



**Anekant Education Society's**  
**Tuljaram Chaturchand College, Baramati**  
*(Autonomous)*

**Two Year Degree Program in Geography**  
**(Faculty of Science & Technology)**

Revised Syllabus for

M.A. /M.Sc. (Geography) Part-II Semester -III

**For Tuljaram Chaturchand College, Baramati**

**Choice Based Credit System Syllabus (2022 Pattern)**  
**To be implemented from Academic Year 2023-2024**

## Title of the Course: M.A. /M.Sc. (Geography)

### Preamble

#### Introduction:

Tuljaram Chaturchand College has decided to change the syllabus of various faculties from June, 2022. Taking into consideration the rapid changes in science and technology and new approaches in different areas of Geography and related subjects, Board of Studies in Geography of Tuljaram Chaturchand College, Baramati - Pune has prepared the syllabus of M. A. /M.Sc. Geography Semester - III under the Choice Based Credit System (CBCS). The model curriculum as developed by U.G.C. is used as a guideline for the present syllabus.

A Master degree in geography will provide you the knowledge and skills you need to begin a variety of rewarding careers. Geographers work as urban planners, GIS technicians and analysts, disaster preparedness planners, teachers, environmental scientists, remote sensing analysts, transportation planners, demographers, hydrologists and in a variety of other areas. Students who complete Master degree in Geography, courses will examine the spatial organization of physical features and human activities at a variety of spatial scales from local to global. Students will be able to locate features on the surface of the earth, explain why they are located where they are, and describe how places are similar and/or different. Students will also examine human interactions with the environment and describe how physical and cultural landscapes change through time. Students completing physical geography courses will be able to describe the processes that drive earth's climate, create landforms, and govern the distribution of plants and animals. Students completing human geography will analyze and describe cultural phenomenon such as population, development, agriculture, language, and religion.

#### ❖ Aims and Objectives of the new curriculum:

1. To maintain updated curriculum.
2. To take care of fast development in the knowledge of Geography.
3. To enhance the quality and standards of Geography Education.
4. To provide a broad common frame work, for exchange, mobility and free dialogue across the Indian Geography and associated community.
5. To create and aptitude for Geography in those students who show a promise for higher studies and creative work in Geography.
6. To create confidence in others, for equipping themselves with that part of
7. Geography which is needed for various branches of Sciences or Humanities in which they have aptitude for higher studies and original work.

**Programme outcomes (Pos) (M.A. /M.Sc. Geography):**

1. Ability of Problem Analysis: Student will be able to analyse the problems of physical as well as cultural environments of both rural and urban areas. Moreover, they will try to find out the possible measures to solve those problems.
2. Conduct Social Survey Project: They will be eligible for conducting social survey project, which is necessity for the assessment of development status of a particular group or section of the society.
3. Individual and teamwork: Works effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
4. Application of modern instruments: Students will be able to apply various modern instruments for data collection and field survey.
5. Application of GIS and modern Geographical Map Making Techniques: Students will learn how to prepare map based on GIS by using the modern geographical map-making techniques.
6. Critical Thinking: Students will able to understand and solve the critical problems of physical and cultural environment.
7. Development of Observation Power: As a student of Geography, they will be capable to develop their observation power through field experience and in future, they will be able to identify the socio-environmental problems of a locality.
8. Development of Communication Skill and Interaction Power: After the completion of the course, they will be efficient in their communication skill as well as power of social interaction.
9. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
10. Enhancement of the ability of Management: Demonstrate knowledge and understanding of the management principles and apply these to their own work, as a member and leader in a team, to manage projects. They will perform effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
11. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions and accept responsibility for them.
12. Understand Environmental Ethics and Sustainability: Understand the impact of the acquired knowledge in societal and environmental contexts and demonstrate the knowledge of need for sustainable development.
13. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context social, environmental and technological changes.
14. Presentation Skill: Students are being able to understand and write effective reports and design credentials, make effective demonstrations, give and receive clear instruction

**Anekant Education Society's**  
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*Autonomous*  
**Board of Studies in Geography**  
 From 2022-23 to 2024-25

Sr.No.	Name	Designation
1.	<b>Dr. Arun S. Magar</b>	Chairman
2.	<b>Dr. Asaram S. Jadhav</b>	Member
3.	<b>Mr. Vinayak D. Chavan</b>	Member
4.	<b>Mr.Sachin C. Memane</b>	Member
5.	<b>Ms. Akshta S. Raje</b>	Member
6.	<b>Dr. Santosh Lagad</b>	Vice-Chancellor Nominee
7.	<b>Dr. Pravin Kokane</b>	Expert from other University
8.	<b>Dr.T. P. Shinde</b>	Expert from other University
9.	<b>Dr. Babaji Maskare</b>	Industry Expert
10.	<b>Mr. Ganesh Ghanawat</b>	Meritorious Alumni
11.	<b>Ms. Aisha Tamboli</b>	Student
12.	<b>Mr. Sagar Lokhande</b>	Student

**M.A./M.Sc. GEOGRAPHY PROGRAMME CREDIT DISTRIBUTION PATTERN (110)**

Class	Semester	Core Course	Elective Course			Ability Enhancement Compulsory Courses (AECC)		Total Credit
			Discipline Specific Elective	Dissertation Project	Generic Elective Course	Ability Enhancement Compulsory Courses	Skill Enhancement Courses	
M.Sc. I	I	4 papers 4 x 4= 16 Credits	-	-	HR – I 2 Credit CS – I 2 Credit	Communication Skill 2 Credit	2 Practical's = 8 Credits	30
	II	4 papers 4 x 4= 16 Credits	-	-	CS – II 2 Credit	-	2 Practical's = 8 Credits	26
M.Sc. II	III	3 papers 3 x 4= 12 Credits	Paper (A) 4 Credit <i>OR</i> Paper (B) 4 Credits	-	Introduction to Constitution 02 Credit	-	2 Practical's = 8 Credits Subject Related Skill Dev. Course 2 Credit	28
	IV	3 papers 3 x 4= 12 Credits	Paper (A) 4 Credit <i>OR</i> Paper (B) 4 Credits	1 Project = 4 Credits	-	-	1 Practical = 4 Credits Subject Related Skill Dev. Course 2 Credit	26
<b>Total Credits</b>		<b>56</b>	<b>8</b>	<b>4</b>	<b>8</b>	<b>2</b>	<b>32</b>	<b>110</b>

**Mandatory 14 additional / add-on credits for Post Graduate Programmes****Note:**

1. 12credits from Group - 1 are compulsory
2. Choose minimum 2credits from Group - 2 to Group - 7

Group-1	Human Rights Awareness Course (Semester-I):		02 credit
	Cyber Security Awareness Course (Semester-I)		02 credit
	Cyber Security Awareness Course (Semester-II)		02 credit
	Introduction to Constitution ( Semester –III)		02 credit
	Subject Related skill development courses (Sem III)		02 credit
	Subject Related skill development courses (Sem IV)		02 credit
Group-2 Skill Component Courses	1. Subject Related Certificate Course (Sem. II)		02 credits
Group-3	(a)	Representation in Sports at University Level	02 credits
	(b)	Representation in Sports at State Level / National level	02 credits
	(c)	Representation in Sports at International (overseas) Level	04 credits
Group-4	(a)	Selection in AVISHKAR at University Level	02 credits
Group-5	(a)	Research paper publication at National level	02 credits
	(b)	Research paper publication at International (overseas) level	02 credits
Group-6	(a)	Participation in Summer School/ Internship programme / Short term course (not less than 2 weeks duration)	02 credits
Group-7	(a)	Participation in cultural and co curricular activities/ extracurricular activities/competitions at University level / State Level	02 credit
	(b)	Participation in cultural and co curricular activities / extracurricular activities/ competitions at International (overseas) level	02 credits

**Note:**

1. One Credit = 15 Lectures.
2. The Project should be initiated at on the onset of III Semester and submitted during IV Semester.
3. Theory paper be covered with 70% actual teaching (3 actual lectures per week) and 30% Component (1 lecture per week) of self-study should be further evaluated through group discussion / Seminar / Open Book Test / MCQ / Essay writing / Assignment etc.

**Structure of the Syllabus:****Semester – I**

<b>Sr. No.</b>	<b>Course Code</b>	<b>Core Compulsory Theory Paper (CCTP)</b>	<b>Choice Based Optional Paper (CBOP)</b>	<b>Core Compulsory Practical Paper (CCPP)</b>	<b>Credit</b>
1	PAGG111	Principles of Geomorphology	-	-	04
2	PAGG112	Principles of Climatology	-	-	04
3	PAGG113	Principles of Economic Geography	-	-	04
4	PAGG114	Principles of Population and Settlement Geography	-	-	04
5	PAGG115	-	-	Practical in Physical Geography	04
6	PAGG116	-	-	Practical in Human Geography	04
				<b>Total Credits</b>	<b>24</b>

**Semester – II**

Sr. No.	Course Code	Core Compulsory Theory Paper (CCTP)	Choice Based Optional Paper (CBOP)	Theory / Practical	Credit	Core Compulsory Practical Paper (CCPP)	Credit
1	PAGG 121	Geoinformatics – I					04
<b>One of the following according to specialization from CCTP</b>							
2	PAGG 122 (A)	Coastal Geomorphology	-	-	04	-	04
	PAGG 122 (B)	Synoptic Climatology	-	-	04	-	
	PAGG 122 (C)	Population Geography	-	-	04	-	
<b>One of the following according to specialization from CCTP</b>							
3	PAGG 123 (A)	Fluvial Geomorphology	-	-	04	-	04
	PAGG 123 (B)	Monsoon Climatology	-	-	04	-	
	PAGG 123 (C)	Geography of Rural Settlements	-	-	04	-	
<b>Optional Paper ( CBOP) ( 1 Theory + 1 Practical )</b>							
4	PAGG 124			Geography of Disaster Management	04		08
	PAGG 125			Practical in Surveying	04		
<b>Core Compulsory Practical Paper (CCPP)</b>							
5	PAGG 126					Practical of Statistical Techniques for Geography	04
<b>Total Credits of Semester – II</b>							<b>24</b>



## Semester – III

Course Code	Core Compulsory Theory Paper (CCTP)	Choice Based Optional Paper (CBOP)	Theory / Practical	Credit	Core Compulsory Practical Paper (CCPP)	Credit
PAGG 231	Geoinformatics-II	-	-	04	-	04
PAGG 232	Research Methodology	-	-	04	-	04
<b>One of the following according to specialization from CCTP</b>						
PAGG 233 (A)	Tropical Geomorphology	-	-	04	-	04
PAGG 233(B)	Agro-Meteorology	-	-	04	-	
PAGG 233(C)	Urban Geography			04		
<b>Choice Based Optional Paper (CBOP) ( 1Theory + 1Practical )</b>						
PAGG 234			Practical in GIS	04	-	08
PAGG 235			Watershed Management	04	-	
<b>One of the following according to specialization from CCPP</b>						
PAGG 236 (A)					Practical in Geomorphology	04
PAGG 236 (B)					Practical in Climatology	
PAGG 236(C)					Practical in Population and Settlement Geography	
<b>Total Credits of Semester -III</b>						<b>24</b>

**Semester – IV**

<b>Course Code</b>	<b>Core Compulsory Theory Paper (CCTP)</b>	<b>Choice Based Optional Paper (CBOP)</b>	<b>Theory / Practical</b>	<b>Credit</b>	<b>Core Compulsory Practical Paper (CCPP)</b>	<b>Credit</b>
PAGG 241	Geography of India	-	-	-	-	04
PAGG 242	Oceanography	-	-	-	-	04
PAGG 243	Geographical thoughts	-	-	-	-	04
<b>Choice Based Optional Paper (CBOP) ( 1Theory + 1Practical )</b>						
PAGG 244			Geography of Soils	04		04
PAGG 245			Practical in Remote Sensing	04		
<b>Core Compulsory Practical Paper (CCPP)</b>						
PAGG 246					Dissertation / Research Project	04
<b>Total Credits of Semester - IV</b>						<b>24</b>

**Department of Geography**  
**Course Structure for M.A / M.Sc. Geography**  
**With effect from Academic Year 2022-2023**

Sem.	Paper Code	Title	No. of Credits
I	PAGG 111	Principles of Geomorphology	04
	PAGG 112	Principles of Climatology	04
	PAGG 113	Principles of Economic Geography	04
	PAGG 114	Principles of Population and settlement Geography	04
	PAGG 115	Practical in Physical Geography	04
	PAGG 116	Practical in Human Geography	04
II	PAGG 121	Geoinformatics I	04
	PAGG 122 (A)	Coastal Geomorphology	04
	PAGG 122 (B)	Synoptic Climatology	04
	PAGG 122 (C)	Population Geography	04
	PAGG 123 (A)	Fluvial Geomorphology	04
	PAGG 123 (B)	Monsoon Climatology	04
	PAGG 123 (C)	Geography of Rural Settlement	04
	PAGG 124	Geography of Disaster Management	04
	PAGG 125	Practical In Surveying	04
PAGG 126	Practical in Statistical Techniques for Geography	04	
III	PAGG 231	Geoinformatics II	04
	PAGG 232	Research Methodology	04
	PAGG 233 (A)	Tropical Geomorphology	04
	PAGG 233 (B)	Agro-Meteorology	04
	PAGG 233 (C)	Urban Geography	04
	PAGG 234	Practical in GIS	04
	PAGG 235	Watershed Management	04
	PAGG 236 (A)	Practical in Geomorphology	04
	PAGG 236 (B)	Practical in Climatology	04
	PAGG 236 (C)	Practical in Population and Settlement Geography	04
PAGG SEC 01	Advanced Techniques in Google Earth	02	
IV	PAGG 241	Geography of India	04
	PAGG 242	Oceanography	04
	PAGG 243	Geographical Thoughts	04
	PAGG 244	Geography of Soils	04
	PAGG 245	Practical in Remote Sensing	04
	PAGG 246	Dissertation / Research Project	04
	PAGG SEC 02	Advanced Techniques in Google Map	02

**M.A/M.Sc. Geography I SEM II**  
**Geomorphology Special Subject Syllabus**

**Subject: PAGG 122 (A) Coastal Geomorphology**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To understand the basic knowledge of coastal geomorphology
2. To study coastal geomorphology by focusing on how coastal regions are formed
3. To study processes of waves, tides, and streams go through to create boulders, coral reefs, and sandy beaches.
4. To understand importance of coastal zone with future resources approach

**Learning Outcomes:**

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

1. Identify the consequences of a rise in sea-level on the coastal zone and society and possible mitigation and adaptation strategies.
2. Describe the principles involved in the generation of waves and tides and evaluate their effects on coastal processes and marine ecosystems.
3. Understand coastal processes that act along the coastline as well as the coastal landforms.
4. Identify the consequences of a rise in sea-level on the coastal zone and society and possible mitigation and adaptation strategies.

**Topics and Learning points**

**Unit 1: Introduction: Coasts and Coastal Systems and Shore Zone**

**Lectures**

1. The coastal environment: littoral, shore, coastal zones
2. Components of coastal systems processes, sediment transport, morphology
3. Spatial and temporal scales in Coastal Geomorphology
4. Coastal classification: genetic and morphological

**12**

- Unit 2: Coastal Processes** **12**
1. Characteristics of Waves
  2. Types of waves
  3. Tide and its types
  4. Equilibrium theory of tides
  5. Currents and types of currents
- Unit 3: Sea level** **12**
1. Sea level and its types
  2. Causes and consequences of sea level change
  3. Quaternary sea level changes
  4. Future sea level changes
  5. Indicators of former sea levels: Fossil beach ridges, beach rocks, abandoned cliffs, caves, raised features , marine terraces
- Unit 4: Coastal sediments** **14**
1. Properties of coastal sediments
  2. Types: clastic and biogenic sediments
  3. Sources of sediments: coastline erosion and sea floor
  4. Pathways of sediments transport
  5. Factors affecting transport, sediments traps and sinks
- Unit 5: Coastal environments** **14**
1. Meaning and concept of Delta
  2. Types of Delta
    - a. Fluvial-dominated
    - b. Tide - dominated
    - c. Wave-dominated
  3. Biotic environments
    - a. Mangrove, swamp, sand salt marshes,
    - b. Corals and coral reefs

**References Books:**

1. **Bird, E.C. (2000):** Coastal Geomorphology: An Introduction, John Wiley and Sons, Chichester.
2. **Bloom, A.L. (2002):** Geomorphology: A Systematic Analysis of Late Cenozoic, Landforms, Prentice-Hall of India, NewDelhi.
3. **Davis, J.L. (1980):** Geographical variation in coastal development, Longman, New York
4. **Goudie, A.S. (Eds.) (2004):** Encyclopaedia of Geomorphology, Routledge, London.
5. **Ivan, V. (2006):** Global Coastal Change, Blackwell publishing, Oxford.
6. **Karlekar Shrikant (2009):** Coastal processes and landforms, Diamond Publication, Pune
7. **King, C.A.M. (1972):** Beaches and Coasts, Edward Arnold, London.
8. **Masselink, G. Hughes, M. and Knight, J. (2011):** Introduction to Coastal Processes and Geomorphology Hodder Education, London.
9. **Pethick, J. (1984):** An Introduction to Coastal Geomorphology, Arnold-Heinemann, London.
10. **Tooley, M.M. and Shennan, I. (1987):** Sea level changes, Basil Blackwell, Oxford, U.K. 8.

**Subject: PAGG 123 (A) Fluvial Geomorphology**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To understand the basic knowledge of fluvial geomorphology
2. To teach the different mechanisms and processes both by traditional and contemporary view in fluvial geomorphology.
3. To understand Quantitative and qualitative estimation and geomorphic analysis of a selected drainage basin along with geomorphological mapping and measurements of some selected fluvial parameters.
4. To Study landforms and the related processes from the traditional concept to the contemporary development in fluvial Geomorphology

**Learning Outcomes:**

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

1. Understand the processes of erosion, deposition and resulting landforms.
2. Understand of how river systems develop within catchments.
3. Understand how the form of a river is controlled by processes operating over a catchment.
4. Analysis and measurements of fluvial properties of a drainage basin.

**Topics and Learning points****Unit 1: Introduction to Fluvial Geomorphology****Lectures**

1. Definition and scope
2. Drainage basin and stream network
3. The drainage basin as a geomorphic unit
4. Horton's laws of drainage composition
5. Laws of allometric growth
6. Phases of drainage network development- Glock's model

**12**

- Unit 2: Drainage Basin Hydrology** **12**
1. Runoff generation and types
  2. Gully and channel formation
  3. Chanel initiation
  4. Discharge and magnitude/frequency of flows in river system
- Unit 3: Open Channel Hydraulics** **10**
1. Types of flows
  2. Flow behaviour- sub-critical, critical and supercritical flow
  3. Flow velocity variations and measurement methods
  4. Shear stress and stream power
- Unit 4: Channel Morphology** **12**
1. River categories- alluvial, bedrock and mix alluvial-bedrock
  2. Cross-section morphology and reach morphology
  3. Controls on channel morphology-
  4. Channel bed configuration-
  5. Channel patterns or plan forms
- Unit 5: Fluvial Erosion, Transport and Deposition** **18**
1. Erosion processes and associated landforms
  2. Transportation processes and associated landforms
  3. Depositional processes and associated landforms

#### References Books:

1. **Charlton, R. (2008):** Fundamentals of fluvial Geomorphology, Routledge, NewYork.
2. **Fryirs, K.A. and Brierley, G.J. (2013):** Geomorphic Analysis of River Systems: An approach to reading the landscape, Wiley-Blackwell.
3. **Garde, R.J. (2006):** River Morphology, New age international limited publishers New Delhi.
4. **Kale, V.S. and Gupta, A. (2001):** Introduction to Geomorphology, Orient Longman, Kolkata.



5. **Knighton, D. (1998):** Fluvial forms and processes, Arnold, an imprint of Hodder Education, and Hachette UK Company, London.
6. **Knighton, D. (1998):** Fluvial forms and processes, Arnold, an imprint of Hodder Education, and Hachette UK Company, London.
7. **Kondolf, M.G. and Piegay, H. (2016):** Tools in Fluvial Geomorphology, Wiley-Blackwell.
8. **Leopold, L.B., Wolman, M.G. and Miller, P. (1954):** Fluvial processes in Geomorphology, Freeman and Co. San Francisco.
9. **Maithi, R. (2016):** Modern approaches to Fluvial Geomorphology, Primus Books.
10. **Mangelsdorf, J., Scheurmann, K. and Weib, F.H. (1989):** River Morphology, Springer-Verlag.
11. **Morisawa, M. (1985):** Rivers: Forms and Processes, Longman, UK.
12. **Richards, K. (1982):** River: Forms and processes in alluvial channels. Methuen and Co. London.
13. **Robert, A. (2003):** River Processes: An Introduction to Fluvial Dynamics. Hodder Education, and Hachette UK Company, London.

**M.A/M.Sc. Geography II SEM III****Subject: PAGG 231 Geoinformatics II**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To understand the field of Geoinformatics.
2. To provide understanding of fundamentals of GIS, Remote sensing and their applications.
3. To prepare skilled manpower to fulfill the dream of Digital India.
4. To encourage the research and development in the field of Geoinformatics.

**Learning Outcomes:**

By the end of the course:

1. Students will able to understand about remote sensing.
2. Students can understand the satellite remote sensing
3. Students can do the image processing.
4. Students can develop an idea about satellite image interpretation.

**Topics and Learning points****Unit 1: Introduction to Remote Sensing****Lectures**

1. Remote Sensing: definition, concept
2. Principles of Remote sensing
3. History of Remote Sensing
4. Development of Remote Sensing in India

**12****Unit 2: EMR and EMS****10**

1. EM Radiation, EM Spectrum, Spectral Signature
2. Interaction of EMR with atmosphere
3. Interaction of EMR with Earth's surface
4. Black body radiation, Laws of radiation

**Unit 3: Platforms and Satellites**

1. Platform: Types and characteristics
2. Satellites: Geo-stationary and Sun synchronous
3. Earth Resources Satellites: LANDSAT, SPOT, IRS, IKONOS satellite series
4. Meteorological satellites: INSAT, NOAA, GOES

**Unit 4: Sensors****14**

1. Sensors: Concept and Basic Principles
2. Types of Sensors : Across track (whiskbroom) and Along track (push broom) scanning
3. Optical mechanical scanners: MSS, TM, LISS, WiFS, PAN

**Unit 5: Resolution and Image Interpretation Techniques****14**

1. Resolution concept and Principles
2. Types of Resolution – Spectral, Spatial, Radiometric
3. Basic principles, types, steps and elements of image interpretation
4. Techniques of visual interpretation and interpretation keys

**Reference Books:**

1. Anji Reddy, M. (2004): Geoinformatics for environmental management. B.S. Publications
2. Campbell, J.B. (2002): Introduction to Remote sensing. Taylor Publications.
3. Chang T.K. (2002): Geographic Information Systems. Tata McGraw Hill
4. Drury, S.A. (1987): Image Interpretation in Geology. Allen and Unwin.
5. Francis Tar Bernhardsen. Geographical Information Systems. John Wiley.
6. Gupta, R.P. (1990): Remote Sensing Geology. Springer Verlag.
7. Heywood, I., Cornelius S, Crver Steve. (2003): An Introduction to Geographical Information Systems. Pearson Education
8. Jensen, J.R. (2000): RS of the Environment: An Earth resource Perspective Prentice Hall.
9. Joseph George (2003): Fundamentals of remote sensing. Universities Press.

**Learning Objectives:**

1. To provide an introduction to research methods and the research process.
2. To learn the principles of research design, data collection, data analysis, and interpretation.
3. To provide students with the skills necessary to design and conduct research studies.
4. To understand the methods of data collection and data analysis.
5. To aware the students with the research ethics and plagiarism.

**Learning Outcomes:**

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

1. Understand the research process and different types of research designs
2. Identify research problems and formulate research questions
3. Choose appropriate research methods and data collection techniques
4. Analyze and interpret research data
5. Write research reports and communicate research findings effectively

**Topics and Learning points****Unit 1: Introduction to Research Methodology****Lectures**

1. Meaning and objectives of research
2. Characteristics of Research
3. Types of Research
4. Various steps in Research Process
5. Research Methods versus Methodology

**10****Unit 2: Research Problem and Research Design****12**

1. Definition and identification of the Research Problem
2. Technique involved in defining a problem
3. Definition and purpose of Research Design
4. Characteristics of Good Research Design

**Unit 3: Sampling Design** **12**

1. Sampling Design – Definition of Population, Sample and Sampling Design
2. Advantages and disadvantages of Sampling
3. Characteristics of a good sample
4. Types or method of sampling

**Unit 4: Methods of data collection and data analysis** **15**

1. Primary data: Questionnaire, Interview and Observation Method/Field Work Method
2. Sources of Secondary data
3. Hypothesis- definition and types
4. Measure for Central Tendency and Dispersion
5. Correlation and Regression and Time series Analysis
6. Parametric and non-parametric tests

**Unit 5: Report writing and research ethics** **15**

1. Dissertation and thesis, research paper, review article, short communication, conference presentation, meeting report, etc.
2. Structure and organization of research reports; literature review
3. Research ethics and plagiarism
4. Use of plagiarism detection software's
5. Research opportunities and funding agencies

**Reference Books:**

1. Gaum, Carl G., Graves, Harold F., and Hoffman, Lyne, S.S., (1950): Report Writing, 3rd ed., New York: Prentice-Hall.
2. Kothari, C.R. (2004): Research Methodology: Methods and Techniques, New Age International (P) Ltd., New Delhi – 110002.
3. Kothari, C.R., (1984): Quantitative Techniques, 2nd ed., New Delhi: Vikas Publishing House Pvt. Ltd.
4. Mishra Shanti Bhushan and Shashi A. (2011): Handbook of Research Methodology, Educreation Publishing, New Delhi – 110075.

5. Pandey, P. and Pandey, M.M. (2015): Research Methodology: Tools and Techniques, Bridge Center, Romania, European Union.
6. Tandon, B.C., (1979): Research Methodology in Social Sciences. Allahabad, Chaitanya Publishing House.
7. Ullman, Neil R. (1978): Elementary Statistics, New York: John Wiley & Sons, Inc.
8. Yamane, T., Statistics (1973): An Introductory Analysis, 3rd ed., New York: Harper and Row.

**Subject: PAGG 233 (A) Tropical Geomorphology**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To introduce basic concept and principles of tropical geomorphology.
2. To provide understanding of process of erosion, deposition and resulting landforms of tropical region.
3. To learn different types of geomorphic processes like weathering and mass wasting and cycle of erosion.
4. To understand factor Factors influencing the weathering.

**Learning Outcomes:**

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

1. Understand the processes of erosion, deposition and resulting landforms of tropical region
2. Explain different types of geomorphic processes like weathering and mass wasting and cycle of erosion
3. Understand the distribution of laterite soil in India and the responsible agents for formation.
4. Understand the morphology of planation surfaces in tropical region.

**Topics and Learning points****Unit 1: Introduction to Tropics****Lectures**

1. Tropical Environment –Definition **12**
2. Peculiarities of tropical climate
3. Classification of Tropics
4. Morphogenetic regions - Temperature, rainfall, humidity, vegetation

**Unit 2: Tropical Weathering****12**

1. Factors influencing the weathering
2. Solubility and Mobility of minerals in Tropics
3. Weathering profile: Deep weathering
4. Tropical Soils: Process of soil formation in Tropics, Clay minerals.

**Unit 3: Duricrusts and Laterites****12**

1. Duricrusts and Laterites – Definition
2. Indurated laterites - Properties and world distribution
3. Classification by site, Morphology and chronology
4. A complete account of various divisions of Lateritic Profile
5. Landform development on laterites
6. Distribution of laterites in India
7. Theories of origin of iron in laterites

**Unit 4: Tropical Landscape****14**

1. Tropical Terrain – Relief characteristics
2. Slope and valley forms
3. Domed and boulder inselbergs
4. Hill slopes and Pediments
5. Tropical coasts

**Unit 6: Tropical Planation****14**

1. Formation and Types of planation surfaces
2. Morphology of planation surfaces
3. Peneplains, Pediplains, Etchplains
4. Double surface of planation

**References Books:**

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



**Subject: PAGG 233 (B) Agro-Meteorology**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. This course covers the principles and applications of meteorology in agriculture.
2. Students will learn the fundamentals of climate, weather patterns, and their effects on crop growth and development.
3. The course also examines the use of weather information and forecasting techniques for agricultural decision-making.
4. Students will understand the impact of climate change on crop growth and development.

**Learning Outcomes:**

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

1. Understand the fundamentals of meteorology and climatology
2. Describe the effects of climate and weather patterns on crop growth and development
3. Analyze the use of weather information in agricultural decision-making
4. Evaluate the role of agro-meteorology in sustainable agriculture

**Topics and Learning points****Unit 1: Introduction to Agro meteorology****Lectures**

1. Meaning and definition
2. Nature and scope
3. Development of Agro meteorology
4. Importance of Agro meteorology

**12****Unit 2: Plants: Energy and Moisture****16**

1. Plants and solar energy Factor affecting solar radiation within Plants
2. Factor affecting soil temperature
3. Importance of moisture for plants
4. Soil Moisture
5. Water stress and plant development

<b>Unit 3: Crop Growth and Development</b>	<b>12</b>
1. Effects of weather on crop growth and development	
2. Relationship between weather and pests and diseases	
3. Mitigation strategies for weather related crops losses	
4. Impact of biological hazard on crops	
<b>Unit 4: Application of RS and GIS in Agro Meteorology</b>	<b>12</b>
1. Introduction to RS and GIS	
2. Use of RS and GIS in Agro Meteorology	
3. Application of RS and GIS in crop diseases	
4. Application of RS and GIS in crop management	
<b>Unit 5 Agro Climatic Classification</b>	<b>12</b>
1. Meaning and definition	
2. Agro Climatic region	
3. Agro Climatic region in India	
4. Impact of climate change on agriculture	

#### References Books:

1. Climate and Agriculture: An Introductory Guide by Mark S. Rasmussen
2. Agro-meteorological Forecasting: Principles and Applications by Jyoti Prakash
3. Climate Change and Agriculture: An Introduction by Benjamin L. Allen.
4. Geiger, Rudolf (1966): The Climate near the Ground, Harward University Press.
5. Hobbs, John E. (1980): Applied Climatology, Dawson West View Press.
6. Lal, M. (ed.) (1993): Global Warming, Tata McGraw Hill, New York.
7. Mather, J.R. (1974): Climatology: Fundamentals and Applications, McGraw Hill, New York.
8. Oliver, John E. (1973): Climate and Man's Environment, John Wiley and Sons, New York.
9. Oliver, John E. (1981): Climatology, Selected Applications, V.H. Winston and Sons, London.

**Subject: PAGG 233(C) Urban Geography**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To enable the students to understand different urban definitions and concepts.
2. To acquaint the students different models related to urban and cities.
3. Students can learn classification of cities.
4. Students can understand morphology of cities.

**Learning Objectives:**

1. Students will know migration status in urban sector.
2. Students will acquaint the difference between rural and urban sector.
3. Students will familiarize with the classification of Towns and Cities.
4. Students will understand the demographical structure of cities in India and world.
5. Students will know urban development policies in India.

**Topics and Learning points****Unit 1: Urbanization****Lectures**

1. Meaning of Urban settlement and urbanization.
2. Review of spatial- temporal variations in urbanization in the world
3. Urbanization curve
4. Contemporary factors of urbanization

**12****Unit 2: Urban Morphology****12**

1. Models of urban structure:
2. Park and Burgess Model
3. Homer Hoyet Model
4. Harris and Ullman Model
5. Characteristics and demarcation of CBD

**Unit – 3: Urban Characteristics and Classification** **12**

1. Growth of Urban population
2. Density of population incites
3. Age, sex and occupational structure
4. Criteria used for classification
5. Functional classification of towns and cities

**Unit – 4: Central Place** **12**

1. Christaller's Central Place Theory
2. Rank-size relationship and rank- size rule
3. Hierarchy of urban settlements

**Unit – 5: Urban issues, policies and planning** **16**

1. Price of land and vertical and horizontal growth of cities
2. Scarcity of housing and growth of slums
3. Problems of civic amenities
4. Urban transport problem
5. Urban Environmental pollution
6. Urban development policy in India
7. Need &Element of city plan
8. Use of GIS in Urban Planning

**References Books:**

1. Bhattacharya: Urban Development in India, Shreepublication
2. Brian, R.K. (1996): Landscape of Settlement Prehistory to present, Routledge,London
3. Careter (1972): Fourth edition: The study of Urban Geography, Arnold,London
4. Hall P. (1992): Urban and Regional Planning, Routledge,London
5. K. Siddharth and S. Mukherji : Cities, Urbanization and UrbanSystems
6. Kundu, A. (1992): Urban Development and Urban Research in India, Khanna Publication

7. Mayer and Kohan: Readings in Geography
8. Northam: Urban Geography
9. Roy Turner: Indian's Urban Future
10. R.B Mandal-V.G A Textbook ( Concept publishing Company)
11. Shah Manzoor Alam: Urbanization in Developing Countries
12. Singh.K.and Steinberg.F. (eds)(1998): Urban India in Crisis. New Age Interns
13. Urban Geography: Tim Hall
14. Verma: Urban Geography, Rawat, Jaipur

**Subject: PAGG 234 Practical in GIS**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To Introduce a student's practical knowledge of aerial photography
2. To understand the use of computing devices and software in Geoinformatics.
3. To understand overview of digital data, formatting and interpretation of different remotely-gathered satellite images.
4. To understand Map enhancement and pre-processing.

**Learning Outcomes:**

1. Student able to develop an idea about different types of thematic mapping techniques.
2. Student will know about the interpretation of Air photographs and Satellite imagery.
3. Student will Gain knowledge about image processing, classification of georeferencing, editing and output, overlays.
4. Students will read, interpret, and generate maps and other geographic representations as well as extract, analyze, and present information from a spatial perspective.

**Topics and Learning points****Unit 1: Aerial Photography Measurements and Interpretation****Lectures**

1. Scale and height (using parallax bar)
2. Visual Interpretation of single aerial photograph
3. Interpretation of stereo pair using Stereoscope

**12****Unit 2: Satellite Images****10**

1. Visual interpretation of LISS, PAN, WiFS
2. Cartosat Data, IKONOS and Quick Bird
3. Visual Interpretation of thermal and Radar image

**Unit 3: Spatial Database Layer Generation** **14**

1. Raster: Full Grid, Chain Codes and Run Length Codes
2. Vector: Manual Digitization, Digitization Errors and Topology Building

**Unit 4: GIS data input** **14**

1. Attribute data input creation of schema, tables data definition, data updating, queries on tables, simple –complex query with two or more tables using SQL.
2. Spatial data input – With AutoCAD map software scanning on screen digitization, editing, topography creation, linear and area measurements, linking of attribute data with geographical features.

**Unit 5: Spatial data analysis techniques** **14**

1. Classification Scheme of Vector-Based and Raster-Based GIS Operations
2. Raster-Based Techniques: Methods of Reclassification, Overlay Analysis, Slope and Aspects, Buffering, Cost-Distance Calculation
3. Vector-Based Techniques: Map Manipulation Techniques, Buffering, Overlay Analysis, Network Analysis
4. Digital Terrain Analyses and Modelling: TIN and DEM, Surface Representation & Analysis.

**Reference Books:**

1. Burrough, P.A. and R.A. McDonnell (2000): Principles of Geographical Information System, Oxford University Press.
2. Chang Kang-tsung. (2002): Introduction to GIS, Tata McGraw Hill, New Delhi.
3. C. P. Lo and Albert, K. W. Yeung (2002): Concepts and Techniques of Geographic Information System, 2002 Prentice –Hall, India.
4. George Joseph (2003): Fundamentals of Remote Sensing, Universities Press, Hyderabad
5. Kang – Tsung – Chang, (2002): Introduction to Geographical Information System, McGraw Hill.
6. J. R. Jensen, (2003) : Remote Sensing of Environment, An Earth Resource Perspective, Pearson Education Pvt. Ltd., New Delhi

7. P. A. Burrough and R. A. McDonnell, (2000): Principles of Geographical Information System, Oxford University Press.
8. Paul A. Lonfley, Michel F. Goodchild, D J. Maguire and D.W. Rhind (2002): Introduction to Geographic Information Systems and Science, John Wiley and Sons Ltd.
9. Vaidyanadhan, R. (1973): Index to a set of 70 aerial stereopairs, UGC, New Delhi.



**Subject: PAGG 235 Watershed Management**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. This course provides an overview of the principles and practices of watershed management.
2. It covers the concept of a watershed, the components of a watershed ecosystem, the factors affecting watershed management, and the different strategies for watershed management.
3. It is designed to provide students with the skills necessary to develop and implement watershed management plans that balance environmental, social, and economic objectives.

**Learning Outcomes:**

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

1. Understand the concept of a watershed and its management
2. Identify the different components of a watershed ecosystem and their interrelationships
3. Assess the ecological, social, and economic factors affecting watershed management
4. Evaluate different watershed management strategies and their effectiveness
5. Apply watershed management techniques to real-world scenarios

**Topics and Learning points**

<b>Unit 1: Concept of watershed management</b>	<b>Lectures</b>
<ol style="list-style-type: none"> <li>1. Definition, concepts of watershed; watershed management,</li> <li>2. Principle of watershed management</li> <li>3. Necessity of watershed management</li> <li>4. Problems in watershed management</li> </ol>	<b>12</b>
<b>Unit 2: Characteristics of watershed</b>	<b>10</b>
<ol style="list-style-type: none"> <li>1. Delineation of Watershed</li> <li>2. Characteristics: Size , Shape , Physiography , Climate, Drainage, Land use, Vegetation, Geology and Soils</li> </ol>	

**Unit 3: Hydrological process in watershed** **15**

1. Precipitation, interception, infiltration, evaporation, evapo-transpiration, Surface runoff, ground water-flow, water budget
2. Hydrological cycle

**Unit 4: Water and soil conservation in watershed** **15**

1. Water conservation:  
Nala Bunding, Check dams, Farm ponds, Percolation tanks, Artificial recharge
2. Soil conservation-  
Contour Bunding, Gullyplugging, Trench cum mound, Levelling

**Unit 5: Watershed development** **12**

1. Application of Remote Sensing and GIS in watershed management
2. Integrated watershed development plans
3. Importance of watershed management in national development

**Reference Books:**

1. Dhruvanarayana, V.V., Sastry, G., Patnaik, U.S.: Watershed Management
2. Kakde, B.K.: Watershed Manual – A Guide for Watershed Development Practitioners and Trainers, BAIF Development Research Foundation, Pune.
3. Murthy, JVS: Watershed Management, New age International Publishers.
4. Rajesh Rajora: Integrated Watershed Management- A Field Manual for Equitable, Productive and Sustainable Development, Rawat Publication, Jaipur.
5. Singh Rajvir: Watershed Planning and Management, 2nd Edition, Yash Publishing House, Bikaner, India.
6. Suresh,R.: Soil and Watershed Conversation Engineering, 2nd Edition, Standard Publication Distributors, Delhi.
7. Schwab,G.O. et al: Soil and Water Conservation Engineering, 4th Edition, John Wiley & Sons.

**Subject: PAGG 236 (A) Practical in Geomorphology**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To understand the symbols used in geomorphological mapping.
2. To develop the ability to interpret the map in terms of landforms and processes.
3. To learn how to use clinometers and profiles from toposheets for hill slope analysis.
4. To learn how to use GPS survey for preparation of beach, river channel maps, etc.
5. To learn how to identify landforms using contours.

**Learning Outcomes:**

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

1. Prepare a geographic map of a small area or basin using toposheets or field data.
2. Identify segments in hill slopes.
3. Use GPS survey for preparation of beach, river channel maps, etc.
4. Estimate grain size parameters.
5. Identify landforms using contours.

**Topics and Learning points**

<b>Unit 1: Geomorphological mapping</b>	<b>Lectures</b>
1. Chart showing symbols	<b>14</b>
2. Preparing a geographic map of a small area / basin –toposheets /field	
3. Interpretation of the map in terms of forms and processes	
 <b>Unit 2: Hill slope Analysis</b>	 <b>16</b>
1. Direct and indirect measurements	
2. Using clinometers / profiles from toposheets,	
3. Identification of segments	
4. Dalrymple et al's nine- unit landsurface model- Understanding nature of processes	

**Unit 3: Field Survey****14**

1. Channel cross sections/ Beach/Hill slope profile Soil/sediment sample collection
2. Surveying and plotting of stream or gully channel cross-section or beach profile or slope profile.
3. Quadrat or Traverse survey of sediment size on river bed beach.
4. Analysis of shape and size of coarse sediment (Zingg's classification)
5. GPS survey
6. Preparation of beach, river channel map setc. using GPS

**Unit 4: Laboratory work****14**

1. Soil/Sediment analysis
2. Analysis of 1 sandy and 1 Clayey sample
3. Plotting of data on probability graph paper
4. Estimation of grain size parameters
5. Interpretation of results

**Unit 5: Topographical maps****06**

1. Introduction to topographical map
2. Identification of landforms using contour
3. Interpretation of topographical map

**Reference Books:**

1. Aackombe, R. V. and Gardiner, V. (1983): Geomorphological Field Manual
2. Chorley, R. J., Schumm, S. A. and Sugden, D.E. (1984) : Geomorphology, Methuen, London
3. Goudie, A. (1990): Geomorphological Techniques, Unwin Hyman, London
4. Hart, M. G. (1986): Geomorphology, Pune and Applied Geomorphology, George Allen and Unwin
5. Kale, V. S. and Gupta, A. (2001): Introduction to Geomorphology, Orient Longman, Calcutta
6. King, C.A.M. (1966): Techniques in Geomorphology, Edward Arnold, London George Allen and Unwin, London

**Subject: PAGG 236 (B) Practical in Climatology**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. This course covers the principles and applications of climatology.
2. Students will learn the Instrumentation and measurement techniques of weather elements. .
3. Students will learn to collect data from weather station for various weather elements.
4. The course also examines the use of weather information and forecasting techniques for various purposes like agricultural, decision-making etc.

**Learning Outcomes:**

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

1. Understand the fundamentals concepts related to practical in climatology
2. Understand different weather instrument and measurement of weather elements
3. Analyze the data collected from weather station and can prepare weather charts.
4. Understand the process of forecasting and will able to predict weather elements.

**Topics and Learning points****Unit 1: Weather Elements****Lectures**

- A. Instrumentation and measurement techniques of weather elements
1. Temperature measurement techniques
  2. Pressure measurement techniques
  3. Precipitation measurement techniques
  4. Humidity measurement techniques

**16****Unit 2: Station Model****16**

1. Sign and Symbol
2. Rules for decoding
3. Exercise on Station model
4. Interpretation of station model

<b>Unit 3: Lapse rate</b>	<b>12</b>
1. Exercise on environmental lapse rate	
2. Exercise on dry adiabatic lapse rate	
3. Exercise on wet adiabatic lapse rate	
<b>Unit 4: Water Balance</b>	<b>12</b>
1. Computation of water balance	
2. Interpretation of water balance	
<b>Unit 5: Interpretation of weather report of IMD</b>	<b>08</b>
1. Introduction to daily weather report	
2. Sign and Symbol	
3. Interpretation of weather report	

#### **Reference Books:**

1. Indian Daily Weather Report, IMD, Pune.
2. Oliver, John E. (1973): Climate and Man's Environment, John Wiley and Sons, New York.
3. Thornthwaite, C. W. and Mather, J. R. (1957): Instructions and Tables for computing potential evapo-transpiration and water balance, Drexel Institute of Technology, Laboratory of Climatology.
4. WMO No. 8 (1983): Guide to Meteorological Instruments and Methods of Observation
5. Navarra, J. G. (1979): Atmosphere, Weather and Climate, W. B. Saunders Company, Philadelphia.

**Subject: PAGG 236 (C) Practical in Population and Settlement Geography**

No. of Credits: 04

Periods: 64

**Learning Objectives:**

1. To enable the students to use various techniques of calculating rates.
2. To acquaint the students with Settlement Models.
3. To acquaint the students with the principles of surveying the first hand data from rural and urban areas.

**Learning Outcomes:**

1. Understand population techniques to calculate rates and models.
2. Learn about model of cities and apply for Indian cities.
3. Understand concentration of cities, worldwide effects of cities.
4. Study in urban geography using RS and GIS techniques.

**Topics and Learning points****Unit 1: Demographic indices****12**

1. Mean age at marriage
2. Measures of fertility
3. Measures of mortality, IMR & A.S.D.R Dependency ratio

**Unit 2: Determinants of Demographic transition:****12**

1. Demographic transition-applied to Maharashtra
2. Pull-push factors affecting volume of migration-simple correlation Matrix
3. Rural urban composition of population

**Unit 3: Population Projection and index****12**

1. Population projection using linear equation regression
2. Human development index
3. Gender development index

**Unit 4: Models in Settlement Geography****12**

1. Gravity model by W.J.Reilly and Zipf, its application,
2. Indices of C.B.D
3. Stages according to urbanization curve
4. Rank size rule
5. Gini's Coefficient concentration index

**Unit 5: Village Survey/ Urban Study****16**

1. Preparation of questionnaire
2. Collection of Population and settlement data
3. Rural / Urban Sprawl
4. Spatial and temporal analysis using images of satellite
5. Data analysis and preparation of report

**Reference Books:**

1. Economic and Political weekly-Special issue of populationsurvey
2. Liendzore J.M Techniques in HumanGeography
3. Martin Cad: Analytical UrbanGeography
4. Siddharth,K and Mukherjee,S (1999): Cities urbanization and urbansystems
5. Chandana,R.,C.Population,Geography
6. Yeats,M.H.(1978): An introduction to quantitative analysis in humanGeography.
7. Carter Harold: UrbanGeography
8. John R.Weeks: Population – an introduction to concepts andissues.



## UAGG SEC01: Advanced Techniques in Google Earth

No of Credits: 02

Periods: 32

### Learning Objectives:

1. To provide an introduction to the Google Earth Pro software.
2. To study capabilities for spatial data visualization, analysis, and communication.
3. To learn how to navigate and customize Google Earth Pro, import and manage Geographic data.
4. To learn to create and edit place marks, polygons, paths, and images, measure distances and areas, perform spatial queries and analysis, and share and export maps and data.

### Learning Outcomes:

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

1. Navigate and customize the Google Earth Pro interface and preferences.
2. Import and manage geographic data in different formats.
3. Create and edit placemarks, polygons, paths, and images, and add attributes and labels to geographic features.
4. Use measurement and annotation tools to perform spatial analysis and querying.
5. Share and export maps and data in different formats and applications.

### Topics and Learning points

<b>Unit 1: Introduction to Google Earth</b>	<b>Lectures</b>
<ol style="list-style-type: none"> <li>1. Overview of Google Earth Pro interface and tools</li> <li>2. Customizing the Google Earth Pro preferences</li> <li>3. Navigation and view controls in Google Earth Pro</li> </ol>	<b>06</b>
<b>Unit 2: Data Import and Management</b>	<b>06</b>
<ol style="list-style-type: none"> <li>1. Importing and exporting data in different formats</li> <li>2. Creating and managing folders, layers, and projects</li> <li>3. Managing and editing data attributes and metadata</li> </ol>	

**Unit 3: Creating and Editing Geographic Features** **06**

1. Creating and editing placemarks, polygons, paths, and images
2. Adding and editing attributes and labels to geographic features
3. Using measurement and annotation tools in Google Earth Pro

**Unit 4: Spatial Analysis and Querying** **07**

1. Performing spatial queries and filters
2. Measuring distances and areas
3. Calculating elevation profiles and 3D views
4. Using time and animation tools in Google Earth Pro

**Unit 5: Sharing and Exporting Maps and Data** **07**

1. Creating and sharing maps and KML files
2. Using Google Earth Pro as a presentation tool
3. Exporting data to GIS software and other applications

**Recommended Textbooks Websites:**

- Battersby, S. E., and Finn, M. P. (2018). Mapping and Visualization with SuperCollider. Springer.
- Brown, M. (2014). Google Maps: Power Tools for Maximizing the API. McGraw Hill Professional.
- Joly, D., and Gaffuri, J. (2016). Web Mapping Illustrated: Using Open Source GIS Toolkits. O'Reilly Media.
- Kohler, A., and Gow, J. (2018). Using Google Earth in Geography Classrooms: A Collection of Lessons and Ideas. Springer.
- Roth, R. E., and Krum, K. (2013). Google Maps API. Apress.
- Google Earth Help Center: <https://support.google.com/earth/?hl=en#topic=4386911>
- Google Earth User Guide: <https://support.google.com/earth/answer/21955>
- Google Earth Outreach: <https://www.google.com/earth/outreach/>
- Google Earth Blog: <https://www.gearthblog.com/>

- Google Earth Community: <https://support.google.com/earth/community?hl=en>
- Google Earth Education: <https://www.google.com/earth/education/>
- GIS Geography: <https://gisgeography.com/google-earth-pro-tutorial/>
- KML Tutorial: [https://developers.google.com/kml/documentation/kml\\_tut](https://developers.google.com/kml/documentation/kml_tut)
- Earth Point: <https://www.earthpoint.us/>
- Google Earth Studio: <https://www.google.com/earth/studio/>