K. C. E. Society's
Moolji Jaitha College
An 'Autonomous College' Affiliated to
K.B.C. North Maharashtra University, Jalgaon.
NAAC Reaccredited Grade - A (CGPA : 3.15 - 3rd Cycle)
UGC honoured "College of Excellence" (2014-2019)
DST(FIST) Assisted College

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ESTD. 1945

के. सी. ई. सोसायटीचे
मूळजी जेठा महाविद्यालय
क.ब.चौ. उत्तर महाराष्ट्र विद्यापीठ, जळगाव संलग्नित
'स्वायत्त महाविद्यालय'
नॅकद्वारा पुनर्मानांकित श्रेणी - 'ए' (सी.जी.पी.ए. : ३.१५ - तिसरी फेरी)
विद्यापीठ अनुदान आयोगाद्वारा घोषित 'कॉलेज ऑफ एक्सलन्स' (२०१४-२०१९)
डी.एस.टी. (फीस्ट) अंतर्गत अर्थसहाय्य प्राप्त

Date :- 01/08/2024

NOTIFICATION

Sub :- CBCS Syllabi of M.A./M.Sc. in Geography (Sem. III & IV)

Ref. :- Decision of the Academic Council at its meeting held on 27/07/2024.

The Syllabi of M.A./M.Sc. in Geography (Third and Fourth Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2023 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2024-25.

Copy of the Syllabi Shall be downloaded from the College Website (www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

To :

1) The Head of the Dept., M. J. College, Jalgaon.
2) The office of the COE, M. J. College, Jalgaon.
3) The office of the Registrar, M. J. College, Jalgaon.

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समर्थ कॉलनी जवळ, जळगांव – ४२५ ००२. (महाराष्ट्र, भारत) । दूरध्वनी क्र. : +९१ २५७-२२३७३६३, २२३४२८१ । ई-मेलः mjcollege@kces.in । वेबसाईटः mjcollege.kces.in

Khandesh College Education Society's

Moolji Jaitha College, Jalgaon

An "Autonomous College"

Affiliated to

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon-425001

STRUCTURE AND SYLLABUS

M.A./M.Sc. Honours/Honours with Research (M.A./M.Sc. Geography)

Under Choice Based Credit System (CBCS)
and
As per NEP-2020 Guidelines

[w.e.f. AcademicYear:2024-25]

Preface

Geography, as a subject, is an ancient discipline that explores the interactions between humans and their environment. Over the years, geography has evolved and incorporated various technological advancements, leading to significant developments in the field. One such noteworthy transformation has been the integration of Remote Sensing (RS), Geographic Information Systems (GIS), and Global Positioning System (GPS) technologies. These cutting-edge tools have revolutionized how geographers collect, analyze, and interpret spatial data, making geography an even more dynamic and relevant subject in contemporary times.

The Department of Geography at M. J. College (Autonomous), Jalgaon, is at the forefront of embracing these recent trends in geography. Through the courses offered, including B.A. Geography, B.Sc. Geography, M.A/M.Sc. Geography, and Ph.D., the department equips students with comprehensive knowledge and practical skills to navigate the complexities of modern geography. Additionally, the Certificate Course in Geoinformatics serves as a valuable platform for students to delve deeper into the applications of RS, GIS, and GPS technologies.

One of the standout characteristics of the Department is its team of expert and qualified faculties. These educators not only possess extensive academic knowledge but also have hands-on experience in utilizing geospatial technologies effectively. Their guidance empowers students to explore and understand the intricacies of geographical phenomena using the latest tools and methodologies.

The Department boasts state-of-the-art facilities, including smart laboratories for practicals, a central library supplemented with a departmental library, and a well-equipped GIS computer lab with internet access. The availability of these resources ensures that students have ample opportunities to engage in hands-on learning and conduct research, contributing to a comprehensive understanding of geographic concepts. Moreover, the Department has been recognized as a research center for Ph.D. studies, encouraging scholarly pursuits in the realm of geography. This designation highlights the institution's commitment to pushing the boundaries of geographical knowledge and fostering innovative research in the field. The integration of technology in geography education is further augmented by the presence of smart classrooms and advanced geographical instruments. These resources enable interactive learning and support students in developing a deep appreciation for the spatial dimensions of various phenomena.

In addition to academic excellence, the Department is devoted to providing specialized coaching for national-level exams such as NET/SET and competitive examinations. This emphasis on exam preparation equips students with the necessary skills to excel in their careers and become leading professionals in the field of geography. The collaboration with the Indian Institute of Remote Sensing (IIRS) as an Outreach Training Program center is a testament to the Department's commitment to keeping abreast of the latest advancements in geospatial technology. This association allows students and faculties to participate in training programs conducted by experts in the field, enhancing their knowledge and skills in RS, GIS, and GPS applications. Furthermore, the Department of Geography at M. J. College (Autonomous), Jalgaon, proudly boasts access to the best telescopes for sky watching. This unique feature provides students with an opportunity to explore celestial phenomena and their connections with the Earth, bridging the gap between the terrestrial and astronomical realms.

Finally, the Department's focus on career opportunities in geography ensures that graduates are well-prepared to enter various professional fields. The interdisciplinary nature of

geography opens doors to careers in environmental management, urban planning, disaster management, cartography, geospatial analysis, and more. The versatility of geography as a subject makes it a rewarding and promising choice for students seeking diverse and impactful career paths.

The Department of Geography at M. J. College (Autonomous), Jalgaon, stands as a vibrant and progressive hub for geography education. The integration of RS, GIS, and GPS technologies, coupled with expert faculty, modern facilities, and extensive research opportunities, equips students to become adept geographers, ready to address the pressing challenges of our ever-changing world.

Program Outcomes (PO) for M.A./M.Sc. Program:

Upon successful completion of the M.A./M.Sc. program, student will be able to:

PO No.	PO
PO 1	Student possess an in-depth understanding of advanced theories, concepts, and methodologies in their specific field of study.
PO 2	Student should demonstrate advanced technical skills and proficiency in utilizing specialized equipment, software, and methodologies relevant to their field of study.
PO 3	Student should be capable of critically analyzing complex problems and synthesizing information from various sources.
PO 4	Student should be proficient in effectively communicating scientific information to both technical and non-technical audiences. They should be able to present their experimental findings through oral presentations, scientific writing, and the use of appropriate visual aids.
PO 5	Student should demonstrate leadership qualities and the ability to work effectively as part of a team.
PO 6	Student should have developed advanced research skills and the ability to independently design and conduct rigorous scientific investigations. They should be able to analyze scientific literature, formulate research questions, develop research plans, collect and analyze data, draw valid conclusions and know about IPR.
PO 7	Student should understand and adhere to ethical principles and professional standards in their field.
PO8	Student should recognize the importance of continuous learning and professional development. They should have the skills and motivation to stay updated with advancements in their field, engage in lifelong learning, and pursue further academic or professional opportunities.

Program Specific Outcome PSO (M.A./M.Sc. Geography):

After completion of this course, students are expected to learn/understand the:

PO No.	
PSO 1	Knowledge of geographical terms, concepts, and theories and will be able to explain and find out the relation between geographical factors and processes.
PSO 2	How their life is related to different geographical factors such as environmental, economic, social, and cultural at the local and global scale. He/she will be able to evaluate

	factors such as environmental, economic, social, and cultural, with respect to spatial dimensions from a local to global scale.
PSO 3	Present the completed research through cartographic tools and other visual formats, with an explanation of research methodology, and carry out scholarly discussions.
PSO 4	Develop a research design including hypotheses, and research questions and also will be able to do a critical analysis of both qualitative and quantitative data to find out the answers using various theoretical and methodological approaches in both physical and human geographies
PSO 5	Skills in interpretation of thematic maps through visual and/or digital interpretation of topographic maps, weather maps, aerial photographs, and satellite images.
PSO 6	apply knowledge of remote sensing and GIS concepts, and techniques in various fields of earth and environment sciences.
PSO 7	Thinking in spatial dimensions and will be able to find out the temporal change which took place over the period of time and understand the present and extrapolate for the future.
PSO 8	Geographical distribution of the global human population and factors affecting human populations including human settlement and economic activities and transport networks. The students will be able to understand the impacts of human activities on the physical environment.

Credit distribution structure for two years/one-year PG MSc programme

Level	Sem	Major (Core) Subjects		Minor Subjects	OJT/Int, RP	Cumulative Credits/Sem	Degree/ Cumulative Cr.
		Mandatory (DSC)	Elective (DSE)				
6.0	I	DSC-1 (4T) DSC-2 (4T) DSC-3 (4T) DSC-4 (2P)	DSE-1(2T) A/B DSE-2(2P) A/B	RM (4T)		22	First-year PG OR One year PG diploma after 3 years UG
	II	DSC-5 (4T) DSC-6 (4T) DSC-7 (4T) DSC-8 (2P)	DSE-3(2T) A/B DSE-4(2P) A/B		OJT/Int (4)	22	
	Cum. Cr.	28	8	4	4	44	
	Exit option: PG diploma (44 Credits) after three-year UG degree						
6.5	III	DSC-9 (4T) DSC-10 (4T) DSC-11 (4T) DSC-12 (2P)	DSE-5(2T) A/B DSE-6(2P) A/B	--	RP (4)	22	Second-year PG after 3 years UG OR PG degree after 4 years UG
	IV	DSC-13 (4T) DSC-14 (4T) DSC-15 (2P) DSC-16 (2P)	DSE-7(2T) A/B DSE-8 (2P) A/B	...	RP (6)	22	
	Cum. Cr.	54	16		4+10	88	
2 Years-4 Sem. PG Degree (80-88 credits) after Three Year UG Degree or 1 Year-2 Sem PG Degree (40-44 credits) after Four Year UG Degree							

Sem- Semester, **DSC**- Department Specific Course, **DSE**- Department Specific Elective, **T**- Theory, **P**- Practical, **RM**- Research Methodology, **OJT**- On Job Training, **Int**- Internship, **RP**- Research Project, **Cum. Cr.** : Cumulative Credits

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
6.0	One-year PG Diploma program after 3 Yr Degree	40	44	2	1
6.5	Two-year master's Degree program After 3-Yr UG Or PG Degree after 4- Yr UG	80	88	4	2

Examination Pattern for MSc

Theory Question Paper Pattern:

- 60 (External) +40 (Internal) for 4 credits
  - External examination will be of three hours duration
  - There shall be 5 questions, each carrying equal marks (12 marks each), while the tentative pattern of question papers shall be as follows;
  - Q1 Attempt any 3 out of 4 sub-questions; each 4 marks
  - Q 2, Q3, Q4 and Q5 Attempt any 2 out of 3 sub-question; each 6 marks.
- 30 (External) +20 (Internal) for 2 credits
  - External examination will be of 1½ hours duration
  - There shall be 3 questions Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. while the tentative pattern of question papers shall be as follows;
  - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
  - Q 2 and Q3 Attempt any 2 out of 3 sub-question; each 6 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

i. Individual Assignments
ii. Seminars/Classroom Presentations/Quizzes
iii. Group Discussions/Class Discussion/Group Assignments
iv. Case studies/Case lets
v. Participatory & Industry-Integrated Learning/Field visits
vi. Practical activities/Problem Solving Exercises
vii. Participation in Seminars/Academic Events/Symposia, etc.
viii. Mini Projects/Capstone Projects
ix. Book review/Article review/Article preparation
x. Any other academic activity
xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher

can decide which units will be assessed using CCEs and which unit will be assessed based on IAT.
The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations.
The subject teachers must communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours and shall be conducted as scheduled.
- There shall be 05 marks for journal and viva voce. A certified journal is compulsory to appear for practical examination.
- The practical examination will be of a minimum of 3 hours duration and shall be conducted as per schedule for 2 consecutive days in case of practical where incubation conditions and allied aspects are essential.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by the department as per the schedule given.
- For internal practical examination, students must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and department head.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities the faculty assigns during regular practicals. For details, refer to internal theory examination guidelines.
- Finally, 40 (10+30) students' performance will be converted into 20 marks.

Exam Pattern:

Theory / Practical	**Credit**	**Internal**	**External**
Theory	**4**	**40**	**60**
Theory	**2**	**20**	**30**
Practical	**4**	**40**	**60**

M.A./M.Sc. Geography Course Structure

Semester	Course Module	Credit	Hours/ week	TH/ PR	Code	Title
I	DSC	4	4	TH	GEO-DSC-511	Principles of Geomorphology
	DSC	4	4	TH	GEO-DSC-512	Principles of Climatology
	DSC	4	4	TH	GEO-DSC-513	Social Geography
	DSE	2	2	TH	GEO-DSE-514A	Tourism Management
	DSE	2	2	TH	GEO-DSE-514B	Ecology & Environment
	DSC	2	4	**PR**	GEO-DSC-515	Practical I - Geomorphology
	DSE	2	4	**PR**	GEO-DSC-516A	Practical II - Climatology
	DSE	2	4	**PR**	GEO-DSE-516B	Hands on GIS Software
	DSC	4	4	TH	GEO-RM-517	Research Methodology for Geography
II	DSC	4	4	TH	GEO-DSC-521	Principles of Human Geography
	DSC	4	4	TH	GEO-DSC-522	Principles of Economic Geography
	DSC	4	4	TH	GEO-DSC-523	Watershed Management
	DSE	2	2	TH	GEO-DSE-524A	Cultural Geography
	DSE	2	2	TH	GEO-DSE-524B	Rural Morphology
	DSC	2	4	**PR**	GEO-DSC-525	Practicals in Human Geography
	DSE	2	4	**PR**	GEO-DSE-526A	Practicals in Economic Geography
	DSE	2	4	**PR**	GEO-DSE-526B	Interpretation of OS Sheets
	DSC	4	8	OJT	GEO-OJT-527	On Job Training/ Internship
III	DSC	4	4	TH	GEO-DSC-611	Sustainable Soil Resource Management
	DSC	4	4	TH	GEO-DSC-612	Introduction to GNSS
	DSC	4	4	TH	GEO-DSC-613	Applied Statistical Methods
	DSE		2	TH	GEO-DSE-614A	Geography of Water Resources
	DSE	2	2	TH	GEO-DSE-614B	Urban Morphology
	DSC	2	4	**PR**	GEO-DSC-615	Data Acquisition and Data Processing
	DSE	2	4	**PR**	GEO-DSE-616A	Web based Data Acquisition
	DSE	2	4	**PR**	GEO-DSE-616B	Application of SPSS
	DSC	4	4	**PR/RP**	GEO-RP-617	Research Project - I
IV	DSC	4	4	TH	GEO-DSC-621	Application of Geoinformatics
	DSC	4	4	TH	GEO-DSC-622	Geospatial Analysis
	DSE	2	2	TH	GEO-DSE-623A	Forest Resources Management
	DSE	2	2	TH	GEO-DSE-623B	Introduction to Global Environment
	DSC	2	4	**PR**	GEO-DSC-624	Practicals in Spatial data Processing
	DSC	2	4	**PR**	GEO-DSC-625	Practicals in Geospatial Analysis
	DSE	2	4	**PR**	GEO-DSE-626A	Thematic Cartography
	DSE	2	4	**PR**	GEO-DSE-626B	GIS and DBMS
	DSC	4	6	**PR/RP**	GEO-RP-627	Research Project - II

DSC : Department-Specific Core course
DSE : Department-Specific elective
TH : Theory
PR : Practical

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

M.A./M.Sc. (Geography)

Semester III

GEO-DSC-611: Sustainable Soil Resource Management

Total Hours: 60 **Credits: 4**

Learning objectives	• Understand the fundamental concepts of sustainable soil resource management • Analyze the factors influencing soil degradation • To acquaint the students with prospects and problems of soil degradation • To aware the students with natural resources available and need of conservation and protection.	
Course outcomes	After successful completion of this course, students are expected to: • Understand terminology used in soil and water conservation and management. • Understand the problems caused by poor management and subsequent soil degradation. • Analyze soil problems, and develop methods to address soil management and conservation problems. • Gain practical experience in utilizing tools for soil resource management. • Understand the societal implications of soil and land use management. .	
Unit	**Topic Particular**	**Hours**
Unit I	**Introduction to Sustainable Soil Resource Management** ○ Meaning and definition of sustainable soil resource management ○ Historical Background and Scientific Foundations ○ Significance of sustainable soil resource management ○ Strategies and approaches for Sustainable Soil Management	15
Unit II	**Soil Degradation** • Soil degradation: meaning, causes and effects. ○ Types of Soil Degradation ○ Causes of Soil Degradation ○ Effects of Soil Degradation ○ Methods to Address Soil Degradation • Soil degradation: Agricultural, Industrial and Natural	15
Unit III	**Soil Conservation** • Meaning and Methods of soil conservation • Soil conservation practices in crop production, range and natural habitats • Advantages of soil conservation	15
Unit IV	**Sustainable soil resource management: Policies and Scheme & Application** • National Mission for Sustainable Agriculture (NMSA), • Soil Health Card scheme • National Policy for Management of Crop Residues (NPMCR). • Rastriya Krishi VigyanYojana (RKVY) • Soil Conservation Schemes in India • Sustainable forestry • Sustainable Soil Management: Challenges, Prospects and Benefits	15

Study Resources	• **Pitty A.F.** 1978: Geography and Soil Properties, Methuen and Company Ltd., London. • **White R.E.** 1987: Introduction to The Principles nd Practice of Soil Science, Blackwell Scientific Publications, London. • **Fenwick I. M. and Knapp B.J**. 1982: Soils Process and Response, Unwin Brothers Ltd., TheGreshman Press, Surrey. • **Birkeland P.W.** 1999: Soil and Geomorphology, Oxford University Press Inc., New York. • **Brady Nyle C., Weil Raymond C.** 2012: The Nature and Properties of Soils, 14th Edition, Pearson Publishing. • **Thomas J.B. and Brunsden D** 1977: Geomorphology and Time, Methuen and Company Ltd. • **Bunting B.T.** 1969: Geography of Soil, Hutchinson University Library, London. • **Cruickshank J.G** 1972: Soil Geography, David and Charles (publishers) Limited, Newton Abbot. • **Foth H.D and Turk L.M** 1973: Fundamentals of Soil Science, Wiley Eastern Private Limited, New Delhi. • **Charman P.E.V and Murphy B.W.** 2000: Soils: Their Properties and Management, Oxford University Press, Melbourne, Australia • **Bunting, B.T.** 1973: The Geography of Soils, Hutchinson, London. • **Clarke G.R**. 1957: Study of the Soil in the Field, Oxford University Press, Oxford. • **Foth H.D. & Turk, L.M.** 1972: Fundamentals of Soil science, John Wiley, New York. • **GovindaRajan, S.V. and GopalaRao, H.G.** 1978: Studies on Soils of India Vikas, New Delhi. • **Raychoudhuri, S.P.** 1958: Soils of India, ICAR, New Delhi. • **Suresh R** 1997: Soil & Water Conservation Engineering Standard Publishers & Distributors

S.Y.M.Sc
Semester III
GEO-DSC-612- Introduction to GNSS

Total Hours: 60 **Credits: 4**

Course Objectives	• To know the basics of Geoid and Datum. • To know the basics of GPS. • To know the basics of GNSS. • To learn the applications of GPS	
Course Outcome	After successful completion of this course, students are expected to: • Understand the basics of Geoid and Datum. • Understand the basics of GPS. • Understand the basics of GNSS. • Understand the applications of GPS in various fields.	
Unit	**Topic Particular**	**Hours**

Unit I	**Concepts**
	• Geoid, Datum/Ellipsoid
	• Definition and basic concepts
	• Global Datum vs. Indian Geodetic Datum
	• Coordinate Systems
	  o Transformation of coordinates
	  o Concept of height, elevation and mean sea level
		15

Unit II	**Basics of GPS**
	• Fundamental Concepts of GPS
	• Types of GPS
	• GPS Satellite
	• Constellation of GPS Satellites
	• GPS Segments:
	  o Space segment
	  o Ground segment
	  o User segment
		15

Unit III	**Fundamentals of GNSS** • GNSS: Working principle, receiver effects, types of services and signal restrictions • Architecture and services: NAVSTAR GPS, GLONASS, Galileo and NAVIC • Types of errors in GNSS and their corrections • Wide Area Augmentation System (WAAS), System for Differential Corrections and Monitoring (SDCM), European Geostationary Navigation Overlay Service (EGNOS) and GPS Aided Geo Augmented Navigation (GAGAN) • DGNSS: Introduction, history, advantages and working	**15**
Unit IV	**Applications** • GNSS applications in forestry • GNSS applications in surveying • GNSS applications in agriculture • GNSS applications in military • GNSS applications in navigation	**15**

Study Resources	• **George l. Hosmer,** 2007: Geodesy, Kessinger publishing • **Kaplan and C. Hegarty,** 2005: Understanding GPS: principles and applications. Artech house; • **Alfred Leick,** 2004: GPS satellite surveying, John Wiley &Sons Inc., 3rd Edition • **Seeber G,** 1998: Satellite Geodesy, Walter De Gruyter, Berlin • **Howard gore J.** 2007: Elements of Geodesy, Kessinger publishing

S.Y.M.Sc
Semester III
GEO-DSC-613: Applied Statistical Methods

Total Hours: 60 **Credits: 4**

Course Objectives	• To change a descriptive character of geography and make it a scientific discipline. • To explain and interpret the spatial patterns of geographical phenomena in a rational, objective & cogent manner • To learn the various statistical methods in geographical data. • To learn to present the statistical data more effectively.	
Course Outcome	After successful completion of this course, students are expected to: • Get knowledge about Geo Statistical Methods. • Demonstrate the representation of Statistical data. • Understand various type of Geographical data • Evaluate the methods for Data Calculation	
Unit	**Topic Particular**	**Hours**
Unit I	**Introduction to Statistical Methods** • Geographical Data o Spatial and Temporal o Discrete and Continuous Data o Grouped and Ungrouped Data o Nominal, Ordinal, Interval and Ratio of scales	**15**
Unit II	**Measures of Central Tendency** • Meaning and Description of Central Tendency o Mean o Median o Mode o Quartile	**15**
Unit III	**Measures of Dispersion** • Mean Deviation • Standard Deviation • Quartile Deviation	**15**
Unit IV	**Statistical Methods** • Skewness and Kurtosis: Concept and Types • Time Series Analysis: Moving Averages • Concept and types of correlation. • Concept of regression: Simple and multiple regression, Use of correlation and regression in geographical research	**15**
Study Resources	• **Ebdon David,** 1989: Statistics for Geographers • **P. Saha and P. Basu** 2006: Advanced Practical Geography, Books and Allied Publication, Kolkata, India. • **S. N. Karlekar and M. Kale** 2006: Statistical analysis of geographical data, Diamond Publication, Pune • **King,** 1975 Statistical Geography • **Norcliffe G.B.** 1977: Inferential statistics for Geographers (Hutchinson, London) • **Rogerson P.A.** 2001: Statistical methods for Geography (SAGE pub.,	

	London, New Delhi) • **Shaw G. &Wheller D.** 1985: Statistical Techniques in Geographical Analysis, John Wiley & Sons, New York. approach to economic geographyHarper and Row, New York • **Singh G.** 1996: Map work and practical geography, Vikas publ. New Delhi • **Singh R.L.,** 1979: Elements of practical Geography, Kalyani publ., New Delhi

M.A/M.Sc. (Geography)
Semester III
GEO-DSE-614-A: Geography of Water Resources

Total Hours: 30 **Credits: 2**

Learning objectives	• To study basics of water resources. • To learn about water supply and utilization. • To learn about water resource problems and its management. • To study the water conservation methods	
Course outcomes	After successful completion of this course, students are expected to: • Understand the basics water resources in detail. • Understand the water uses for domestic, agriculture and industry purpose. • To know various problems and its management of water resources. • To find out the sustainable solutions for water crises.	
Unit	**Topic Particular**	**Hours**
Unit I	**Introduction to Water Resources** • Introduction • Importance of water resource and renewable resource • Hydrological Cycle • Distribution of world surface and surface water resources including: glaciers, ice caps, rivers channels lakes and reservoirs & ground water.	7
Unit II	**Water Supply** • Utilization Methods: o Water supply and utilization methods of estimation: o Agricultural, industrial, municipal land domestic uses of water • Agriculture: o Agricultural cropping pattern: 1. Water requirement of crop 2. Soil – water – crop relationships, moisture surplus and deficit 3. Regions – water balance and drought – measure and minor irrigation: water harvesting techniques, soil water conservation. • Water Utilization: Industrial Utilization o Industrial demand for water and utilization: Type wise, region wise industrial affluents, water Pollution and treatment. o Municipal demand and use of water: Commercial, Institutional and Domestic	10
Unit III	**Problems and Management** • Introduction • Problems of water resource o Abundance and scarcity: floods and draughts. • Measures of water managements: o Including afforestation, channel improvement, river embankments and land use regulation.	7
Unit IV	**Water Conservation** • Introduction • Conservation and Planning • Integrated basin planning, special remedies for collection of rain water so as to increase of ground water level, water shed management. • International, inter-state water disputes.	6

Study Resources	• **John, J. A.** 1997: Global Hydrology: Processes, Resources and Environment Management, Longman Publishers. • **Law, B. C.** Ed. 1968: Mountains and Rivers of India, IGU National Committee for Geography, Calcutta. • **Matter, J. R.** 1984: Water Resources Distribution, Use and Management, John Wiley, Maryland. • **Newson, M.** 1992: Land, Water and Development, River Basin Systems and their Sustainable Management, Rowfledge, London. • **Rao, K. L.** 1979: India‟s Water Wealth, Orient Longman, New Delhi • **Singh, R. A. and Singh, S. R.** 1979: Water Management Principles and Practices, Tara Publication, Varanasi.

M.A./M.Sc. (Geography)
Semester III
GEO-DSE-614-B: Urban morphology

Total Hours: 30 **Credits: 2**

Learning Objectives	• To study the nature of urban morphology. • To study the trends of urbanization. • To study the functions of urban morphology. • To study the theories of urban morphology.	
Course Outcomes	After successful completion of this course, students are expected to: • Will understand types of urban morphology. • To understand the functions of urban morphology. • Will able to analyse systematic growth of urban. • Student knows the morphological characteristics of Indian cities.	
Unit	**Topic Particular**	**Hours**
Unit I	**Introduction** • Manning definition and elements of urban morphology • The elements of urban form: o The urban tissue o The natural context o The streets system o The plots system o The building's system	**7**
Unit II	**Models of urban structure** • Park and Burgess Model • Homer Hoyet Model. • Harris and Ullman Model • Characteristics and demarcation of CBD	**7**
Unit III	**Urban Classification** • Urban functions o Functional classification of towns and cities by C.D. Harris and H. J. Nelson • Urban policy and planning o Policies of Urban development. o Need of city planning o Elements of city plan o Urban development and urban policy in India o Use of GIS in urban planning.	8
Unit IV	**Urban morphology and planning** • Application of urban morphological analysis in urban planning • Assessing Complexity of Urban Spatial Network Spatial Graphs of Urban Environments. Accessibility analysis. • Spatial Statistics for Urban Morphological Analysis Use of spatial autocorrelation and spatial regression models in quantitative urban morphology	8

Study Resources	• **Carter** 1972: The Study of Urban Geography, Edward Arnold,.London. • **Hall P.** 1992 Urban and Regional Planning, Routledge, London • **Kundu, A.** 1992: Urban Development and Urban Research in India, Khanna Publication. • **Singh. K. and Steinberg. F.** eds 1998 : Urban India in Crisis. New Age Interns, • **Brian. R. K.** (1996) : Landscape of Settlement Prehistory to the present, Routledge, London • **Northam**: Urban Geography • **Tim Hall**: Urban Geography • **K. Siddharth and S. Mukherji**: Cities,. Urbanizations and Urban Systems. • **Mayer and Kohn** : Readings in Urban Geography • **Roy Turner**: Indian's Urban Future. • **Shah Manzooor Alam**: Urbanization in Developing Countries • **Verma** : Urban Geography, Rawat, Jaipur • **Bhattacharya**: Urban development in India, Shree publication. • **Raj Bala** : Urbanization in India.

M.A./M.Sc. (Geography)
Semester III
GEO-DSC-615: Data Acquisition and Data Processing

Total Hours: 60 **Credits: 2**

Learning Objectives	• To understand various data acquisition methods in geography. • To develop practical skills in geographic data processing. • To apply spatial and statistical analysis techniques to geographic problems. • To create effective visual representations of geographic data.	
Course Outcomes	After successful completion of this course, students are expected to: • Demonstrate proficiency in acquiring geographic data through different methods. • Show competence in preprocessing, managing, and analyzing geographic data. • Perform and interpret spatial and statistical analyses accurately. • Create clear and informative visualizations of geographic data.	
Sr. No	**Topic Particular**	**Hours**
	Introduction to Data Acquisition	
1	Overview of Data Acquisition: Definition, types, and significance in geography.	**4**
2	Data Sources: Primary and secondary data;	**4**
3	Data Sources: traditional methods (field surveys, interviews) and modern methods (remote sensing, GPS).	**4**
4	Sampling Techniques: Types of sampling (random, systematic, stratified); sample size determination.	**4**
5	Field Survey Techniques: Designing questionnaires, conducting interviews, recording observations	**4**
	Remote Sensing and GIS Data Acquisition	
6	Remote Sensing: Introduction, types of sensors, platforms (satellites, drones), image acquisition.	**4**
7	Geographic Information System (GIS): Basics of GIS, data types (vector and raster), data acquisition through GPS.	**4**
8	Data Import and Export: Importing satellite images and GPS data into GIS software.	**4**
	Data Processing Techniques	
9	Data Preprocessing: Cleaning, transforming, and normalizing data	**4**
10	Spatial Data Processing: Georeferencing, digitizing, and creating spatial layers.	**4**
11	Attribute Data Processing: Data entry, database creation, and attribute data management.	**4**
	Data Analysis and Visualization	
12	Spatial Analysis: Buffering, overlay analysis, and spatial querying.	**4**
13	Statistical Analysis: Descriptive statistics, correlation, and regression analysis	**4**

	on geographic data.	
14	Statistical Analysis: Descriptive statistics, correlation, and regression analysis on geographic data.	**4**
15	Data Visualization: Creating thematic maps, charts, and graphs.	**4**
Study Resources	• **Lillesand, T., & Kiefer, R. W.** 2000: Remote Sensing and Image Interpretation. John Wiley & Sons. • **Burrough, P. A., & McDonnell, R. A.** 1998: Principles of Geographical Information Systems. Oxford University Press. • **Lo, C. P., & Yeung, A. K. W.** 2007: Concepts and Techniques of Geographic Information Systems. Prentice Hall. • **Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W**. 2015: Geographic Information Systems and Science. John Wiley & Sons. • **Lillesand, T., & Kiefer, R. W.** 2000: *Remote Sensing and Image Interpretation*. John Wiley & Sons. • **Burrough, P. A., & McDonnell, R. A.** 1998: *Principles of Geographical Information Systems*. Oxford University Press. • **Lo, C. P., & Yeung, A. K. W.** 2007: *Concepts and Techniques of Geographic Information Systems*. Prentice Hall. • **Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W.** 2015: *Geographic Information Systems and Science*. John Wiley & Sons. • **Campbell, J. B., & Wynne, R. H.** 2011: *Introduction to Remote Sensing*. Guilford Press. • Jensen, J. R. (2007). *Remote Sensing of the Environment: An Earth Resource Perspective*. Prentice Hall. • **Heywood, I., Cornelius, S., & Carver, S.** 2011: *An Introduction to Geographical Information Systems*. Prentice Hall. • **Bolstad, P.** 2016: *GIS Fundamentals: A First Text on Geographic Information Systems*. XanEdu Publishing. • **Chang, K.** 2016: *Introduction to Geographic Information Systems*. McGraw-Hill Education • **Miller, H. J., & Han, J.** 2009: *Geographic Data Mining and Knowledge Discovery*. CRC Press. • **Haining, R.** 2003: *Spatial Data Analysis: Theory and Practice*. Cambridge University Press.	

M.A./M.Sc. (Geography)
Semester III
GEO-DSE-616-A: Web Based Data Acquisition

Total Hours: 60 **Credits: 2**

Learning Objectives	• To introduce students to the fundamentals of web-based data acquisition in geography. • To develop practical skills in collecting and processing geographic data from various online sources. • To apply web-based data acquisition techniques to geographic research and analysis. • To enhance students' ability to use online tools and platforms for geographic data collection and analysis.	
Course Outcomes	After successful completion of this course, students are expected to: • Proficiency in acquiring geographic data from various online sources. • Ability to preprocess and analyze spatial data acquired from the web. • Competence in using real-time and cloud-based data acquisition platforms. • Awareness of the ethical and legal considerations in web-based data acquisition.	
Sr. No.	**Topic Particular**	**Hours**
	Introduction to Web-Based Data Acquisition	
1	Overview: Definition, importance of web-based data acquisition in geography.	**4**
2	Web base application of data sourcing	**4**
3	Online Data Sources: Types of data available online (e.g., satellite images, census data, climate data), and evaluating the reliability of online data sources.	**4**
4	Web Scraping Basics: Introduction to web scraping, tools, and techniques.	**4**
5	APIs and Data Portals: Understanding APIs, accessing geographic data through APIs, and using data portals (e.g., USGS Earth Explorer, NASA Earth data).	**4**
	Acquiring Spatial Data from the Web	
6	Geospatial Data Formats: geospatial data formats (f.e.g., GeoJSON, KML, Shapefiles).	**4**
7	Downloading and Importing Data: Techniques for downloading spatial data and importing it into GIS software.	**4**
8	Data Preprocessing: Cleaning and organizing acquired data for analysis.	**4**
	Real-Time and Big Data Acquisition	
9	Real-Time Data Sources: Accessing and using real-time geographic data (e.g., weather data, traffic data).	**4**
10	Big Data in Geography: Introduction to big data concepts and their applications in geographic research.	**4**
11	Cloud-Based Data Acquisition: Using cloud platforms (e.g., Google Earth Engine) for acquiring and processing large datasets.	**4**
	Ethical and Legal Aspects of Web-Based Data Acquisition	
12	Ethical Considerations: Understanding the ethical implications of web-based data acquisition.	**4**
13	Legal Issues: Copyright, data privacy, and terms of use.	**4**

14	Data Security: Ensuring the security and integrity of acquired data.	**4**
15	Application in Geography	**4**
Study Resources	• **Goring, S. J., & Ross, N.** 2021: Geospatial Data Science Quick Start Guide. Packt Publishing. • **Mitchell, T.** 2018: Web Scraping with Python: Collecting Data from the Modern Web. O'Reilly Media. • **O'Reilly, T., & Wahlin, L.** 2018: Geographic Information Systems and Science. John Wiley & Sons. • **Sherman, G.** 2015: Geospatial Data in the Cloud: Using GeoServer, PostgreSQL, and Open Layers. Packt Publishing. • **Lawhead, J.** 2014: The ArcGIS Book: 10 Big Ideas about Applying Geography to Your World. ESRI Press. • **Karimzadeh, M.** 2019: Data Science for Geospatial Technologies. Springer. • **Zhao, P., & Tsou, M. H.** 2011: Web GIS: Principles and Applications. ESRI Press. • **Olaya, V.** 2016: Geospatial Free and Open Source Software in the 21st Century. Springer.	

M.A./M.Sc. (Geography)
Semester IV
GEO-DSE-616-B: Application of SPSS

Total Hours: 60 **Credits: 2**

Learning Objectives	• To introduce students to the basic and advanced functionalities of SPSS software. • To develop practical skills in data analysis using SPSS. • To apply SPSS techniques to real-world geographic data for statistical analysis. • To enhance students' ability to interpret and present data analysis results effectively.	
Course Outcomes	After successful completion of this course, students are expected to: • Proficiency in using SPSS software for data entry, management, and analysis. • Ability to create and customize data visualizations using SPSS. • Competence in performing and interpreting various statistical tests in SPSS. • Skill in conducting advanced data analyses, such as factor analysis, cluster analysis, and time series analysis, using SPSS.	
Sr. No.	**Topic Particular**	**Hours**
	Introduction to SPSS	
1	Overview of SPSS**:** Introduction to SPSS software, its interface, and basic functionalities.	**4**
2	Data Entry and Management**:** Entering data into SPSS, importing data from other formats, data cleaning, and management.	**4**
3	Descriptive Statistics: Measures of central tendency (mean, median, mode)	**4**
4	Descriptive Statistics: measures of variability (range, variance, standard deviation), and frequency distributions.	**4**
	Data Visualization in SPSS	
5	Graphs and Charts**:** Creating bar charts, histograms, pie charts, box plots, and scatter plots.	
6	Customization**:** Editing and customizing charts and graphs for better presentation.	**4**
7	Exporting Visuals**:** Exporting charts and graphs to other formats for use in reports and presentations.	**4**
	Inferential Statistics using SPSS	
8	Hypothesis Testing**:** T-tests (independent and paired samples), ANOVA (one-way and two-way), and Chi-square tests.	**4**
9	Correlation and Regression: Pearson	**4**
10	Correlation and Regression: Spearman correlation, simple	**4**
11	Correlation and Regression: multiple linear regression analysis.	**4**

	Advanced Data Analysis in SPSS	
12	Factor Analysis**:** Principal component analysis (PCA)	**4**
13	Factor Analysis**:** exploratory factor analysis (EFA)	**4**
14	Cluster Analysis**:** Hierarchical and k-means clustering techniques.	**4**
15	Time Series Analysis: Basics of time series analysis and forecasting.	**4**
Study Resources	• **Field, A. (2017).** Discovering Statistics Using IBM SPSS Statistics. Sage Publications. • **Pallant, J. (2020).** SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS. Routledge. • **George, D., & Mallery, P.** 2019: IBM SPSS Statistics 26 Step by Step: A Simple Guide and Reference. Routledge. • **Green, S. B., & Salkind, N. J.** 2016: Using SPSS for Windows and Macintosh: Analyzing and Understanding Data. Pearson. • **Kinnear, P. R., & Gray, C. D.** 2011: IBM SPSS Statistics 19 Made Simple. Psychology Press. • **Bryman, A., & Cramer, D.** 2011: Quantitative Data Analysis with IBM SPSS 17, 18 & 19: A Guide for Social Scientists. Routledge. **Levesque, R.** 2007 SPSS Programming and Data Management: A Guide for SPSS and SAS Users. SPSS Inc.	

M.A./M.Sc. (Geography)
Semester III
GEO-RP-617: Research Project- I

Total Hours: 60 **Credits: 4**

Course Objectives:

- To give exposure to the students to research culture and technology
- To introduce students to how to select a research topic, plan, perform experiments, collect and analyze the data
- To foster self-confidence and self-reliance in the students as they learn to work and think independently

Course outcomes:

After successful completion of this course, students are expected to:

- Conceive a problem based on published research and conduct a comprehensive literature survey.
- Plan and carry out the tasks in the given framework of the dissertation and present the work in writing and viva.
- Learn how to collect database and its analysis using GIS softwares.
- Learn how to present the project in PowerPoint and answer the queries to examiners and the science of writing.

Credit distribution (1 credit for each unit)

- Identification of a research topic, formulation of research problem, objectives, sample size and hypothesis, etc
- Preparation of Outline
- Review of literature
- Bibliography

The systematic approach towards the execution of the project should be as follows:

1. The complete tenure of the research project should be one year. It should be allotted during the third semester and completed in the fourth semester.
2. Weekly 8 hours should be allotted to the research project in a regular timetable.
3. In the third semester, students will be evaluated based on a credit distribution mentioned above. In the fourth semester, students should perform further research work, collect and analyze the data, compile the results and prepare and submit the final dissertation.
4. Students may be given an opportunity to participate in ongoing research activities in the respective Departments/Schools/Supervisors' laboratories. This will familiarize them with the literature survey and give them a fundamental understanding of designing and executing a research project.
5. Students may work individually or in groups (not more than 3 students) to be decided by the concerned department/supervisor.
6. Each research group should have a different research topic with some possible level of novelty.
7. The student should select the topic relevant to priority areas of concern or allied subjects with the guidance of supervisor/ head of the department.
8. Students are encouraged to work on multidisciplinary and applied projects, but it is not mandatory criteria.
9. At the beginning, students should submit the outline of the research work to be carried out in the project. (Writing in order: Title, Aim and objectives, Literature to be collected,

Experimental plan or method design, expected outcome etc.)

10. Write and submit a Literature Review Report and Research outline
    Tentative order for review: Title of the Project, Certificates, Acknowledgment, Abstract and Keywords, Contents, Introduction, Literature Review, Aim of the Project, Materials and Methods, Bibliography/reference etc.

    Tentative order for research outline: Title page, introduction, background and significance of study, problems to be investigated, objective, hypothesis, chapter scheme, bibliography.

11. At the end of the third semester, each student should submit a detailed Literature Review Report and research outline.
12. An appropriate and essential conclusive statement must be drawn at the end of the study.
13. Students should maintain lab notebooks, and the Supervisor may ask them to submit the mid-semester progress report.
14. For documents related to project submission: Font- Times New Roman, Heading Font Size-14, Normal Text Size-12, spacing-1.5, both sides justified and 1 inch margin on all side, both side printing on A-4 size.
15. Three copies of the Literature Review Report, research outline should be prepared (one copy for each department, guide, and student).
16. At the end of the semester, the candidate should prepare and present research work using a PowerPoint presentation with modern ICT tools and present the same in front of his/ her respective department during the Internal Examination.
17. For external examination the candidate will have to present the research work and face viva voce.
18. Students may present their research work in Avishkar/Webinars/Conferences.
19. Students should note that plagiarism is strictly prohibited.

Internal examination (40 marks): Components of continuous internal assessment:

- Draft Research Outline (10 marks)
- Draft Review of literature (10 marks)
- Working Bibliography (10 marks)
- PowerPoint presentation, and oral examination (10 marks)

External examination (60 marks) and Components of external assessment:

- Final submitted review report, research outline in bound form at the time of examination (40 marks)
- Overall presentation reflecting the contribution of work, response to questions (20 marks)

M.A./M.Sc. (Geography)
Semester-IV

M.A./M.Sc. (Geography)
Semester IV
GEO-DSC-621: Application of Geoinformatics

Total Hours: 60 **Credits: 4**

Learning Objectives	• To apply remote sensing to map resources, addressing technical limits and supporting SDGs. • To use land use classification for urban planning, agriculture, and forest management to aid sustainable development. • To use remote sensing GIS for crop and soil management to boost agricultural productivity and sustainability. • To implement GPS navigation and geotagging/geofencing for better transportation and location-based services.	
Course Outcomes	After successful completion of this course, students are expected to: • Apply remote sensing principles to map and analyze resources, addressing technical limitations and supporting Sustainable Development Goals (SDGs). • Utilize land use classification systems for urban planning, agricultural monitoring, and forest management to promote sustainable development and resource management. • Employ remote sensing and geospatial techniques for crop monitoring and soil management to enhance agricultural productivity and sustainability. • Develop GPS-based navigation systems and geotagging/geofencing techniques to improve transportation efficiency and provide location-based services across various applications.	
Unit	**Topic Particular**	**Hours**
Unit I	Remote Sensing Applications • Definition and basic principles of remote sensing • Technical limitations (resolution, spectral range, atmospheric interference) • Techniques for mapping different types of resources using remote sensing data • Role of remote sensing in achieving Sustainable Development Goals	**15**
Unit II	Applications of LULC Analyses • Land use classification, principles and systems • Urban and Regional Planning • Agricultural Monitoring • Forest and Vegetation Management	**15**
Unit III	Agriculture and Precision Farming A. Crop Monitoring • Assessing crop health and growth stages using remote sensing • Predicting crop yields and assessing production risks • Identifying areas affected by pests, diseases, or nutrient deficiencies B. Soil Management • Mapping soil types and properties • Monitoring soil moisture levels for efficient irrigation • Managing soil erosion and fertility	**15**
Unit IV	**GPS and Navigation &Geotagging and Georeferencing** • Developing and using GPS-based navigation systems • Supporting location-based services (LBS) for various applications • Enhancing transportation and logistics efficiency	**15**

	• Tagging geographical locations for various uses (photos, social media) • Implementing geofencing for targeted marketing and security	
Study Resources	• **SPRS Technical Commission VII** 2002: Symposium on Resource Environmental Monitoring, ISRSAnnual Convention, IIRS, Dehradun. • **Deekshatulu, B. L.**1990: Description and use of Land use/Landcover, NRSA, Hyedrabad. • **Sudershana, R. Mitra, D. Mishra, Roy, P.S., Rao, D. P**.2000: Subtle Issues in Coastal Management, IIRS, Dehradun. • **Harris, J. E.** 1990: Earthwatch – The Climate from space, Ellishorwood Ltd., Midsower Norton. • **Lal, D. S.** 1998: Climatology, Chaitanya Publishing House, Allahabad. • **Escalante, R. B.** 2012: Remote Sensing- Advances techniques and Plateforms, Intech, Rijeka Croatia. • **Escalante, R. B.** 2012: Remote Sensing Application, Intech, Rijeka Croatia. • **Roy, P.S., Dwivedi, R. S.** 2010: Remote Sensing Application www.nrsc.gov.in/Learning- Center, EBook. html.	

M.A./M.Sc. (Geography)
Semester IV
GEO-DSC-622: Geospatial Analysis

Total Hours: 60 **Credits: 4**

Learning Objectives	• Understand the key differences and functionalities of spatial and non-spatial databases, including their respective relationships and models. • Analyze spatial data using various methods, including grid operations and zonal and global analysis. • Explore the creation and application of digital elevation and terrain models for representing spatial surfaces. • Develop skills in structuring and editing spatial data, as well as performing attribute and spatial queries using SQL and algebraic operations.	
Course Outcomes	After successful completion of this course, students are expected to: • Understand and differentiate between spatial and non-spatial data models, including their relationships and representations. • Perform advanced spatial data analysis using various grid operations, and comprehend zonal and global data processing techniques. • Create and apply digital elevation and terrain models for surface analysis and relevant applications. • Develop skills in structuring, editing, and querying both attribute and spatial databases using SQL and map algebra.	
Unit	**Topic Particular**	**Hours**
Unit I	**Database and data model** • Spatial: spatial relationship, functional relationship, logical relationship • Non-spatial: nominal, ordinal, ratio and cyclic • Spatial: Geometric primitives, Raster, Vector, Quad tree tessellation, comparative overview of raster and vector models, layers and coverage ii. • Non-spatial: DBMS- Advantages, conceptual models; Implementational models- hierarchical, network and relational	15
Unit II	**Data Analysis** • Spatial • Simple to complex, • Grid Operations • Zonal and Global **Spatial Interpolation Surfaces** • Surfaces • Digital Elevation Model • Digital Terrain Model • Applications	15
Unit III	**Structuring of Spatial Data** • Digitizers: manual, semi-automatic & automatic • Editing error: detection & correction, topology building	15
Unit IV	**Data Analysis** • Attribute databases: operations from algebraic theory • Operations from set theory SQL: attribute query • Spatial Databases: map algebra, grid Operations: Local, Focal • SQL: spatial query	15

Study Resources	• **Burroughs,P. A. and McDonnell,R.A.** 2002: Principles of Geographical Information System, Oxford University Press. • **George J.** 2004: Fundamentals of Remote Sensing, Universities Press Pvt. Ltd., Hyderabad. • **Jensen, J. R.** 2003: Remote Sensing of Environment, An Earth Resource Perspective, Pearson Education Pvt. Ltd., New Delhi. • **Kang- Tsung-Chang**, Introduction to Geographical Information System, 2002, McGraw Hill. • **Lillesand, T. M. and Kiefer R. W.** 2002: Remote Sensing and Image Interpretation, John Wiley and Sons, New Delhi. • **Lo C. P. and Yeung, A.K.W.** 2002: Concepts and Techniques of Geographic Information System, Prentice Hall, India. • **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. • Fundamentals of Remote Sensing, A Canada Centre for Remote Sensing Remote Sensing Tutorial.

M.A/M.Sc. (Geography)
Semester IV
GEO-DSE-623-A: Forest Resources Management

Total Hours: 30 **Credits: 2**

Learning Objectives	• To study available forest resources and its classification. • To find out the causes of deforestation. • To study the conservation and management techniques. • To learn the different forest policies in India.	
Course Outcomes	After successful completion of this course, students are expected to: • Understand the available forest resources and its classification. • Understand the causes of deforestation and forest degradation. • Understand the challenges of forest conservation and its management. • Understand the forest policies in India in detail.	
Unit	**Topic Particular**	**Hours**
Unit I	**Introduction to Forest Resources** • Introduction • Forest as a resources • Classification of Forest Resources • Problems associated with Forest resources • Significance of Forest resources	7
Unit II	**Deforestation and Forest degradation** • Introduction • Causes of deforestation and forest degradation • Deforestation and forest degradation impact on Livelihood • Climate Change	7
Unit III	**Conservation of Forest resources and its management** • Introduction • Historical background • Need to Forest resource management • Attributes of Forest Resource management • Green Cover Management • Challenges of Forest Conservation and its management	9
Unit IV	**Forest Policies in India** • Wildlife Protection Act of 1972 • Forest Conservation Act 1980 • Environmental Protection Act 1986 • National Forest Policy 1988	**7**
Study Resources	• **Daniel B.Botkin and Edward A. Keller** 1982: "Environmental Studies".Charles E. MerrillPublishing Comp., A Bell & Howell Comp., London. • **Savindar Sing** 1997: "Environmental Geography", PrayagBhawan, Allahabad. • **Jonnathun Turk and Turk** "Environmental Science",Witness& Witness, London • **Jonnathun Turk and Turk** "Introduction to Environmental	

	Studies",Nebet: Environmental Science: • **William M.Marsh and John M. Grossa, JR**.1996: "Environmental Geography", John Wileyand Sons, New York. • Biogeography: Newbegin • **Girish Chopra** 2006: "Environmental Geography", Commonwealt, New Delhi. Centre for Science and Environment, New Delhi:"The State of Indias"s Environment,1984-85". • **Kevin J Gaston and John I Spicer** 2004: "Biodiversity: An Introduction", Blackwell Publishing. • **Noel De Nevevs**: "Air Pollution control Engineering", McGraw hill, international edition civilEngineering Series • **R. Kumar**: "Environmental Pollution &Health",Ashish Publication, 818 Punjabi Bag,New Delhi. .

M.A/M.Sc. (Geography)
Semester IV
GEO-DSE-623-B: Introduction to Global Environment

Total Hours: 30 **Credits: 2**

Learning Objectives	• Comprehend the issues, challenges, and impacts of climate change on wildlife, water, and the environment. • Analyze the causes and effects of acid rain, and evaluate potential solutions to mitigate its impact on ecosystems and human health. • To study the basics of drought and desertification. • Examine the causes, effects, and preventive measures ozone layer depletion**.**	
Course Outcomes	After successful completion of this course, students are expected to: • Learn origin of issues of global environmental problems. • Learn about the Acid Rain, Greenhouse Effect and Global Warming. • Understand the drought and desertification. • .Learn the causes and protection techniques of Ozone layer.	
Unit	**Topic Particular**	**Hours**
Unit I	**Climate Change** • Introduction • Issues and Challenges • Greenhouse Gases and Ozone Layer • Effects of Climate Change o Effects on Wildlife o Effects on Water.	6
Unit II	**Acid Rain, Greenhouse Effect and Global Warming** • Introduction • Acid Rain o The Geography of Acid Rain o The Causes of Acid Rain o Acid Rain and Geology o Acid Rain and Aquatic Environment o Acid Rain and Terrestrial Environment o Acid Rain and Human Health o Solutions to the Problem of Acid Rain • Greenhouse Effect and Global Warming o The Creation of The Greenhouse Gasses a. The Carbon Cycle and the Greenhouse effect b. Atmospheric carbon dioxide and temperature Change c. The contribution of other Greenhouse gases d. Socio -Economic Impacts of Increasing Greenhouse Gases	10
Unit III	**Drought and Desertification** • Introduction • Drought o Definition o Aridity and drought o Human responses to drought o Types of droughts o Drought and human activity	8

	• Desertification
	  o Desertification initiated by drought
	  o Desertification caused by human activities
	  o Prevention and reversal of desertification.	

Unit IV	**Ozone Depletion** • Introduction • Creation of ozone layer • Causes • Effects • Protection and Maintenance of ozone layer.	**6**
Study Resources	• **Daniel B.Botkin and Edward A. Keller** 1982: "Environmental Studies".Charles E. MerrillPublishing Comp., A Bell & Howell Comp., London. • **Savindar Sing** 1997: "Environmental Geography", PrayagBhawan, Allahabad. • **Jonnathun Turk and Turk** "Environmental Science",Witness& Witness, London Jonnathun Turk and Turk "Introduction to Environmental Studies",Nebet: Environmental Science: • **William M.Marsh and John M. Grossa, JR.**1996: "Environmental Geography", John Wileyand Sons, New York. • Biogeography: Newbegin • **Girish Chopra** 2006: "Environmental Geography", Commonwealt, New Delhi. Centre for Science and Environment, New Delhi: "The State of Indias"s Environment,1984-85". • **Kevin J Gaston and John I Spicer** 2004: "Biodiversity: An Introduction", Blackwell Publishing. • **Noel De Nevevs**: "Air Pollution control Engineering", McGraw hill, international edition civilEngineering Series • **R. Kumar**: "Environmental Pollution &Health",Ashish Publication, 818 Punjabi Bag,New Delhi. .	

M.A./M.Sc. (Geography)
Semester IV
GEO-DSC-624: Practicals in Spatial data Processing

Total Hours: 60 **Credits: 2**

Learning Objectives	• To develop proficiency in visual interpretation of various satellite images, including LISS, PAN, WiFS, and merged images. • To understand and apply high-resolution satellite data and spatial database concepts, focusing on raster spatial data models and vector digitization techniques. • To master digital image enhancement techniques, such as linear and non-linear contrast enhancement, spatial filtering, and NDVI computation. • To gain expertise in software-based image processing GIS tasks, including image registration, enhancement, classification, georeferencing, and thematic layer generation.	
Course Outcomes	After successful completion of this course, students are expected to: • Acquire skills in visual interpretation of various satellite images including LISS, PAN, WiFS, and merged images. • Develop proficiency in processing high-resolution satellite data and managing spatial databases using raster and vector models. • Master digital image enhancement techniques, including linear and non-linear contrast enhancement, spatial filtering, and band ratioing. • Implement GIS-based image processing tasks such as image registration, supervised and unsupervised classification, georeferencing, and thematic layer generation.	
Sr. No.	**Topic Particular**	**Hours**
	Satellite Images Interpretation	
1	visual interpretation of LISS and PAN	**4**
2	visual interpretation of WiFS and Merged Images A WiFS	**4**
3	High Resolution Satellite Data	**4**
	Spatial Database	
4	Raster Spatial data model	**4**
5	Raster: Full Grid Chain Codes	
6	Raster: Run Length Codes	**4**
7	Vector: Manual Digitization, Digitization	**4**
	Digital Image Enhancement	
8	Linear – Contrast Enhancement	**4**
9	Non-Linear – Square, Square root, Cube, Cube root	**4**

10	Spatial Filtering –Mean & Median Band Ratioing,	**4**
11	NDVI Computation	**4**
	Software based image Processing GIS	
12	Image Registration, Enhancement,	**4**
13	Supervised Classification Unsupervised Classification	**4**
14	Georeferencing of scanned raster image, Digitization (vectorization),	**4**
15	Rasterization, Attribute data linking, Thematic Layer Generation	**4**
Study Resources	• **P. A. Burrough and R. A. McDonnell**, 2000 : Principles of Geographical Information System, Oxford University Press. • **C. P. Lo and Albert, K. W. Yeung** 2002 : Concepts and Techniques of Geographic Information System, 2002Prentice –Hall, India. • **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. • **Kang – Tsung – Chang,** 2002 : Introduction to Geographical Information System, McGraw Hill. • **George Joseph,** 2004 : Fundamentals of Remote Sensing, Universities Press Pvt. Ltd., Hyderabad. • **J. R. Jensen,** 2003: Remote Sensing of Environment, An Earth Resource Perspective, Pearson Education Pvt. Ltd., New Delhi.	

M.A./M.Sc. (Geography)
Semester IV
GEO-DSC-625: Practicals in Geospatial Analysis

Total Hours: 60 **Credits: 2**

Learning Objectives	• To identify and correct various types of digitizing errors, and apply topological and non-topological editing techniques. • To effectively manage and manipulate attribute data in GIS, including data entry, exploration, and query operations. • To perform advanced spatial analysis using vector-based and raster-based techniques, including overlay operations, map algebra, and cost surface analysis. • To conduct network and point pattern analysis to evaluate network complexity, determine optimal paths, and analyze point distributions.
Course Outcomes	After successful completion of this course, students are expected to: • Identify and rectify various digitizing errors using topological and non-topological editing techniques in GIS. • Manage and manipulate attribute data within GIS, performing queries and data exploration for effective data analysis. • Execute spatial analysis using both vector-based and raster-based methods, including overlay operations and map algebra. • Conduct advanced network and point pattern analysis to evaluate network complexity and analyze spatial distributions.

Sr. No.	Topic Particular	Hours
	Spatial Data Editing	
1	Types of Digitizing Errors, Causes for Digitizing Errors	**4**
2	Topological Editing and Non-topological Editing	**4**
3	Other Editing Operations; Editing Using Topological Rules	**4**
	Attribute Data and Data Exploration	
4	Attribute Data in GIS, Attribute Data Entry	**4**
5	Manipulation of Fields and Attribute Data	**4**
6	Data Exploration; Attribute Data Query, Raster Data Query	**4**
7	Map- Based Data Manipulation	**4**
	Spatial analysis – Vector based	
8	Overlay operations: Point-in-polygon, Linein-polygon, polygon-in-polygon.	**4**
9	Single layer operations: Feature identification, extraction, classification manipulation.	**4**
10	Multilayer operation: Union, intersection, symmetrical difference, update, merge, append and dissolve	**4**
	Spatial analysis – Raster based	
11	Map algebra, grid based operations, local, focal, zonal and global functions	**4**

12	Cost surface analysis, optimal path and proximity search	**4**
	Network and Point Pattern Analysis	
13	Network Analysis: Concepts, Evaluation of Network Complexity Using Alpha-Gamma Indices.	**4**
14	Types of Network Analysis: Optimum Cyclic Path, Vehicle Routing, Path Determination and Cost-Path Analysis.	**4**
15	Point Pattern Analysis: Methods for Evaluating Point Patterns: Clustered and Random Distribution	**4**
Study Resources	• **P. A. Burrough and R. A. McDonnell**, 2000, Principles of Geographical Information System, Oxford University Press. • **C.P.Lo and AlbertK. W. Yeung,** 2002, Concepts and Techniques of Geographic Information System, Prentice –Hall, India. • **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. • **Kang – tsung – Chang,** 2002, Introduction to Geographical Information System, McGraw Hill. • **George Joseph,** Fundamentals of Remote Sensing, 2004, Universities Press Pvt. Ltd., Hyderabad. • **J.R. Jensen,** 2003, Remote Sensing of Environment, An Earth Resource Perspective, Pearson Education Pvt. Ltd., New Delhi. • **Lillesand T.M. and Kiefer R.W**., 2002, Remote Sensing and Image Interpretation, John Wiley and Sons, New Delhi. • **Heywood I, (el.)** 2011 An Introduction to Geographical Information Systems , Pearson	

M.A./M.Sc. (Geography)
Semester IV
GEO-DSE-626-A: Thematic Cartography

Total Hours: 60 **Credits: 2**

Learning Objectives	• To understand the fundamentals of thematic cartography. • To learn how to collect, clean, and prepare spatial data for thematic mapping. • To develop skills in creating various types of thematic maps using GIS software. • To explore advanced techniques in thematic cartography.
Course Outcomes	After successful completion of this course, students are expected to: • Understand and apply basic cartographic design principles and GIS software to classify and analyze different types of thematic maps. • Collect, clean, and preprocess spatial data for accurate and consistent thematic mapping using GIS tools. • Create and interpret various thematic maps to visualize spatial data effectively. • Develop skills in creating bivariate and multivariate maps, using advanced cartographic techniques for complex data representation.

Sr. No.	Topic Particular	Hours
	Introduction to Thematic Cartography	
1	Definitions of cartography and explore basic cartographic design principles using	**4**
2	Introduction to GIS software (e.g., ArcGIS, QGIS).	**4**
3	Identify and analyze different types of thematic maps (e.g., choropleth, dot density, proportional symbol, and isarithmicmaps).	**4**
	Data Collection and Preparation	
4	Collect spatial data from different sources (e.g., online databases, field surveys).	**4**
5	Use GIS software to import and manage spatial datasets.	**4**
6	Clean and preprocess spatial data for thematic mapping (e.g., removing duplicates, correcting errors).	**4**
7	Prepare datasets for specific thematic maps, ensuring data accuracy and consistency.	**4**
	Creating Thematic Maps	
8	Create a choropleth map representing literacy rate.	**4**
9	Produce a dot density map to visualize distribution patterns (e.g., Male and female population distribution).	**4**
10	Design a proportional symbol map to depict quantitative data.	**4**
11	Generate an isarithmic (contour) map to illustrate continuous data.	**4**

	Advanced Cartographic Techniques	
12	Create bivariate map	**4**
13	Create multivariate maps display relationships between multiple variables.	**4**
14	Use color blending and symbol combinations for complex data representation.	**4**
15	Practicals report writing	**4**
Study Resources	• **Robinson,A.H.andOthers**(1995):ElementsofCartography,VIEdition,JohnWiley&Sons, New York. • **Anson, R. W. and Ormeling, F. J., (Ed.)** (1993): Basic Cartography for Students and • **Technicians,Vol.I,**InternationalCartographicAssociationandElseiverAppliedSciencePublishers,London. • **Dickinson,G.C.**(1977)StatisticalMappingandthePresentationofStatistics,EdwardArnoldLtd.,London. • **Monkhouse,F.J.andH.R.Wilkinson,**(1971):MapsandDiagrams,Methuen&Co. Ltd.,London. • **Hodgkiss,A.G.**(1970):MapsforBooksandTheses,DavidandCharlesPublishersLtd., London. • **Misra R. P. andA. Ramesh,** (1969): Fundamentals of Cartography, Prasaranga, Universityof Mysore.	

M.A./M.Sc. (Geography)
Semester IV
GEO-DSE-626-B: GIS and DBMS

Total Hours: 60 **Credits: 2**

Course Objectives	• To introduce the students to the basic concepts and principles of DBMS • To understand the techniques of DBMS. • To apply the techniques in different fields • To learn various database security concepts.	
Course Outcome	After successful completion of this course, students are expected to: • Understand the DBMS and Database Security Concept • Know the applications of DBMS in GIS • Evaluate the methodologies for Database management. • Students understand various operators of DBMS	
Unit	**Topic Particular**	**Hours**
Unit I	• Introduction: DBMS, RDBMS, SQL Database Security Concept • Advantages of RDBM Sand ER Modeling.	**10**
Unit II	• Controlling User Access: Control Database Access, Privileges, Creating User, Concept of Role, Creating, Granting Privileges to Role, Revoking Privileges.	**15**
Unit III	• Managing Schema Object: Data Types, DDL, DML, DCL • Constraints: Types of Constraints, Primary Key, Foreign Key, Check Constraint, Not Null, Altering Constraint, Concept of Backup Recovery. Overview of Index.	**15**
Unit IV	• Manipulating Dataset using SQL Statement: Basic Select Statement, Selecting Specific Column, Using Arithmetic Expressions, Defining Column Alias, using Where Clause • Restricting & Sorting Data: using Comparison Condition (=,<=,>=Etc), • Using Logical Operator: AND, OR, NOT, using BETWEEN, LIKE Conditions	**20**
Study Resources	• **SPRS Technical Commission VII** 2002: Symposium on Resource Environmental Monitoring, ISRS Annual Convention, IIRS, Dehradun • **Deekshatulu, B. L.** 1990: Description and use of Land use/Landcover, NRSA, Hyderabad • **Sudershana, R. Mitra, D. Mishra, Roy, P.S., Rao, D. P.** 2000: Subtle Issues in Coastal Management, IIRS,Dehradun **Harris, J. E.** 1990: Earthwatch – The Climate from space, Ellishorwood Ltd., Midsower Norton • **Lal, D. S**. 1998: Climatology, Chaitanya Publishing House, Allahabad • **Escalante, R. B.** 2012: Remote Sensing- Advances techniques and Platforms, Intech, Rijeka Croatia • **Escalante, R. B.** 2012: Remote Sensing Application, Intech, Rijeka Croatia	

M.A./M.Sc. (Geography)

Semester IV

GEO-RP-627: Research Project- II

Total Hours: 120 **Credits: 6**

Course Objectives:

- To give exposure to the students to research culture and technology
- To introduce students to how to select a research topic, plan, perform experiments, collect and analyze the data
- To foster self-confidence and self-reliance in the students as they learn to work and think independently

Course outcomes:

After successful completion of this course, students are expected to:

- Conceive a problem based on published research and conduct a comprehensive literature survey.
- Plan and carry out the tasks in the given framework of the dissertation and present the work in writing and viva.
- Learn how to collect database and its analysis using GIS softwares.
- Learn how to present the project in PowerPoint and answer the queries to examiners and the science of writing.

The systematic approach towards the execution of the project should be as follows: (Wherever applicable)

1. The complete tenure of the research project should be one academic year. It should be allotted during the third semester and completed in the fourth semester.
2. Weekly 12 hours should be allotted to the research project in a regular timetable.
3. In the fourth semester, students should perform further experimental work, analyze the data and compile the results.
4. Students may be given an opportunity to participate in ongoing research activities in the respective Departments/Schools/Supervisors' laboratories. This will familiarize them with the literature survey and give them a fundamental understanding of designing and executing a research project.
5. Students may work individually or in groups (not more than 3 students) to be decided by the concerned department/supervisor.
6. Each research group should have a different research topic with some possible level of novelty.
7. The student should select the topic relevant to priority areas of concern or allied subjects.
8. Students are encouraged to work on multidisciplinary and applied projects, but it is not mandatory criteria.
9. Students are expected to work in line with the research outline and literature review, which was submitted in the third semester.
10. Students are expected to learn how to execute the research work systematically and overcome the hurdles. Students will get the opportunity to learn about practical aspects of many characterization techniques or models and further how to effectively employ them in the research work. Students should be able to critically evaluate the literature on the topic, identify the research gaps, plan and perform the experiments, interpret the results, understand the limitations of the work and draw conclusions.
11. At the end of the semester, each student should submit a detailed Research Report.

12. The format of the final research report shall be as per the guidelines of respective department. (**Example**: Title of the Project, Certificates, Acknowledgment, Abstract and Keywords, Contents, Introduction, Literature Review, Aim and objective, Materials and Methods, Result, Data analysis and Discussions, conclusion, limitations, suggestion, future scope, Bibliography, Appendix etc.)
13. An appropriate and essential conclusive statement must be drawn at the end of the study.
14. Students should maintain lab notebooks, and the supervisor may ask them to submit the mid-semester progress report.
15. For documents related to project submission: Font- Times New Roman, Heading Font Size-14, Normal Text Size-12, spacing-1.5, both sides justified and 1 inch margin on all side, both side printing on A-4 size.
16. Three copies of the dissertation should be prepared (one copy for each department, guide, and student).
17. At the end of the semester, the candidate should prepare and present research using a PowerPoint presentation using modern ICT tools during the Internal and External Examination.
18. Besides writing a dissertation, students are encouraged to write a manuscript/patent if the results obtained are worthy of publication.
19. Students may present their research work in Avishkar/Webinars/Conferences.
20. Students should note that plagiarism is strictly prohibited.

Internal examination (60 marks): Components of continuous internal assessment:

- Literature collected, methodological planning, analysis of data, design and work, progress reports etc (30 marks)
- Presentation in Webinars/Conferences/publication and departmental presentation etc (20 marks)
- Oral examination (10 marks)

External examination (90 marks) and Components of external assessment:

- Evaluation of dissertation submitted in bound form at the time of examination **(60 marks)**
- Presentation (PPT format) **(15 marks)**
- Overall presentation reflecting the contribution of work, Response to questions **(15 marks)**

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