, Prentice Hall, New Jersey, 2001
7. Johnston, R.J. (editor), Dictionary of Human Geography Blackwell, Oxford, 1994.
8. Mc Bride, P.J., Human Geography: Systems, Patterns and Change, Nelson, U.K. and Canada, 1996 9. Michael, Can, New Patterns: Process and Change in Human Geography Nelson, 1997
9. Rubenstein, J.H. and Bacon, R.S., The Cultural Landscape -A Introduction to Human geography, Prentice Hall, India, New Delhi, 1990

## CC- 04 Climatology and Oceanography

### Unit 1

Earth's atmosphere; vertical structure of atmosphere; temperature changes.  
Insolation and heat budget; Temperature- Heating and cooling of temperature; distribution of temperature; inversion of temperature;

### Unit 2

Air pressure and wind circulation; tricellular meridional circulation; Monsoons and Jet-stream; local winds; Humidity; Condensation; Adiabatic change of temperature; fogs ; Precipitation- Origin and mechanism theories of precipitation.

### Unit 3

Air masses- source region; classification of air masses; Frontogenesis – Fronts and frontogenesis; Cyclones- Temperate cyclones;Tropical cyclone; Thunderstorm; Tornado; Anticyclone; Climatic classification- Koeppen's classification; Thornthwaite's

### Unit-4

Ocean basins; Bottom reliefs of Atlantic Ocean, Pacific Ocean and Indian Ocean  
Temperature and density of the ocean water; Salinity of the ocean ; Ocean deposits.

### Unit 5

Ocean tides; Ocean currents; Currents of Atlantic Ocean, Pacific Ocean, and Indian Ocean.  
Coral reefs; Theories of the origin of coral reefs by Darwin, Murray, Daly, and W.M Davis;  
coral bleaching; Marine resources; marine fishing; marine ranching.

## CP – 03 Advanced Spatial Analysis

Ex. no.	No. of classes	Exercises
1	5	3D Analysis: TIN, DEM, Slope, Aspect, Hillshade and Viewshed
2	6	Interpolation: IDW, Kriging, Spline, Trend and Natural Neighbor
3	6	Measuring Geographical Distribution: Central Feature, Directional Distribution, Mean Center, Median Center, Linear Directional Mean, Standard Distance
4	5	Geocoding and Reverse Geocoding
5	6	Network Analysis: Shortest Path, Closest Facility, Service Area, Cost Matrix, Location-Allocation, VRP
6	6	Overlay Analysis: Weighted Overlay, Fuzzy Overlay
7	5	Preparation of 3D and Animation Map in GIS
8	4	Indices: NDVI, NDWI, NDBI, SAVI and MSI
9	8	Hydrology Analysis: Watershed Delineation, Flow Direction, Flow Accumulation and Stream Order Creation

10	6	Multivariate Analysis: Iso Cluster Unsupervised Classification
11	4	Mapping Cluster: Hot Spot Analysis and Grouping Analysis
12	5	Model Builder: Identification of Optimal Location for Specific Purpose
13	6	Preparation of Toolbox, Toolset and Tools

**Total Classes = 72**

### CP-04 Digital Image Analysis

Ex. no.	No. of classes	Exercises
1.	4	Geometric correction: Keyboard and Image to image Method, Mosaic Fusion
2.	4	Generation of AOI and Vector layer
3.	6	Subset: GCP Method, AOI Method, viewer and Shape file Method
4.	4	Image Enhancement: Spatial Enhancement: Low Pass, High Pass, Haze Reduction, Neighborhood Function
5.	4	Spatial Enhancement: Horizontal, Vertical, Edge Detect, Edge Enhance, Adaptive Filter, Focal Analysis
6.	4	Spectral Enhancement: Principal Component Analysis, Inverse Principal Component Analysis, independent Component,
7.	4	Spectral Enhancement: RGB to IHS, HIS to RGB, Decorrelation Stretch
8.	4	Radiometric Enhancement: LUT Stretch, Noise Reduction, Histogram Equalization
9.	4	Radiometric Enhancement: Histogram match, Brightness Inversion, Destripe TM Data
10.	4	Classification and Accuracy assessment
11.	4	Topographical Analysis: DEM, Slope, Aspect, Shaded Relief,
12.	4	Topographical Analysis: Painted Relief, Raster Contour, Viewshed, DEM Height Converter
13.	4	Model Builder
14.	10	Indices: Normalized Difference Vegetation Index, Vegetation Index Ratio, TNDVI, Transformed Vegetation Index and other Indices
15.	8	Image Fusion: Resolution Merge, Ehlers Fusion, Wavelet Fusion
16.	4	
<b>Total Classes</b>	<b>72</b>	



## AECC-02 Digital Image Processing

### **Unit I:**

Basics and Image Rectification: Image, Digital Image, Single Layer Digital Image, Multispectral Digital Image; Image Rectification: Radiometric Correction and Geometric Correction

### **Unit II:**

Image Enhancement Techniques: Contrast, Contrast Enhancement – Linear and Non-linear, Histogram Equalization, Density Slicing, Spatial Filtering – Low and High frequency Filtering, Edge Enhancement, Band Rationing, Band Combination. Principle Component Analysis.

### **Unit III:**

Image Classification: Unsupervised Classification, Advantages and Disadvantages of Unsupervised Classification, Supervised Classification – Steps of Supervised Classification, Algorithms of Classification – Parallelepiped, Minimum Distance to Mean and Maximum Likelihood, Accuracy Assessment.

### **References:**

1. Richards, J. A, Jia, X. (1999): Remote Sensing and Digital Image Processing, Springer, Verlag Berlin
2. Cha, B., Dattaa, D., Majumdar (2001): Digital Image Processing Analysis, Prentice-Hall of India, New Delhi
3. Nag, P. Kudrat, M. (1998): Digital Remote Sensing, Concept Publishing Company, New Delhi
4. Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey 5.
5. Lillesand, T. M., Kiefer, R. W. Chipman, J. W. (2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi
6. Sabins, F. F. (1996): Remote Sensing: Principles an Interpretation, W. H. Freeman Company, New York

## **SEC -02 Spatial Analysis**

### **Unit I**

Introduction to Spatial analysis: Significance of spatial analysis. Overview of tools for analysis

### **Unit II**

Spatial analysis – Vector based: Single layer operations: Feature identification, extraction, classification manipulation. Multilayer operation: Union, intersection, Identity. Overlay operations: Point-in-polygon, Line in-polygon, polygon-in-polygon.

### **Unit III**

Spatial analysis – Raster based: Map algebra, grid based operations, local, focal, zonal and global functions, cost surface analysis, optimal path and proximity search

### **Unit IV**

Network analysis: Concepts, evaluation of network complexity using Alpha-gamma indices. C-matrices for evaluating connectivity of the network. Network data model. Path analysis. Linear referencing and segmentation. Types of network analysis: Optimum cyclic path, Service Area, path determination and cost-path analysis.

### **Unit V**

Point pattern analysis: Methods for evaluating point patterns: clustered and random distribution **Unit VI**

Surface analysis: Interpolation methods: Trend surface analysis, IDW, kriging, measures of arrangement and dispersion, autocorrelation, semi-variogram, DEM, TIN, slope, aspect, hillshade and viewshed

## **Unit VII**

Spatial modeling: Role of spatial model, explanative, predictive and normative models. Correlation-regression analysis in model building. Handling complex spatial query and case studies

### **References:**

1. Demers, M. N. (2000): Fundamentals of Geographic Information Systems, John Wiley and Sons, New Delhi
2. Burrough, P. A. and McDonnell, R. A. (2000): Principles of Geographical Information Systems, Oxford University Press, New York
3. Makrewski, J. (1999): GIS Multi-Criteria Analysis, John Wiley and Sons, New York
4. Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York
5. Longley, P. A., Goodchild, M. F., Maguire, D. J. Rhind, D. W. (2002): Geographical Information Systems and Science, John Wiley & Sons, Chichester
6. Lo, C. P. Yeung, A. W. (2002): Concepts Techniques of Geographical Information Systems, Prentice-Hall of India, New Delhi

## **DSE-01 Basics of Computer Programming**

### **Unit I**

Introduction to Computer Programs: History, Different types of Programming Language, Uses of Computer Programs, Algorithms, Editor, Compiler and Interpreter. Programming Environment: Basic Syntax, Variables and Data Type, Keywords, Basic Operators, Loops, Number, Characters, Arrays, Strings and Functions.

### **Unit II**

Basic Programming in Python: Python Basics, Flow Control, Functions, List, Dictionaries and Structuring Data, Manipulating Strings.

### **Unit III**

Automating Tasks Using Python: Pattern Matching with Regular Expressions, Reading and Writing Files, Organizing Files, Debugging, Web Scraping.

### **Unit IV**

Automating Software Using Python: Working with Excel Spreadsheets, Working with PDF and Word Documents, Sending Email and Text Messages, Manipulating Images, Graphical User Interface.

### **References:**

1. Sweigart Al, Automate the Boring Stuff with Python, Practical Programming for Total Beginners, No Starch Press, San Francisco.
2. [http://www.tutorialspoint.com/computer\\_programming/computer\\_programming\\_tutorial.pdf](http://www.tutorialspoint.com/computer_programming/computer_programming_tutorial.pdf)
3. <http://nomad.so/download/book/PureBasic%20-%20A%20Beginners%20Guide.pdf>
4. Yashwant Kanetkar, 2013, Let us C, BPB Publications, New Delhi
5. <http://www.introprogramming.info/wp-content/uploads/2013/07/Books/CSharpEn/Fundamentals-of-Computer-Programming-with-CSharp-Nakov-eBook-v2013.pdf>

6. Allan B Downey, 2012, Think Python, Shroff Publishers & Distribution Pvt. Ltd, New Delhi
7. <http://www.greenteapress.com/thinkpython/thinkpython.pdf>
8. <http://anh.cs.luc.edu/331/notes/PythonBasics.pdf>
9. <http://resources.arcgis.com/en/communities/python/>

## **Semester II**

### **GE-02 A. Applications of Geo-informatics**

#### **Unit I**

Geosciences: Concepts of geomorphology, landform analysis, drainage basin morphometry, slope mapping, integrated approach for landslide hazard zonation models and mapping. Aerial photo and satellite data interpretation.

#### **Unit II**

Water resources: Watershed hydrology, physical processes in watershed, principles of remote sensing in water resource assessment, river valley project, planning, organization and design of spatial and non-spatial data in water resource engineering. Hydrological modelling.

#### **Unit III**

Forest: Image processing for forest, vegetation classification mapping, forest inventory, sampling techniques, Growing stock estimation, biomass estimation, forest management, fire risk zonation, land evaluation for forestry, RS of forest ecosystem.

#### **References:**

1. SPRS Technical Commission VII (2002): Symposium on Resource Environmental Monitoring, ISRS Annual Convention, IIRS, Dehradun
2. Deekshatulu, B. L. (1990): Description and use of Land use/Landcover, NRSA, Hyderabad
3. Harris, J. E. (1990): Earthwatch – The Climate from space, Ellishorwood Ltd., Midsower Norton
4. Lal, D. S. (1998): Climatology, Chaitanya Publishing House, Allahabad
5. Escalante, R. B. (2012): Remote Sensing- Advances techniques and Platforms, Intech, Rijeka Croatia
6. Escalante, R. B. (2012): Remote Sensing Application, Intech, Rijeka Croatia
7. Roy, P.S., Dwivedi, R. S. (2010): Remote Sensing Application [www.nrsc.gov.in/Learning- Center](http://www.nrsc.gov.in/Learning-Center), E Book. html

## **Semester II**

### **GE-02 B. Regional Planning and Development**

#### **Unit 1**

Region: Concept, meaning; Classifications of the Region; Delineation and delimitation of the Region; Regionalization and regionalism: concept and meaning; Introduction to Planning: Concept, purpose evolution and application; Towards Regional planning: approaches, theories.

#### **Unit 2**

Concept of Regional Development; Five year planning model in India: applications and implications; Regional imbalances and inequalities in India; Disparities in Regional Development; Urban and Rural planning and regional development.

#### **Unit 3**

Regional Planning and Policies: issues, mechanism and approaches for regional development; Planning and policies for city region; Case studies: Damodar Valley Region, Indira Gandhi Canal Command Area.

### References

1. Chand Mahesh and V. K. Puri. 2011. *Regional Planning in India*. Allied Publishers.
2. Cooke Philip. 1983. *Theories of Planning And Spatial Development*. London. Hutchinson
3. Dreze Jean and Amartya Sen. 1999. *Indian Development-Selected Regional Perspectives*. New Delhi. Oxford University Press.
4. Gaffikin Frank and Mike Morrissey. 2011. *Planning in Divided Cities: Collaborative Shaping of Contested Space*. Oxford. Blackwell Publishing Ltd.
5. Glasson John and Tim Marshall. 2007. *Regional Planning*. New York. Routledge.
6. Hall Peter. 2002. *Urban and Regional Planning*. London and New York. Routledge.
7. Khullar D. R. 2014. *India: A comprehensive Geography*. Kalyani Publishers.
8. Mishra R P. 2002. *Concepts, Techniques, Policies and Case Studies*. New Delhi. Concept Publishing Company.
9. Verma Niraj. 2007. *Institutions and Planning*. Amsterdam. Elsevier.

## Semester II

### GE-02 C. Urban GIS and Smart Cities

#### Unit I

Challenges of Urbanization, Concept and features of Smart city, intelligent urban space, Core infrastructure elements of smart city.

#### Unit II

Technology in smart cities: Big data, cloud technology, Modern urbanization and Smart solution for urban crisis.

#### Unit III

Smart city missions in India: Smart city initiatives in India.

#### References:

1. . <http://smartcities.gov.in/writereaddata/smartcityguidelines.pdf>
2. [http://www.emeraldgroupublishing.com/learning/ami/vol2\\_iss\\_2/smart\\_cities.pdf](http://www.emeraldgroupublishing.com/learning/ami/vol2_iss_2/smart_cities.pdf)

## Semester –III

### CC- 05 Regional Planning and Development

#### Unit I

Region: Concept, meaning; Classifications of the Region; Delineation and delimitation of the Region; Regionalization and regionalism: concept and meaning; Introduction to Planning: Concept, purpose evolution and application.

#### Unit II

Concept of Regional Development; Five year planning model in India: applications and implications; Regional imbalances and inequalities in India; Disparities in Regional Development; Urban and Rural planning and regional development.

#### Unit III

Towards Regional planning: approaches, Models and theories; System approach in planning; Regional Interdependence Analysis (Input-Output model); theories of urbanization; core-periphery model; Cumulative Causation theory, Central Place Theory.

#### Unit IV

Regional Planning and Policies: issues, mechanism and approaches for regional development; Planning and policies for city region; Case studies: Damodar Valley Region, Indira Gandhi Canal Command Area.

#### References

1. Chand Mahesh and V. K. Puri. 2011. *Regional Planning in India*. Allied Publishers.
2. Cooke Philip. 1983. *Theories of Planning And Spatial Development*. London. Hutchinson
3. Dreze Jean and Amartya Sen. 1999. *Indian Development-Selected Regional Perspectives*. New Delhi. Oxford University Press.
4. Gaffikin Frank and Mike Morrissey. 2011. *Planning in Divided Cities: Collaborative Shaping of Contested Space*. Oxford. Blackwell Publishing Ltd.
5. Glasson John and Tim Marshall. 2007. *Regional Planning*. New York. Routledge.
6. Hall Peter. 2002. *Urban and Regional Planning*. London and New York. Routledge.
7. Khullar D. R. 2014. *India: A comprehensive Geography*. Kalyani Publishers.
8. Mishra R P. 2002. *Concepts, Techniques, Policies and Case Studies*. New Delhi. Concept Publishing Company.
9. Verma Niraj. 2007. *Institutions and Planning*. Amsterdam. Elsevier.

## Semester –III

### CC- 06 Geo-informatics Application in Natural Resource Management

#### Unit I

Forest: Forest Classification and Mapping, Forest Inventory, Sampling Techniques, Carbon Stock Estimation, Forest Management, Fire Risk Zonation, Wildlife Habit Suitability Analysis

#### Unit II

Water Resources: Basic Concept of Water Resources, Sustainable Watershed Management, Water Pollution Detection, Salinity and Waterlogged Area Mapping, Flood Inundation

Mapping, Flood Damage Assessment, Watershed Characteristics, Watershed Harvesting Structure.

### **Unit III**

Soil: Physiographic Soil Mapping, Soil Type Identification, Soil Moisture Mapping

### **Unit IV**

Marine Resources: Fundamental of Marine Ecology, Bio Resources Mapping and Monitoring, Coastal Bathymetry, Ocean Colour Mapping, SST Mapping, Potential Fishing Zone Mapping.

### **References:**

1. SPRS Technical Commission VII (2002): Symposium on Resource Environmental Monitoring, ISRS Annual Convention, IIRS, Dehradun
2. Deekshatulu, B. L. (1990): Description and use of Land use/Landcover, NRSA, Hyderabad
3. Sudershana, R. Mitra, D. Mishra, Roy, P.S., Rao, D. P. (2000): Subtle Issues in Coastal Management, IIRS, Dehradun
4. Harris, J. E. (1990): Earthwatch – The Climate from space, Ellishorwood Ltd., Midsower Norton
5. Lal, D. S. (1998): Climatology, Chaitanya Publishing House, Allahabad
6. Escalante, R. B. (2012): Remote Sensing- Advances techniques and Plateforms, Intech, Rijeka Croatia
7. Escalante, R. B. (2012): Remote Sensing Application, Intech, Rijeka Croatia
8. Roy, P.S., Dwivedi, R. S. (2010): Remote Sensing Application  
[www.nrsc.gov.in/Learning- Center, E Book. html](http://www.nrsc.gov.in/Learning-Center/E-Book.html)

## **Semester –IV**

### **CC-07 Geo-informatics Application in Disaster, Urban and Agricultural Studies**

#### **Unit I**

Disaster Management: Natural and Man-Made Disasters, Pre-Disaster Planning and Preparedness, Prediction and Early Warning, Damage Assessment and Relief Management.

#### **Unit II**

Urban Planning and Development: Urban LULC Classification, Monitoring and Change Detection, Urban Growth Assessment and Modelling, Urban Heat Island, Property Tax, Real Time Traffic Monitoring System, Utility Mapping and Planning.

#### **Unit III**

Agriculture: Crop Mapping and Yield Estimation, Crop Assessment and Crop Health, Crop Suitability Assessment, Erosion Identification and Remediation, Damage and Land Degradation Assessment, Irrigated Landscape Mapping and Management, Precision Agriculture.

### **References:**

1. NRSA (2002): Symposium Tutorial on Sustainable Agriculture (Volume of Lectures), Hyderabad
2. NRSA (2001): National Agricultural Drought Assessment Monitoring System, India, Summary Report, Hyderabad
3. Roy, P. S. (2000): Natural Disaster their Mitigation, IIRS, Dehradun
4. ISRS and IARI (1990): Proceedings of National Symposium on RS for Agricultural Application, New Delhi

5. ISRS (2000): National Symposium on Spatial Technologies for Natural Hazards Management, IIT, Kanpur
6. Nirupama, (2002): Role of Remote Sensing in Disaster Management, ICIR Research Paper Series NO. 21, Institute for catastrophic loss reduction, University of Western Ontario, Ontario
7. Escalante, R. B. (2012): Remote Sensing- Advances techniques and Plateforms, Intech, Rijeka Croatia
8. Escalante, R. B. (2012): Remote Sensing Application, Intech, Rijeka Croatia
9. Roy, P.S., Dwivedi, R. S. (2010): Remote Sensing Application
10. www.nrsc.gov.in/Learning- Center, E Book. html

## Semester –IV

### CP- 05 Cartography and Surveying

#### Unit I

Cartographic Techniques: Cartography – Nature and Scope,

#### Unit II

Map Projection- the polar gnomonic zenithal projection, the polar orthographic zenithal projection, the polar stereographic zenithal projection, the polar zenithal equidistant projection, the polar zenithal equal area projection; Conical Projection – simple conical projection with one standard parallel, simple conical projection with two standard parallel, Cylindrical projection – simple cylindrical projection, cylindrical equal area projection, Bonne’s projection, polyconic Sinusoidal projection, Mollweide’s projection, Mercator’s projection, zonation using UTM.

#### Unit III

Surveying:, Chain survey, Prismatic compass, Plane Table, Auto leveling, Theodolite, Advanced Total Station Survey, GPS.

#### Unit IV

Topographical Map – Interpretation of a Mountain area with the help of Cross and Longitudinal Profiles; slope analysis; drainage basin analysis.

#### References:

1. Anson R. and Ormelling F. J., 1994: *International Cartographic Association: Basic Cartographic Vol.* Pregmen Press.
2. Gupta K.K. and Tyagi, V. C., 1992: *Working with Map*, Survey of India, DST, New Delhi.
3. Mishra R.P. and Ramesh, A., 1989: *Fundamentals of Cartography*, Concept, New Delhi.
4. Monkhouse F. J. and Wilkinson H. R., 1973: *Maps and Diagrams*, Methuen, London.
5. Punmia B. C., Ashok K. J. and Arun. K. J., 2016: *Surveying Vol. I*, Laxmi Publication (P) Ltd. New Dehli.
6. Punmia B. C., Ashok K. J. and Arun. K. J., 2016: *Surveying Vol. II*, Laxmi Publication (P) Ltd. New Dehli.
7. Rhind D. W. and Taylor D. R. F., (eds.), 1989: *Cartography: Past, Present and Future*, Elsevier, International Cartographic Association.
8. Robinson A. H., 2009: *Elements of Cartography*, John Wiley and Sons, New York.
9. Sharma J. P., 2010: *Prayogic Bhugol*, Rastogi Publishers, Meerut.
10. Singh R. L. and Singh R. P. B., 1999: *Elements of Practical Geography*, Kalyani Publishers.
11. Sarkar, A. (2015) *Practical geography: A systematic approach*. Orient Black Swan Private Ltd., New Delhi.
12. Singh R L & Rana P B Singh(1991) *Prayogtmak Bhugol ke Mool Tatva*, Kalyani Publishers, New Delhi.
13. Sharma, J P (2010) *Prayogtmak Bhugol ki Rooprekha*, Rastogi Publications, Meerut.

Singh, R L & Dutta, P K (2012) PrayogatkamakBhugol, Central Book Depot, Allahabad.

### CP – 06 Advanced RS and GIS Techniques

Ex. no.	No. of classes	Exercises
1	8	Identification of Land Use and Land Cover Changes
2	8	Preparation of Landslide Vulnerable Zones
3	8	Identification of Optimal Site for Landfill
4	8	Calculation of Soil Erosion using USLE/MUSLE
5	8	Calculation of Hypsometric Properties of a Drainage Basins
6	8	Identification of Morphometric Properties of a Drainage Basin
7	8	Identification of Groundwater Potential Zone
8	8	Mapping of Land Degradation
9	8	Calculation of Land Surface Temperature

**Total Classes = 72**

### Semester –IV CP-07 Quantitative Techniques in Geography

#### Unit I

Fundamentals: Exploratory and Confirmatory Approaches in Geography; Descriptive and Inferential Methods. Data types and scales. Basic statistical analysis; Frequency Distribution; Measures of Central Tendency, Measures of Dispersion; Skewness and Kurtosis, Normal distribution curve, level of significance, Hypothesis testing, chi square test, t-test

#### Unit II

Data collection tools: Interview and Questionnaire Methods, structured questionnaire, semi-structured and non-structured. Sampling techniques: sampling unit, sampling frame. Sample selection: Simple random sampling, stratified random sampling, Purposive sampling. Sampling and Non sampling Error, Sample Size and Non-response.

#### Unit III

Statistical Software: SPSS: Data Entry, Storing and Retrieving Data Files, Data File Handling, Generating New Variables, Running Statistical Procedures, Constructing Graphical Displays, Output Viewer. Data analysis: bi variate, univariate, Regression and correlation.

#### **References :**

1. David M. Smith (1975), Patterns in Human Geography, Penguin, Harmonswoth.



2. Ebdon D (1983) Statistics in Geography : A Pratical Approach, Blackewell, London.
3. Gregory, S. (1978) Statistical Methods and the Geographer (4th Edition), Longman, London.
4. Gupta, S.P. : Statistical Methods, Sultan Chand and Sons, Latest Edition.
5. Mathews, J.A. (1987) Quantitative and Statistical Approaches to Geography, Practical Manual, Pergmon, Oxford.
6. Pal, S.K. (1998) Statistics for Geoscientists; Techniques and Applications, Concept Publishing Company, New Delhi.
7. Peter, J. Taylor (1977), Quantitative Methods in Geography, Houghton Mifflin Company, Boston.
8. Robert Hammond and Patrik Mc. Cullagh (1974),Quantitative Methods in Geography, Clarendon Press, Oxfords.
9. Yeates, Mauris (1974), An Introduction to Quantitative Analysis in Human Geography, McGraw Hill , New York.

**Semester –IV**  
**SEC-03 Filed Visit/Project (2 to 3 weeks)**

The students enrolled in the course will opt for either Field Visits organized by the co-ordinator as a group activity and will submit report or will undergo summer internship that will result in a project report. However the case may be, this will carry 3 credits that will require involvement for 45 hours.

**Semester IV**  
**CC-08 Internship (6 to 8 weeks)**

The students enrolled in the course will undergo internship for 6 to 8 weeks in an institution which is private/public or quasi-government that works with GIS related projects. They will participate in the project as a team or individual contributor and will contribute to the project with their expertise. An internal supervisor will be assigned to every student, who will guide them time and then. The on-site supervisor in the institution in which the candidate undergoes internship will be termed as external supervisor. The candidate will update the learning monthly through weekly report to the internal supervisor. The final report will be prepared by the candidate duly signed by the internal and external supervisor will be evaluated for 100 marks.

**DSE 02 Dissertation 12-16 weeks**

The students enrolled in the course will concise his/her research contribution as a dissertation report which will be evaluated for 100 marks.

**\*\*End\*\*\*\***