M.Sc. GEOGRAPHY

(2022 – 2024)

REGULATIONS
&
CURRICULUM STRUCTURE

BHARATHIDASAN UNIVERSITY

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M.Sc. GEOGRAPHY PROGRAMME

Choice Based Credit System [CBCS]

Regulations and Syllabus (2022-2024 onwards)

REGULATION AND SYLABUS

M.Sc. Geography (Two-Year Programme) is an autonomous programme through **C**hoice **B**ased **C**redit **S**ystem [**CBCS**] offered by the Department of Geography, Bharathidasan University. The ultimate aim of this programme is to teach fundamental concepts of geography and create an integrated environment to learn geospatial technologies and its applications in geography. In this programme, the candidates will have an opportunity to learn systematic and regional concepts of geography so as to succeed in national level examinations including UGC-NET, CSIR-NET and competitive examinations. The strong laboratory programme enable students to learn modern geospatial technologies and this will be of immense value to students to directly pursue the Ph.D. programme. The opportunity to engage in an intense research projects in the University environment will enhance the students to select better career choices.

DURATION

The total duration of the programme is for a period of two years. Each year shall consist of two semesters.

Odd semester: July - November

Even semester: December - April

There shall be not less than 90 working days which shall comprise 450teaching clock hours for each semester (exclusive of the days for the conduct of University End-Semester Examinations)

ELIGIBILITY

MSc Geography is a 2-year postgraduate program that can be pursued after completion of a bachelor's degree in geography. The applicant holding a bachelor's degree in geography with a minimum of 50% marks from a recognized university thereto are eligible for admission to M. Sc. Geography Two-Year Programme.

Admission for the programme will be based on the aggregated average of the performance of the candidate in their bachelor's degree and also through the entrance test / interview conducted by the Department for this purpose, if necessary.

EXAMINATION

Examination will be conducted at the end of each semester - for odd semesters in the month of November / December; for even semesters in April / May.

Students must have 75 percent of attendance in each Course for appearing the examination. Students who have 74 percent to 70 percent of attendance shall apply for condonation in the prescribed form with the prescribed fee. Students who have 69 percent to 60 percent of attendance shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 60 percent of attendance are not eligible to appear for the examination.

A candidate should get registered for the semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit / regulation prescribed OR belated joining OR on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after completion of all 4 semesters.

A candidate who fails in a theory course or courses can reappear for the same in the subsequent semester(s). However, candidates who have arrears in practical courses shall be permitted to take their arrear practical examination only along with regular practical examination in the respective semester. A candidate failing in the dissertation shall be required to resubmit the work in the next semester.

EVALUATION

The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by a Continuous Internal Assessment (CIA) by the concerned Course Teacher as well as by an **E**nd **S**emester **E**xamination (**ESE**) and will be consolidated at the end of the programme. The components for Continuous Internal Assessment are: **a) Internal Test, b) Seminar, c) Assignment, d) Interaction and e) Attendance.**

PATTERN OF QUESTION PAPER

- The question paper in each course would comprise of Part A, Part B and Part C.
- Part-A Students have to answer 10 questions (10 X 2 = 20 marks)
- Part-B There will be 5 questions in either or pattern (5 X 5 = 25 marks)
- Part-C Two out of three questions have to be answered (2 X 15=30marks)

PASSING MINIMUM OF MARKS

A candidate shall be declared to have passed in each course if he/she secures not less than 40 percent marks in the University End-Semester Examination (ESE) and 40 percent marks in the Continuous Internal Assessment (CIA) including practical and not less than 50 percent in the aggregate, taking CIA and ESE marks together. Candidates, who have secured the pass mark in the ESE and in the CIA but failed to secure the aggregate minimum pass mark (ESE + CIA), are permitted to improve their Continuous Internal Assessment mark in the subsequent semester(s) and /or in End-Semester Examinations.

A candidate shall be declared to have passed in the Dissertation if he/she gets not less than 40 percent in the Dissertation and Viva-voce but not less than 50 percent in the aggregate of both the marks for Dissertation and Viva-voce. A candidate who gets less than 40 percent in the Dissertation must resubmit the Dissertation. Such candidates need to take again the Viva-Voce on the resubmitted Dissertation.

CLASSIFICATION OF FINAL RESULTS

Evaluation of each student enrolled in the programme will be done under the Grading System. There will be a letter grades; S+, S, D++, D+, D, A++, A+, A, B, C and F on a 10 point scale which carries 10,9.5, 9.0, 8.5, 8.0,7.5, 7.0, 6.5, 6.0, 5.5 and 0 grade points respectively. The final result of the candidate shall be based only on CGPA earned by the candidate. Candidates who secure not less than 50 percent of the aggregate marks or 5.0 CGPA or ‘C’ grade in the whole examination shall be declared to have passed in the examination. The results of successful candidates will be classified as indicated below on the basis of the Cumulative Grade Point Average (CGPA):

CGPA 9.01 and above	-	First Class – Exemplary	*(With first appearance within the prescribed duration of the programme)*
CGPA between 7.51 and 9.00	-	First Class with Distinction	
CGPA between 6.01and 7.50	-	First Class	
CGPA between 5.01 and 6.00	-	Second Class	

A candidate who has passed all the examinations of the programme at first appearance with maximum CGPA in aggregate will be given a Rank certificate. However, absence from an examination shall not be taken as an attempt.

The final consolidated statement of marks will be signed and issued by the Controller of Examinations, Bharathidasan University, Tiruchirappalli.

CONFERMENT OF THE DEGREE

A candidate shall be eligible for the conferment of the M.Sc. Geography (Two year programme) only after he /she has passed all the examinations and earned the minimum required credits (i.e. 90 credits) prescribed to the programme.

REVISION OF REGULATION AND CURRICULUM

The curriculum structure (Table: 1) gives a detailed account of the scheme of courses. The Department **B**oard of **S**tudies (**BOS**) scrutinize and alter the regulations and the structure of the curriculum, if found necessary. However, the Department follows other general guidelines of the University, which are not laid down in this regulation.

SPECIAL FEATURES

1. Weekly seminar for the students with recent and trending topics.
2. Scheduling weekly tests for the students.
3. Library facilities including digital satellite and statistical data.
4. Availability of hard copy and digital topographic sheets and OSM sheets.
5. Licensed ESRI ArcGIS & ArcGIS Pro software's.
6. Surveying instruments such as DGPS and Total Station.
7. Ground Penetrating Radar (GPR) for field survey.
8. Educational field trips.
9. Industrial Visits.

Bharathidasan University Tiruchirapalli
Department of Geography
Programme Structure: M.Sc., Geography
2022-2024 Onwards

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
SEMESTER – I						
22GE2PC01	Geomorphology	4	5	25	75	100
22GE2PC02	Population Geography	4	5	25	75	100
22GE2PC03	Quantitative Techniques in Geography	4	5			100
22GE2PC04	a) Digital Cartography b) Geohydrology	4	4	25	75	100
22GE2PC05	Techniques of Mapping, Analysis and Image Interpretation (P)	4	4	40	60	100
22GE2PE01	Elective anyone from **List A**	3	4	25	75	100
	Common Seminar, Library, Leveraging E-Resources, VAC, etc.		3			
	Total	**23**	**30**			**600**

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
SEMESTER – II						
22GE2PC06	Applied Climatology	4	5	25	75	100
22GE2PC07	Geographical Thought	4	5	25	75	100
22GE2PC08	a) Regional Planning b) Sustainable Management	4	5	25	75	100
22GE2PC09	GIS Data Analysis (P)	4	4	40	60	100
22GE2PE02	Elective anyone from **List B**	3	3	25	75	100
22GE2PN01	Non Major Elective (offered by other Departments)	2	3	25	75	100
22GE2PSB1	Skill Based Elective: Data Collection and Filed Work	2	2	25	75	100
22GE2PVA1	Open Source GIS (Common Seminar, Library, Leveraging E-Resources, VAC, etc.)	2	3	25	75	100
	Total	**25**	**30**			**800**

Bharathidasan University Tiruchirapalli
Department of Geography
Programme Structure: M.Sc., Geography
2022-2024 Onwards

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
SEMESTER – III						
22GE2PC10	Watershed Studies	4	5	25	75	100
22GE2PC11	Urban Geography	4	5	25	75	100
22GE2PC12	a) Industrial and Transport Geography b) Spatial Analysis	4	5	25	75	100
22GE2PC13	Geospatial Data Analysis for Resource Management (P)	4	4	40	60	100
22GE2PE03	Elective anyone from **List C**	3	3	25	75	100
22GE2PN02	Non Major Elective (offered by other Departments)	2	3	25	75	100
22GE2PSB2	Skill Based Elective: Summer Internship	3	2	25	75	100
22GE2PVA2	AI for Geographical Analysis (Common Seminar, Library, Leveraging E-Resources, VAC, etc.)	2	3	25	75	100
	Total	**26**	**30**			**800**

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
Semester-IV						
22GE2PC14	Research Methodology & IPR	5	5	25	75	100
22GE2PC15	Disaster Studies	5	5	25	75	100
22GE2PEIB1	Digital Photogrammetry	5	5	25	75	100
22GE2PC16	Dissertation and Viva Voce	5	15	25	75	100
		20	**30**			**400**

Elective Course List

Group A	1. Advanced Python for GIS Analysis 2. Geography of Tourism 3. Rural Development
Group B	4. Remote Sensing, GIS, GNSS 5. Geography of Tamil Nadu 6. Word Regional Geography
Group C	7. Health and Wellbeing 8. Environmental Geography 9. Climate Change Vulnerability and Adaptation

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
SEMESTER – I						
22GE2PC01	Geomorphology	4	5	25	75	100
22GE2PC02	Population Geography	4	5	25	75	100
22GE2PC03	Quantitative Techniques in Geography	4	5	25	75	100
22GE2PC04	c) Digital Cartography d) Geohydrology	4	4	25	75	100
22GE2PC05	Techniques of Mapping, Analysis and Image and Interpretation (P)	4	5	40	60	100
22GE2PE01	Elective anyone from **List A**	3	3	25	75	100
	Common Seminar, Library, Leveraging E-Resources, VAC, etc.		3			
	Total	**23**	**30**			**600**

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester -I	
Course Code / Title	22GE2PC01 - GEOMORPHOLOGY	

Objectives

1) *Students will learn about the mechanism and working principle of underlying in the present earth-surface.*
2) *Students will acquire Field knowledge about structure, process and stages of the land forms*
3) *Learners will acquire knowledge on how climate and land forms changes from place to place.*

Unit: 1	**Basics:** Meaning, Scope and Development -Basic Concepts in Geomorphology-Endogenic processes -Fold, Fault, Earthquake, Volcanoes -Continental Drift-Sea floor spreading -Plate Tectonics.
Unit: 2	Exogenic processes -Weathering -Mass movement -Soils -Fluvial landforms -Concepts of Landform evolution –Davisian views -Penck's view -L.C.King's view – Wood's view -Dynamic Equilibrium concept.
Unit: 3	**Concepts:** Morphogenetic regions – Concept of cycle of erosion: Davis, Penck - Idealized Fluvial Cycle – Peneplain and Pediplain –Slope development: classification and elements – Theories of slope evolution: Davis, Penck.
Unit: 4	**Landforms:** Evolution of Geomorphic landforms -Fluvial, Karst, Glacial, Aeolian and Coastal landforms.
Unit: 5	Ice Ages –Climatic Geomorphology –Morphogenetic regions –Applied Geomorphology with reference to engineering, mineral exploration and hydrological studies.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Landforms analysis, Drainage basin morphometric and slope mapping, integrated approach of land and water resource management.

References:

1. Bierman, P. R. and Montgomery, D. R., (2014): Key concepts in geomorphology, Freeman and Company Publishers.
2. Bloom, A.L., (1978): Geomorphology: A systematic analysis of late Cenozoic land forms, Prentice-Hall
3. Christopherson, R. W. and Birkeland, G. H., (2012): Geosystems: An Introduction to Physical Geography (8th edition), Pearson Education
4. Huggett, R. J., (2007): Fundamentals of Geomorphology, Routledge.
5. Husain, M. (2002): Fundamentals of Physical Geography, Second Edition, Rawat Publications, and Jaipur.
6. K.Siddhartha, Dr. S.Mahapatra, S.Mukherjee (2021): Basic Physical geography, Kishalaya Publications New Delhi.
7. Kale, V. and Gupta, A. (2018): Introduction to Geomorphology, Orient Black Swan.
8. Singh, S., (2022): Geomorphology, Pravalika Publications
9. Strahler, A. H. and Strahler, A N., (2001): Modern Physical Geography (4/E), John Wiley and Sons,
10. Summerfield M.A., (2013): Global Geomorphology, Routledge.
11. Thornbury, W.D. (2004): Principles of Geomorphology, (Indian Reprint), John Wiley, New Delhi 20.
12. Wooldridge, S.W. and Morgan, R.S. (1991): An Outline of Geomorphology, Orient Longmans, Calcutta.

Web Sources

1. *https://www.sciencedirect.com/journal/geomorphology*
2. *https://researchguides.dartmouth.edu/physical_geography/geomorphology*
3. *https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/geomorphology*
4. *https://www.britannica.com/science/geomorphology*

Course Outcomes:

On completion of the course the student will:

1. *Discussing how volcanoes elevate the surface of the earth.*
2. *Analyzing the relationship between folding, faulting, volcanic activity, and plate tectonics.*
3. *Understand the conceptual and dynamic aspects of landform development.*
4. *Learn the relevance of applied aspects of Geomorphology in various fields.*
5. *Study various landforms and the related processes from the traditional concept to modern development in Geomorphology*
6. *Gain an in-depth knowledge on the influence of various types of rocks.*
7. *Discussing the erosional and depositional landforms of wind.*
8. *Physical field surveys enable the students to understand the landforms, geomorphic process and associated hazards.*
9. *Enrich their knowledge in the form, process and interaction in the landform development and methods of geomorphic analysis of the landforms*
10. *Applying Geoinformatics techniques in geomorphic processes.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester -I	
Course Code / Title	22GE2PC02 - POPULATION GEOGRAPHY	

Objectives

1) *To understand how population Geography deals with the spatial variations of distribution, composition, migration and growth of populations in related places.*
2) *To familiarize with the characteristics of population distributions that change in a spatial context.*
3) *To analyze how the population statistics could explain the past trends and accurately predict the future.*
4) *To orient the students towards interdisciplinary perspectives on population issues at different geographical scales.*
5) *To appreciate the role of spatial perspectives towards showcasing population changes and its impact on the economy, society, environment and politics at diverse geographical spheres.*

Unit: 1	**Introduction:** Nature, Scope and Approaches- Relationship with Demography and other social sciences-Types and Sources of data- -History of population geography in India, Recent research studies in population geography.
Unit: 2	**Population Growth and Distribution:** Population growth trend and distribution-Determinants of Population Change: fertility, mortality and migration-Population growth and associated issues in Developed and Developing Countries- Depopulation, displacement, Literacy and growth in world and India.
Unit: 3	**Population Theories and Models:** Malthus- Marx- Boserup- Demographic Transition-Models in population studies - Population and resources: optimum, over and under population - Contemporary issues of Population.
Unit: 4	**Population Composition**: Age and Sex composition- Occupational structure- Rural – Urban Composition- Concept of Ageing- Global Population projection - Population and Sustainable Development Goals- 4 and 5.
Unit: 5	**Population Projection and policies:** Population Projection Initiatives at Global Level- Significance of Population projection- Population policy for developed and developing countries– Role of Population Resource in Geography- Technology and Population Development.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Gender inequality, Migration issues, Women empowerment, growing urban residents, Environmental sustainability.

References:

1. Birdsell, N., Kelley, A.C., and Sinding, S.W., (2001). Population matters: demographic change, economic growth, and poverty in developing world. Auckland: Oxford University Press.
2. Census Commissioner, India, 2001
3. Census of India Series-I, India Provisional Population Totals, Published by Registrar General &
4. Census of India, India: A State Profile Office of the Registrar General of India, Census Operations,
5. Chandna, B.C., (2012). Geography of Population, Kalyani Publishers, Ludhiana.
6. Debjani Roy., (2015). Population Geography, Books and Allied Private Limited, Kolkata.
7. Dyson, T., (2010). Population and Development: The Demographic Transition, London: Zed Books.
8. Ehrlich, P.R. and Ehrlich, A.H., (1996). Ecoscience: Population, Resources, Environment. 6th edition, W.H. Freeman and Company, San Francisco.
9. Gould, W.T.S., (2009). Population and Development, London: Routledge.
10. James, K.S., (2011). India's demographic change: opportunities and challenges. Science 333 (6042), 576-580.

11. May, J.F., (2012). World population policies: their origin, evolution, and impact, Washington DC: Springer.
12. Mohammad Izhar Hassan. (2020). Population Geography-A systematic Exposition, Routledge India Publications.

    New Delhi
13. Sawant, S. B. (1994). Population Geography. Pune: Mehta Publishing House.

Web Sources:

1. *www.worldometers.info*
2. *www.census.gov/topics/sex/age*
3. *www.economic discussion.net*
4. *www.un.org/population/migrationreport/*
5. *www.populationmatters.org*

Course Outcomes:

On completion of the course the student will:

1. *Recall the active role of population geography as a distinct field of human geography.*
2. *Recognize the different sources of demographic data, and compare the salient features of factors affecting population distribution.*
3. *Interpret the indices of population and demonstrate the global population growth.*
4. *Examine the different components of population change, its drivers, and their consequences upon contemporary socio-economic, environmental, and political changes.*
5. *Formulate the diverse perspective of population and its development.*
6. *Estimate the consequences of demographic transition on the economy, society and politics.*
7. *Justify the population policies and its vital role towards managing the population affairs on the path of sustainability.*
8. *Appreciate the role of spatial perspectives towards showcasing population changes and its impact on the economy, society, environment and politics at diverse geographical spheres.*
9. *Argue the conversion of increasing population as a premier resource in India.*
10. *Estimate the recent score of Achieving SDG in connection with population studies.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester- I	
Course Code / Title	22GE2PC03 - QUANTITATIVE TECHNIQUES IN GEOGRAPHY	

Objectives

1) *This course aimed to describe about quantitative information in geography, including data collection, management, and analysis.*
2) *This course educate some analytical procedures, include graphical presentation of data, descriptive statistics, sampling theory, and inferential statistics.*
3) *This course acquire knowledge on data analysis software for analyzing geographical data.*

Unit: 1	**Introduction:** Definition of statistics, Importance and use of statistical techniques in geography, Statistical data, Various types of averages, Measures of dispersion and their calculation, Normal frequency distribution, Curve and its uses, Binominal and poisons frequency distributions.
Unit 2:	**Geographic Matrices:** Characteristics of samples, Methods of sampling, Statistical significance, Standard error of difference, Significance test in small samples, Student's'‘t’ test, Snedecor's variance ratio test (F test).
Unit 3:	**Statistics Techniques and Models:** Difference between large and small samples, Significance test in large samples, Standard error of the difference of sample means, Chi Square test-, Simulation models, Gravity models, Lorenze curve, Ginne's coefficient.
Unit 4:	**Measures of spatial distribution**: Point and line distribution, Nearest neighbour index, Models, Importance of models in geography, Models as quantitative techniques- Nelson's method, Weaver's method, Raffiullah's method, Ternary diagram.
Unit 5:	**Hypothesis Testing:** Logic of hypothesis testing, Steps in hypothesis testing, Uncertainty and error, hypothesis test, effect size and statistical power- Mann-Whitney U test, Analysis of Variance (ANOVA).

Unit 6: Current Contours: Not for Examination Only for Discussion

- Statistical Software's: GIS and Spatial Auto Correlation, SPSS and Amoss tool, MaxStat Lite, MATLAB.

References:

1. Ashis Sarkar (2020) Quantitative Geography Techniques and Presentations, Orient Blackswan, Pvt. Ltd. Hyderabad.
2. Ashissarkar, (2013), quantitative goegraphy: tech. & presentations orient blackswan private limited - New delhi.
3. Gregory, S. (1978), Statistical Methods and the Geographer(4th Edition), Longman,
4. Haan, M. (2013). An Introduction to Statistics for Candian Social Scientists. Oxford.
5. Hammond, R. and McCullagh, P.S. (1974), Quantitative Techniques in Geography: An Introduction, Clarendan Press, Oxford.
6. Harris, R. and C. Jarvis (2011). Statistics for Geography and Environmental Science. Pearson
7. Jha, Shiva Nand (2020): Statistical Methods in Geography, Raghav Publications, New. Delhi.
8. Johnston R. J. (1973), Multivariate Statistical Analysis in Geography, Longman, London.
9. Peter a. Rogerson (2015), statistical methods for geography: a student's guide, sage publications ltd, london, united kingdom.
10. Shafer, D.S. and Z. Zhang (2012). Beginning Statistics. Open source textbook: http://2012books.lardbucket.org/

Web sources

1. *https://www.jstor.org/stable/pdf/2987578.pdf*
2. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8354454/*
3. *https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000017GE/P001787/M027021/ET/1517203182ModuleIVBivariatelinearRegression(3.pdf.*
4. *https://docs.qgis.org/2.8/en/docs/training_manual/vector_analysis/spatial_statistics.html*
5. *https://ibis.geog.ubc.ca/~ewyly/g450/hypotheses.pdf*

Course Outcomes:

On completion of the course the student will:

1. *Understand about the importance of statistics in quantitative geographical research.*
2. *Get knowledge on combinational analysis and it importance for analyzing geographical data.*
3. *Understand and explain about geographic matrices and it components.*
4. *Demonstrate basic descriptive statistics and regression methods as they apply to problem solving in Geography.*
5. *Understand various types of correlation co-efficient and it importance in research.*
6. *Perform basic data manipulation, statistical calculations and graphical presentation by hand, and using computer spreadsheets or statistical software (e.g., Excel, SPSS).*
7. *Evaluate the roles of sampling distributions in drawing inferences about populations based on samples.*
8. *Handle different spatial data using various quantitative techniques promptly.*
9. *Able to understand and use the Time Series data to find the future trend.*
10. *Identify when and where statistical procedures are appropriate.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester -I	
Course Code / Title	22GE2PC04 - DIGITAL CARTOGRAPHY	

Objectives

1) *To introduce the students the theories and techniques in modern map-making concepts*
2) *The course will also develop practical skills in preparing and drafting of thematic maps*
3) *To learn internet mapping and mobile mapping*

Unit: 1	**Map Characteristics:** Maps are unique - communication process - Map functions and map types: cadastral and utilities maps, large scale maps and small scale maps - Thematic and temporal comparison – Geodesy – Map projection-Digital data.
Unit 2:	**Map Design and Models:** Cartographic design - Perceptual considerations - Graphic communication – Controls on map design - Design planning - Map elements -Colour and pattern use – colour theory and cartographic models.
Unit 3:	**Map Symbolization:** Symbolization features -Mapping the statistical surface: point, line, area and volume symbols – Visualization methods - Statistical mapping.
Unit 4:	**Cartographic Production:** Management and documentation of spatial information - Desktop mapping - Map production - Mapping time - Map animation.
Unit 5:	**Web Mapping:** Web map design - Web map and multimedia - Mapping cyberspace - Geovisualization - Map as a decision tools - Web based electronic atlases - GIS - Geospatial information policy.

Unit 6: Current Contours: Not for Examination Only for Discussion

- Cartographic display, GIS and cartography, Democratization of cartography, Mobile cartography, Virtual mapping, Crowd sourcing of spatial data, Neo-cartography

References:

1. Kennedy, M., Kopp, S., (2001): Understanding Map Projections, ESRI Press.
2. Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O., (2011): Map Use: Reading, Analysis, Interpretation, 7th Edition, ESRI Press.
3. Mishra, R.P., (2014): Fundamentals of Cartography (Second Revised and Enlarged Edition), Concept publication.
4. Prakash, A., (2021), Remote Sensing and Geographical Information System, Academic Aspirations.
5. Robinson A. H., (2009): Elements of Cartography, John Wiley and Sons.
6. Sahu, K. C., (2022) Textbook of Remote Sensing and Geographical Information Systems, Atlantic Publishers and Distributors (P) Ltd.
7. Sarkar, A., (2015): Practical geography: A systematic approach. Orient Black Swan Private Ltd.
8. Sharma J. P., (2010): Prayogic Bhugol, Rastogi Publishers.
9. Shimada, M., (2022), Imaging from Spaceborne and Airborne SARs, Calibration, and Applications (SAR Remote Sensing), CRC Press.
10. Singh, R. L., Singh, R. P. B., (2008): Elements of Practical Geography, Kalyani Publishers

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1. *https://www.mdpi.com/2072-4292/11*
2. *https://www.pdfdrive.com/remote-sensing-and-geographical-information-systems-e33404721.html*
3. *https://gisrsstudy.com/*
4. *https://www.umesc.usgs.gov/documents/reports/1995/95p001r.pdf*
5. *https://elearning.iirs.gov.in/elearning.php*

Course Outcomes:

On completion of the course the student will:

1. *Skilful in cartographic design and map-making.*
2. *Spatial analysis techniques to manipulate, extract, locate and analyse geographic data.*
3. *Modelling, data integration & conversion, geocoding and geomatics are useful skills*
4. *It facilitates students to apply the concepts of remote sensing and image processing techniques.*
5. *It enhances the knowledge on image pre-processing and image enhancement.*
6. *Knowledge of cartographic design principles including colour and symbology theory, map projections, thematic and statistical mapping, topographic and reference mapping, display hierarchies, typography, and data generation.*
7. *Knowledge of GIS principles including spatial data types, data layers, basic geographic, analytic, and statistical functions*
8. *Collect, analyse and integrate geographic into an effectively designed cartographic product.*
9. *Proficient in the use of mapping software, hardware and platforms necessary for cartographic and web production, such as ESRI ArcView GIS, ESRI ArcGIS and Intergraph GeoMedia Pro.*
10. *Specialize in the production of maps. They analyse and compile geographic data and mix it into a publishable map.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester -I	
Course Code / Title	22GE2PC04 - GEOHYDROLOGY	

Objectives

1) *To understand the fundamentals concepts of groundwater concepts for its storage and movement of water.*
2) *To learn about the chemical and physical properties of groundwater.*
3) *To learn various groundwater management techniques such as artificial recharge, conjunctive use basin management and control of sea water intrusion.*
4) *To understand the groundwater pollution, remediation and modeling of the aquifer with respect flow model and transport model*

Unit: 1	**Fundamental Concepts:** Geohydrology; meaning - Groundwater in hydrologic cycle - Origin of groundwater - Aquifers and its Types – Porosity - Vertical Distribution of Groundwater - Zone of Aeration - Zone of Saturation; Specific Yield – Springs - Hydraulic Conductivity and Storage Coefficient and their Practical Significance - Darcy's Law and its Validity - Groundwater Flow Contours and their Applications - Tracer Techniques in Groundwater Flow Studies.
Unit 2:	**Water wells and Groundwater Investigation:** Types, Construction, Development and Maintenance of Water wells – Artesian Well -Groundwater exploration – Surface investigations of Groundwater: Geologic, Geophysical and Remote sensing Methods – Subsurface investigations of Groundwater: Logging – Types and Techniques.
Unit 3:	**Groundwater Quality:** Chemical, Physical and biological Analyses - Graphical Representation of Chemical quality of Groundwater - Water quality criteria for domestic, industrial and irrigation use - Groundwater Pollution sources – Municipal, Industrial Agricultural and other sources - Evaluation and Monitoring of Groundwater Pollution - Groundwater quality issues and mitigation.
Unit 4:	**Groundwater level and Fluctuations:** causes and control – Effects of global climate change on groundwater - Sea water intrusion in Aquifers – Occurrence and Prevention – Ghyben Herzberg relation between fresh and saline water – fresh salt water interface - Effects of Wells on Sea water intrusion– upcoming of saline water - Groundwater province of India.
Unit 5:	**Groundwater Management and Modelling:** Groundwater Management – Basin Investigation – Data collection and field work – Basin Yields - Salt balance - Evaluation and Management of Groundwater Basin – Water balance studies – Safe yield and Overdraft – Concept of artificial recharge –Recharge methods - Artificial and Induced Recharge – Wastewater Recharge - Aquifer Modeling - Flow Modeling - Solute Transport Modeling.

Unit 6: Current Contours: Not for Examination Only for Discussion

- Management of water resources – Towards a sustainable future – Waste water - integrated water resources management - system analysis in water resources management

References:

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14. Younger, P. L. (2009). Groundwater in the Environment: An Introduction. John Wiley & Sons.

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1. *https://groundwater.ucdavis.edu/files/156562.pdf*
2. *https://www.nrc.gov/docs/ML1735/ML17355A590.pdf*
3. *https://pubs.usgs.gov/gip/gw/quality.html*
4. *https://www.sciencedirect.com/topics/earth-and-planetary-sciences/groundwater-management#:~:text=Groundwater%20management%20deals%20with%20the,benefit%20of%20all%20parties%20involved.*
5. *https://web.worldbank.org/archive/website00671/WEB/PDF/HANDB-23.PDF*

Course Outcomes:

On completion of the course the student will:

1. *To understanding the fundamental concept of groundwater for its storage movement governing laws with field and laboratory estimation of hydraulic properties.*
2. *Understand the linkage between the Atmospheric and hydrological system and water conservation strategies.*
3. *Derivation of the flow Water through porous media its governing equations and estimation of aquifer parameters with various types of pumping tests in tube wells and open wells.*
4. *Practicing various groundwater management techniques such as artificial recharge, conjunctive use basin management and control of sea water intrusion.*
5. *To understand the groundwater pollution, remediation and modeling of the aquifer with respect to flow model and transport model.*
6. *Gaining knowledge on ground water quality and its deteriorations*
7. *Be able to assess the critical relation between surface and subsurface discharge and recharge of water and its relation with water table.*
8. *Be able to know various groundwater management strategies through applying different techniques and Approaches.*
9. *Gain knowledge on the impact of irrigation, Industrialization and urbanization on water resources and contemporary water crisis.*
10. *Specialize in the field of groundwater resources and methods to evaluate policies and management of India.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - I	
Course Code / Title	22GE2PC05 - Techniques of Mapping, Analysis and Image Interpretation (P)	

Objectives

1) *This course studies the concept of thematic map information through computer-based*
2) *Use Pocket Stereoscope and make planimetric measurements from Aerial Photos.*
3) *Interpret Satellite Images and Aerial photos visually and with stereoscope for delineating various landforms and landcover features.*

Ex No: I	Topographic, Thematic and Atlas mapping
Ex No: II	Slope analysis using Google Map
Ex No: III	Crop Concentration, Crop Diversification and Combination Mapping
Ex No: IV	Marginal Information of Aerial Photography
Ex No: V	Stereovision Test
Ex No: VI	Mirror Stereoscope
Ex No: VII	Determination of Photographic Scale
Ex No: VIII	Height Measurement from Aerial Photographs using Parallax Box
Ex No: IX	Mapping from Aerial Photography: Geomorphology, Drainage, LULC and Transport
Ex No: X	Marginal Information of Satellite Image
Ex No: XI	Mapping from Satellite Image: Geomorphology, Drainage, LULC, Water Resources, Forest Cover.
Ex No: XII	Comparison of Toposheet, Aerial Photography and Satellite Image

Unit 6: Current Contours: Not for Examination Only for Discussion

- Erdas Imagine, ARCGIS.

References:

1. Anson, R.W. (Ed.) (1984) Basic Cartography for Students and Technicians, Volume 2, International Cartograhic Association, Elsevier Applied Science Publishers, London.
2. David P. Paine, James D. Kiser (2012) Aerial Photography and Image Interpretation, Third Edition, John Wiley & Sons, Inc.
3. Dorling, D. and David Fairbairn (1997), Mapping: Map of representing the world, Addisson Wesley Longman Ltd., U.K.
4. Imagine (2009). Tour Guide Imagine, Leica Geosystem GIS & Mapping, Atlanta.
5. Jensen, J. R., (2006). Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc., New Jersey.
6. Kang-tsung Chang (2002) Introduction to Geographical Information Systems, Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. Lillisand. T.M., and Kiefer, P.W., (1998). Remote Sensing and Image Interpretation, John Wiley & Sons, New York.
8. Paul Gibson, and Clare H. Power, (2000). Introductory Remote Sensing: Digital Processing and Applications, Routledge Publisher, London.
9. Richards, J. A. and Jia Xiuping (2005). Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag, Berlin.

Web sources:

1. *https://earthobservatory.nasa.gov/features/ColorImage*
2. *https://www.rgs.org/CMSPages/GetFile.aspx?nodeguid=09c5b6e1-87f5-4ba9-9976-e03c383506ff&lang=en-GB*
3. *https://www.isprs.org/proceedings/XXVII/congress/part2/380_XXVII-part2-sup.pdf*
4. *https://www.researchgate.net/publication/342322385_Image_Processing_Techniques_for_Analysis_of_Satellite_Images_for_Historical_Maps_Classification-An_Overview*
5. *https://www.nrcan.gc.ca/maps-tools-and-publications/satellite-imagery-and-air-photos/tutorial-fundamentals-remote-sensing/image-interpretation-analysis/elements-visual-interpretation/9291*

Course Outcomes:

On completion of the course the student will:

1. *Students will learn various Map Appreciation and interpretation*
2. *Students study various crop concentration and Crop combination from regional to local.*
3. *Know how Quantitative symbolization and Digitization*
4. *Familiar from various aerial photographs and satellite imaginary concept.*
5. *Use Pocket Stereoscope measurements from Aerial Photos.*
6. *Understand the concept of stereoscopy and its use to determine height by parallax measurement.*
7. *Use scale and height measurements from aerial photograph.*
8. *Learn to Interpret Satellite Images and Aerial photos for delineating various landforms and land cover features.*
9. *The students will learn various satellites imaginary and produce different thematic maps.*
10. *The students will learn various comparative toposheet, satellite and aerial thematic maps..*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - I	
Course Code / Title	**22GE2PE01 -** Elective anyone from **List A**	
1. Advanced Python for GIS 2. Geography of Tourism 3. Rural Development		

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
SEMESTER – II						
22GE2PC06	Applied Climatology	4	5	25	75	100
22GE2PC07	Geographical Thought	4	5	25	75	100
22GE2PC08	c) Regional Planning d) Sustainable Management	4	5	25	75	100
22GE2PC09	GIS data Analysis (P)	4	4	40	60	100
22GE2PE02	Elective anyone from the List	3	3	25	75	100
22GE2PN01	Non Major Elective (offered by other Departments)	2	3	25	75	100
22GE2PSB1	Skill Based Elective: Data Collection Filed Work	2	2	25	75	100
22GE2PVA1	Open Source GIS (Common Seminar, Library, Leveraging E-Resources, VAC, etc.)		3	25	75	100
	Total	**23**	**30**			**800**

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - II	
Course Code / Title	22GE2PC06 – APPLIED CLIMATOLOGY	

Objectives

1) *The broad objective of the course is to introduce to the students the fundamentals of atmospheric phenomena, global climate systems and climate change.*
2) *Students will learn how climatic variability and change are central to the issue of current and future global environmental change.*
3) *To grasp the techniques for modeling the climate, theoretical and technical aspects.*
4) *Students will understand the Humidity, precipitation and atmospheric disturbances.*
5) *To be able to analyses and interpret climatic data*

Unit: 1	**Atmosphere Composition and Structure:** Solar radiation –Temperature – factors controlling the distribution of temperature – horizontal, vertical distribution of temperature – heat balance of the earth – Atmospheric Pressure – distribution – General circulation of the atmosphere – wind – systems – planetary – seasonal and local winds.
Unit: 2	**Atmospheric Moisture:** Humidity, evaporation – condensation – clouds – Precipitation – types and forms – distribution – Air mass – classification – fronts – Thunderstorms – jet streams – Elnino and La Nina .
Unit: 3	**Climatic Classification:** Empirical and generic climatic classification –Koppen and Thornthuwaite – World Climatic regions – Climatic changes – evidences and theories world level to India.
Unit: 4	**Applied climatology:** Micro climate –agro climatology – Crop calendar – LGP- elements – temperature – Water balance – Climate health.
Unit: 5	**Urban climatology:** Micro climatic changes– global warming – heat island – health hazards – pollution –rainwater harvesting – man's impact on climate – Green urban and urbanisation.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- IMD, Climate Change, Climate And Water Resources, Human Bioclimatology, Forecasting Climate.

References:

1. Ahrens, C.D., Jackson, P.L., Jackson, C.E.J. and Jackson, C.E.O. (2012): Meteorology Today: An Introduction to Weather, Climate and the Environment; Cengage Learning; Boston
2. Barry, R.G. and Chorley, R.J. (2003): Atmosphere, Weather and Climate; Psychology Press, Hove; East Sussex.
3. Critchfield, H. J. (1987), General Climatology, Prentice Hall, Englewood Cliffs.
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6. Jones and Bartlett Learning (2017), Climatology, 4th editions, Louisiana State University, Baton Rouge.
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9. Smith, K., (1975). Principles of Applied Climatology, McGraw Hill Book Co., London
10. Eric Barrett, (2021) Climatology from Satellites, Routledge, UK

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2. *https://nios.ac.in/media/documents/316courseE/ch9.pdf*
3. *https://education.nationalgeographic.org/resource/koppen-climate-classification-system*
4. *https://www.sciencedirect.com/topics/earth-and-planetary-sciences/climate-classification*
5. *https://egyankosh.ac.in/bitstream/123456789/83620/1/Unit-8.pdf*

Course Outcomes:

On completion of the course the student will:

1. *The learners will have the basic concepts of climatology and its geographical significance along with knowledge of earth's atmosphere in respect to structure, composition and characteristics.*
2. *Understand the elements of weather and climate, different atmospheric phenomena.*
3. *To Know the various human activities are increasing emissions of the natural greenhouse gases.*
4. *They aware of the difficulties involved in the detection of any unusual global warming and background noise of natural variability.*
5. *Understand IPCC, for the climate.*
6. *Evaluate the mean global atmospheric circulations of world climate systems.*
7. *To explain atmosphere and the earth's surface.*
8. *To identify climate and human issues.*
9. *Gain knowledge about impacts of urban climatic conditions.*
10. *Establish relationship between different impacts of climate change for satellite data analysis*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - II	
Course Code / Title	22GE2PC07 – GEOGRAPHICAL THOUGHT	

Objectives

1) *To study the history and philosophy of geography and interdisciplinary*
2) *To know the contributors and the evolution of geography from classical to modern*
3) *To understand the contemporary research in human and physical geography*
4) *Study the basic knowledge on geography as a spatial science.*

Unit: 1	**Nature and scope of Geography:** Geography as a spatial science, as interdisciplinary and integrated discipline. Place of Geography in the system of Sciences (Physical and Human Sciences)
Unit: 2	**Geographical Tradition:** Development of Geographical Thought **- Classical** – Greek, Roman and Indian. **Medieva**l – Age of Discovery and Arab Geographical Tradition. **Modern** –.Humboldt & Ritter, European and American-German-France-British-India schools of thoughts.
Unit: 3	**Dualism and Dichotomy in Geography:** Physical Vs Human science (dichotomy)- Regional versus Systematic, Ideographic versus Nomothetic (dualism) Quantitative vs Qualitative, Visual Vs Digital.
Unit: 4	**Contemporary movements in Geography:** Radicalism - Radical/Marxist ideas in Geography- Humanistic and Behaviourism; Quantitative Revolution; and model building (Chorley, Hagget and Haggerstrand). Inductive and deductive approaches.
Unit: 5	**Recent Trends in Geography:** Applied geography and applied research - Paradigms in Geography –Geography and Sustainable development Goals (SDG)–Geoinformatics-Online resources – future of geography and geographers

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Geographical Society in World and India- Modern geography- Role of remote sensing- GIS- GNSS- Application – Web resources- planning.

References:

1. Adhikari S. (2004) Fundamentals of Geographic thought, concept publishers, New Delhi.
2. David Harvey (2000) Explanations in Geography, Macmillan, New York.
3. Dikshit R.D. (2001). Geographical Thought: A Conceptual History of ideas, prentice Hall publishing Company, New Delhi
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12. Ramesh Dutta Dikshit .(2018) Geographical Thought: A Contextual History of Ideas, PHI Learning,India
13. Y.K Sharma,(2020) Geographical Thoughts, Lakshmi Narain Agarwal publications, Agra

Web Sources:

1. http//Evolution Of Geographical Thought By Majid Husain PDF, ePub eBook
2. http// Physical Geography and the Geographic Thought Course
3. https://www.youtube.com/watch?v=8Dg-lJh6IF8, Modern Geographical Thought
4. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/geographical-thought
5. https://www.oxfordbibliographies.com/view/document/obo-9780199874002/obo-9780199874002-0127.xml

Course Outcomes:

On completion of the course the student will:

1. *Perceive the evolution of the philosophy of Geography*
2. *Appreciate the contribution of the thinkers in Geography.*
3. *Discussing the evolution of geographical thought from ancient to modern times.*
4. *Establishing relationship of Geography with other disciplines and man-environment relationships.*
5. *Analysing modern and contemporary principles of Empiricism, Positivism, Structuralism, Human and Behavioural Approaches in Geography the Students who complete this subject will be able to think critically about different schools of geographical thought.*
6. *Evaluate theoretical concepts from geography and elsewhere; and be able to demonstrate an understanding of the dynamic and contested nature of the discipline.*

   Analyse the Quantitative revolution
7. *Analyse Quantitative and Qualitative revolution with geographical planning.*
8. *Evaluate Modern geography and innovative works in geography.*
9. *Demonstrate geographical issues from a Third World perspective*
10. *Demonstrate the inclusive nature of 21st century geographical discourses.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - II	
Course Code / Title	22GE2PC08 – REGIONAL PLANNING	

Objectives

1) *To equip the students in the regional analysis at various levels, preparation of action oriented policies, plan, strategies and management plan for human settlements*
2) *To educate Sustainable Resource Management plans*
3) *To educate on planning for social inclusion and people participatory programs for long term goals*

Unit: 1	**Basics of Regional Planning:** Basic concept – Geographic space and regions – concept of region – Types of regions- Goals and objectives of regional planning –Regional planning process - Interdisciplinary nature of regional planning Regionalism versus sectionalism - planning for sustainable development.
Unit: 2	**Approaches to Regional Analysis:** Systems concept – Geographic Data Matrix - population Analysis, population Projection, Location analysis, input –output Analysis, Multiplier - effort – Spatio – temporal dimensions - Grouping of dimensions in regional analysis - Methods Regional science methods to Indian regional problems – Growth pole and growth centre concept – Multi level planning.
Unit: 3	**Approaches to Regional Economic Development:** Classical Geographical approaches - Economic approaches – Social approaches – Holistic approach –Comprehensive regional development – 73rd and 74th Constitutional Amendments and their implications in planning and development in India.
Unit: 4	**Indian Regional Development:** Development of regional planning in India- Five year plans and Annual plans – Demarcation of planning regions – Economic planning regions of India – Regional imbalances – Development programmes- integrated rural development programme , Panchayat Raj and decentralized planning - command development – planning for backward area, desert, drought-prone, hill and tribal area development.
Unit: 5	**Regional Planning in Tamil Nadu:** Evolution of regional planning –Planning regions of Tamil Nadu -Backward area development – Panchayat Act, Municipality Act, Corporation Act, TNULB Act, land acquisition Act 1854- Role and responsibilities of local bodies finance, revenue, expenditure and resource mobilization Town and Country Planning Act of Tamil Nadu 1972 - Urban Development 1972-m Urban Development Act.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Resource Regions; Corridors as regions; National, Sub-National and State as a region; Macro, Meso and Micro regions in India

References:

1. Addaney, M., Cobbinah, P., (2021) Sustainable Urban Futures in Africa, Routledge.
2. Hall P (2020) Urban And Regional Planning 6th Edition 2020. Taylor & Francis Ltd
3. Harrison J., Galland D., Tewdwr-Jones M. (2021), Planning Regional Future, Routledge.
4. Misra, R. P., Sundaram, K.V.and V.L.S.Prakasa Rao, (1974) Regional Development planning in India, Vikas Publishing House Delhi.
5. Misra, RP (2002) Regional Planning –Concept, Techniques, Polices and case Studies, Concept publishing Company, Delhi.
6. Mohapatra, A.C, and Jayant K. Routray (1998) Regional Development and Planning, Rawat Publications, Jaipur.
7. Nath,V (2009) Regional Development and planning in India, Concept Publishing Company , Delhi.
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9. Sundaram, K, V (1977) Decentralised Multi level planning- Principles and Practice, Concept Publishing Company, Delhi.
10. Sundaram, K.V. and R.P. Misra (1976) Micro –Level planning and Development Process-Vol.1: Area Development Programme in India –A Review and Appraisal, Institute of Development Studies, University of Mysore.

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2. *http://guides.lib.berkeley.edu/city-planning*
3. *http://guides.lib.umich.edu/c.php?g=283101&p=1886114*
4. *http://www.semcog.org/*
5. *http://geography.utoronto.ca/department/careers-in-geography-and-planning/*

Course Outcomes:

On completion of the course the student will:

1. *Gain good knowledge about scientific theory and methods within city and regional planning.*
2. *Apply knowledge to new topics within city and regional planning.*
3. *Analyse the relevant problems while taking planning history, traditions, methods and social responsibility into account.*
4. *Understand technical and aesthetic aspects of the existing urban environment as well as propose new ones.*
5. *Critically assess consequences associated with proposed land use and building development*
6. *Analyse the consequences associated with transport plans.*
7. *Contribute to original thinking and innovation.*
8. *Equip with knowledge regarding regional analysis at various levels, prepare strategic plans and management policies.*
9. *Propose a city development plan.*
10. *Apply the techniques of urbanization planning.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - II	
Course Code / Title	22GE2PC08 - SUSTAINABLE MANAGEMENT	

Objectives

1. *To solve complex problems with a systems thinking approach.*
2. *To communicate complex social, economic, and environmental issues and their interrelationships to diverse audiences.*
3. *To analyze and critically evaluate evidence to formulate and organize sustainable strategies.*
4. *To engage and lead sustainability initiatives at local, national, and global levels.*

Unit: 1	**Introduction:** Definition - scope and elements - History, Concepts, Historical Background, Components, Strategies,Measurement, Limitations, Sustainable Development Goals.
Unit: 2	**Challenges for Sustainable Development:** Land Management, Water Crisis, Energy Crisis, Food Security and Agriculture, Poverty, unemployment, inadequate housing, unsafe drinking water, deficiency of energy sources and supply, sanitation, unscientific waste management, lack of transportation facilities.
Unit: 3	**Sustainable Utilization of Resources and Environmental Protection:** Land, Water and Energy - National Environment Policy (NEP) - Environment protection policies, waste management, Pollution control, reduce the use, reuse and recycle, sustainable energy, preservation of forest and water sources.
Unit: 4	**Global goals for sustainable development:** Domain, conflict, crisis and compromise - Role of SDGs in India
Unit: 5	**Sustainability in Urban areas:** Increasing imperviousness in cities, thermal environment (Urban Heat Island), Urban disaster risk management, Sustainable Smart Cities and Good Governance, Sustainable approaches to Urban WaterManagement.

Unit: 6 Current Contours: [Not for Examination]

Sustainable Agriculture, Climatic Change and Sustainability, Feasibility of Sustainable Development, Technical glossary.

References

1. Agyeman, Julian, Robert D. Bullard, & Bob, Evans (Eds.) (2003), Just Sustainabilities: Development in anUnequal World. London: Earthscan. (Introduction and conclusion.).
2. Ayers, Jessica & David Dodman (2010). Climate change adaptation and development I: the state of the debate.Progress in Development Studies 10 (2): 161-168.
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5. Browne, S. 2017. Sustainable Development Goals and UN Goal-Setting, Routledge.
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8. Roling, N.G., & Wageruters, M.A.E.,(ed.) (1998). Facilitating Sustainable Agriculture, Cambridge: CambridgeUniversity Press.
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Web sources

1. *https://sdgs.un.org/goals*
2. *https://www.epa.gov/sustainable-management-food*
3. *https://www.ingwb.com/*

4. https://www.globalgoals.org/
5. *https://indiatogether.org/*

Course Outcomes

On completion of the course the student will:

1. Define and discuss the idea and practice of sustainability.
2. Explain current challenges to sustainability, including modern world social, environmental, and economic structures and crises.
3. Interpret social, scientific, and business-related information in the context of sustainability.
4. Make informed judgments that lead to sustainable outcomes.
5. Employ systems thinking approaches to evaluate sustainability issues.
6. Communicate sustainability to diverse audiences.
7. Analyse individual, local, and global dimensions of social, environmental, and economic responsibility.
8. Evaluate sustainability issues and solutions using a holistic approach focusing on connections between complex human and natural systems.
9. Integrate knowledge from multiple sources and perspectives to understand environmental limits governing human societies and economies and social justice dimensions of sustainability.
10. Cultivate awareness of and the capacity to critique contemporary globalisation in terms of sustainability.

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - II	
Course Code / Title	22GE2PC09 – GIS DATA ANALYSIS (P)	

Objectives

1) *To make the students know about spatial data structures*
2) *To impart knowledge on working with vector and raster data formats*
3) *To effectively visualize the spatial data*

Ex. No: I	Components of GIS - Arc catalog- Scene
Ex. No: II	Scaning and Georeferencing
Ex. No: III	Geodatabase Creation - Spatial Data and non-spatial data
Ex. No: IV	Digitizing – Manual and automatic.
Ex. No: V	Data Collection and Conversion
Ex. No: VI	Attribute : Join and Relate
Ex. No: VII	Vector data editing
Ex. No: VIII	Raster Data Pre-processing
Ex. No: IX	Raster Data Corrections
Ex. No: X	Raster Analysis
Ex. No: XI	GPS Data Collection and Import
Ex. No: XII	Data Visualization
Ex. No: XIII	Overlay analysis
Ex. No: XIV	Proximity analysis
Ex. No: XV	Interpolation analysis
Ex. No: XVI	Surface analysis
Ex. No: XVII	Density analysis / Layout

Current Contours: Not for Examination Only for Discussion

- Erdas Imagine, ArcGIS.

References:

1. Farkas, G. (2017). Practical GIS. United Kingdom: Packt Publishing.
2. Grekousis, G. (2020). Spatial Analysis Methods and Practice: Describe - Explore - Explain Through GIS. India: Cambridge University Press.
3. Gupta. R.P., (2005). Remote Sensing Geology (2nd Edition), Springer India, New Delhi.
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10. Verbyla, D. L. (2002). Practical GIS Analysis. United Kingdom: Taylor & Francis.

Web Sources:

1. *https://www.packtpub.com/product/practical-gis/9781787123328*
2. *https://www.oreilly.com/library/view/practical-gis/9781787123328/*
3. *https://www.coursera.org/specializations/gis-mapping-spatial-analysis*
4. *https://data.cdrc.ac.uk/dataset/introduction-spatial-data-analysis-and-visualisation-r/resource/practical-data*

Course Outcomes:

On completion of the course the student will:

1. *Explain principles of remote sensing, different satellite systems and sensors*
2. *Perform image pre-processing, enhancement and classification and interpretation of satellite images*
3. *Develop basic understanding and hands-on on GIS software and GPS*
4. *Understand GIS Data Structures and GIS Data Analysis*
5. *Apply GIS for natural resource management,*
6. *Apply ArcGIS for spatial data preparation, analysis and visualisation with sophisticated skills of vector and raster processing*
7. *Demonstrate proficiency in integrating GIS data analysis with simple statistical analysis*
8. *Demonstrate ability to conduct a GIS research project in the area of their choice.*
9. *Learn how to visualize and manipulate GIS data (vector and raster data)*
10. *Understand the basic and intermediate GIS concepts and analysis.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - II	
Course Code / Title	**22GE2PE02 -** Elective anyone from **List B**	
1. Remote Sensing 2. Geography of Tamil Nadu 3. Word Regional Geography		

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:02
	Semester - II	
Course Code / Title	22GE2PSB1 - SKILL BASED ELECTIVE – DATA COLLECTION AND FIELD WORK	

Objectives

1) *To understand the fundamental facts of the field survey*
2) *To identify the problems and choosing the study area*
3) *To familiarize methods which is used to collect the sample data sets*
4) *To create the curious on field-survey report in addition to photographs, sketches, maps and diagrams.*

Unit: 1	**Introduction:** Fieldwork in Geographical studies – Role and significance. Selection of study area and objectives. Pre-field preparations. Ethics of fieldwork
Unit: 2	**Field techniques and tools**: Observation (participant, non-participant), questionnaires (open, closed, structured, non-structured). Interview with special reverence to focused group discussions.
Unit: 3	**Field techniques and tools**: Landscape survey using transects and quadrants, constructing a sketch, photo and video recording.
Unit: 4	**Data collection**: Positioning and collection of samples. Preparation of inventory from field data. Post-field tasks.
Unit: 5	**Data output:** Problem identification - Designing of questionnaire and sampling method - Data collection - Tabulation - Statistical Analysis - Report writing and prepare thematic maps.

Unit: 6 Current Contours: [Not for Examination]

Online Survey, App based Survey, Google forms

References:

1. Creswell J., (1994) Research Design: Qualitative and Quantitative Approaches Sage Publications.
2. Dikshit, R. D. (2003)The Art and Science of Geography: Integrated Readings. Prentice, New Delhi.
3. Evans M., (1988) Participant Observation: The Researcher as Research Tool‖ in Qualitative Methods in Human Geography, eds. J. Eyles and D. Smith, Polity.
4. Geographical Fieldwork in the 21st Century. (2021). United Kingdom: Taylor & Francis.
5. Maity, S. K. (2021). Essential Graphical Techniques in Geography. Singapore: Springer Singapore.
6. Mukherjee, Neela (2002). Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi
7. Robinson A., (1998), "Thinking Straight and Writing That Way", in Writing Empirical Research Reports: A Basic Guide for Students of the Social and Behavioural Sciences, eds. by F. Pryczak and R. Bruce Pryczak, Publishing: Los Angeles.
8. Rogerson, P. A. (2019). Statistical Methods for Geography: A Student's Guide. United Kingdom: SAGE Publications.
9. Stoddard R. H., (1982) Field Techniques and Research Methods in Geography, Kendall/Hunt.
10. Wolcott, H. (1995). The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA.

Web Sources:

1. *https://www.esri.com/en-us/arcgis/products/arcgis-quickcapture/overview*
2. *https://byjus.com/maths/data-collection-methods/*
3. *https://pubsonline.informs.org/doi/pdf/10.1287/ited.2017.0181*
4. *https://onlinelibrary.wiley.com/doi/abs/10.1002/9781444316568.wiem02047*

Course Outcomes:

On completion of the course the student will:

1. *Learn the importance of methodology of research*
2. *Acquire the knowledge about study area selection.*
3. *Identify the problems of the selecting area.*
4. *Capable to collecting the data using different methods of sampling and prepare thematic maps.*
5. *Proficient to prepare field sketches*
6. *Gain confidence in surveying and mapping*
7. *Explore the data analysis and interpretation skills.*
8. *Demonstrate the ideas and interpret the data.*
9. *Obtain the knowledge to convert survey data to tables*
10. *Gain courage to prepare a mini and major projects.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:02
	Semester - II	
Course Code / Title	22GE2PVA1 – OPEN SOURCE GIS	

Objectives

1) *GIS is becoming an important tool in natural resource management and spatial data analysis.*
2) *To learn GIS and mapping concepts using open source GIS software. The hands-on exercises that incorporated in the course will enable the students to do themselves of Georeferencing, digitization, symbolization, layout of map and spatial analysis.*
3) *Acquisition of these practical skills will help the students to fetch good employment opportunities.*

Unit: 1	**Introduction:** Open source tools - Open source GIS software - GRASS - QGIS: Overview of interface - Toolbars - Adding spatial and non-spatial data - Coordinate Systems.
Unit: 2	**Raster Data:** Sources of raster data - Conversion of analog into digital - Spatial and spectral resolution - Preparing grayscale, true colour and false colour images - Georeferencing of raster images.
Unit: 3	**Vector Data:** Spatial data capturing: point, line and polygon - Creating shape files - Digitizing and editing vector data - Adding attribute data - Joining tables - Labeling.
Unit: 4	**Symbolization and Visualization:** Attribute field selection and classification - Symbols: graduated, continuous and unique value - Map composition: title, map body, legend, north arrow, scale bar, map border, source and graticule.
Unit: 5	**Spatial Analysis:** Measuring distances and area -Vector analysis: buffer and spatial overlay - Raster analysis: spatial interpolation and raster overlay - Data conversion: raster to vector - vector to raster.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Web Mapping Architecture and Components – Web Mapping Servers- Thin Clients in Web Mapping – WMS, WFS, WCS, WPS and other web services- Open Server Standards, AGT - Archaeological Geophysics Toolbox.

References:

1. Bill Kropla Beginning Map Server (2005) Open Source GIS Development, Apress (Springer Verlog) New York.
2. Burrough, P. A and Racael A. McDonnell, (1998), Principles of Geographical Information Systems, Oxford University Publications.
3. Chang, K. T. (2006) Introduction to Geographic InformationSystems. 3rdEdition, McGraw Hill, New York.
4. Cutts, A., Graser, A. (2018). Learn QGIS: Your Step-by-step Guide to the Fundamental of QGIS 3.4, 4th Edition. United Kingdom: Packt Publishing.
5. Markus Neteler And Helena Mitasova (2007): Open Source GIS: A GRASS approach, Springer-Verlag Berlin, Heidelberg
6. Mitchell T (2005) Web mapping illustrated", O"Reilly Media Inc., Sebastopol, Canada
7. Neteler M, Helena M „Open source GIS (2008) A GRASS GIS approach, 3rd edition, Springer, New York,
8. Neteler, M. and Mitasova, H. (2008) Open Source GIS: A GRASS GIS Approach. 3rd Edition, Springer, NewYork.
9. Peng, Z.R. and Tsou, M.H. Internet GIS (2003), distributed geographic information services for the Internet and wireless networks. New York: John Wiley and Sons, New York.
10. Sutton,T.Dassau, O. and Sutton, M. (2009) A Gentle Introduction to GIS, Spatial Planning & Information, Department ofLand Affairs, Eastern Cape.

Web Sources:

1. http://www.qgis.org/en/docs/index.html
2. http://www.manifold.net/doc/transform_b order_buffers.htm
3. https://opensource.com/resources/what-open-source
4. https://opensource.org/links
5. http://www.gov.pe.ca/photos/original/IPEI_ebiz_oss.pdf

Course Outcomes:

On completion of the course the student will:

1. *Students can find the important of Open source technology in GIS and various options available in its implementation.*
2. *Learner can understand various Concepts and protocols used in Open Source GIS.*
3. *Learners will know Functionalities of Open Source GIS software in Desktop.*
4. *To explain Functionalities of Open Source GIS in Web based environments.*
5. *Students find out the availability of various Open Source GIS software and their architecture.*
6. *Learner can use a range of open source and cloud-based GIS software.*
7. *Students can able to create a spatial database.*
8. *Learner get knowledge about Publish a web mapping service.*
9. *Students can able to covert the data in spatial analysis*
10. *Learner will be understand the composition of maps*

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
SEMESTER – III						
22GE2PC10	Watershed Studies	4	5	25	75	100
22GE2PC11	Urban Geography	4	5	25	75	100
22GE2PC12	c) Industrial and Transport Geography d) Spatial Analysis	4	5	25	75	100
22GE2PC13	Geospatial Data Analysis for Resource Management (P)	4	4	40	60	100
22GE2PE03	Elective anyone from the **List**	3	3	25	75	100
22GE2PN02	Non Major Elective (offered by other Departments)	2	3	25	75	100
22GE2PSB2	Skill Based Elective: Summer Internship	3	2	25	75	100
22GE2PVA2	AI for Geographical Analysis (Common Seminar, Library, Leveraging E-Resources, VAC, etc.)	2	3	25	75	100
	Total	**26**	**30**			**800**

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - III	
Course Code / Title	22GE2PC10 - WATERSHED STUDIES	

Objectives

1) *The students acquire knowledge about hydrologic cycle, precipitation its measurement and analysis along with its abstractions*
2) *Ability the concepts of watershed characteristics and management strategies*
3) *To Develop water resource estimation, evaluation and modelling*
4) *To Gain knowledge in Geoinformatics approach to a different aspect of water resources*

Unit: 1	**Introduction to watersheds:** Definition-concept of watershed - Watershed delineation-traditional –Geo informatics approach-codification of watershed (Indian watershed atlas) - Problems and Prospects in watershed management in India, Inter basin transfer of water, inter boundary, interlinking of rivers, trans boundary.
Unit: 2	**Watershed Characteristics:** Drainage pattern and its types –Morphometric analysis: areal-linear-relief-hydrograph analysis-runoff modelling-surface water modelling-Data generation-Digital Elevation Model-soil data- landuse/land cover-climate data-surface water system model-HEC-RAS.
Unit: 3	**Groundwater:** Groundwater origin and occurrence-storage-types of aquifers- groundwater movement-quantity-quality-level-Groundwater modelling-Groundwater potential zone mapping-vulnerability-recharge-MODFLOW-DRASTIC.
Unit: 4	**Land and Water Resources:** Physical land suitability-Soil Erosion Model-Groundwater sustainability- Watershed and Land use planning Database-Thematic layers- Weightage- .Ranking and Rating scale-Integration-Suitability Classification-Crop suitability analysis.
Unit: 5	**Geo-informatics Approaches in Watershed Modeling:** Soil erosion model RUSLE-Watershed prioritization-SWAT-GIS for Water supply and irrigation-GIS- for flood management and spatial decision support system in Watershed studies.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Management of watershed – Sustainable Water Resources Development– Waste water – Water resources modelling – Environmental impact of water resource

References:

1. Chow, David R Maidment, Larry W. Mays (2010) Applied Hydrology, McGraw Hill Book Company, New Delhi.
2. David R Maidment, (2002), Arc Hydro: GIS for Water Resources, Volume I, ESRI Press, Redlands, USA.
3. FAO (2007) Land Evaluation,Rome
4. Hudak,Paul F,(2021) Principles of Hydrogeology, (3rd Edition).CRC Press.
5. Lynn E Johnson (2009) Geographic Information systems in water resources engineering, Taylor and Francis Group, New York.
6. Lyon, J.G (2003) GIS for Water Resources and Watershed Management. Taylor and Francis, New York.
7. Misra. H.N. (Ed.) (2014, Managing Natural resources Focus on Land and water, Prentice Hall.
8. Murthy, V.V. N., (1994), Land and Water Management, Kalyani Publishers
9. Sharad K. Jain, V.P Singh (2003) Water Resources Systems Planning and Management, Elsevier B.V, Netherlands.
10. Strahler, A. H., (1991), Modern physical geography, John Wiley & Sons
11. Todd, D.K. (2011). Ground water Hydrology, Wiley India Edition, New Delhi (3rd Edition).
12. Younger, P. L. (2009). Groundwater in The Environment: An Introduction. John Wiley & Sons.

Web sources:

1. http://www.sciencedirect.com/science/book/9780080449678
2. https://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=1090&context=josh
3. https://appaqua.appstate.edu/sites/default/files/pdf/colby_2019.pdf
4. https://www.fao.org/land-water/home/en
5. https://www.indiawaterportal.org/articles/land-and-water-resource-atlas-india

Course Outcomes:

On completion of the course the student will:

1. *Know about watershed delineation concept.*
2. *Interpret hydrological and rainfall dispersion graphs and diagrams.*
3. *Gain knowledge to prepare landuse and land cover maps.*
4. *Evaluate surface water resources and groundwater, policies and management.*
5. *Acquire knowledge about disasters and its management, conservation of water and climate change and its impact on water resources.*
6. *Learn about different of GIS for surface water modelling, groundwater modeling, and flood plain mapping.*
7. *Identify the importance of remote sensing and GIS in various applications like water resources, drought assessment, flood plain zoning.*
8. *Understand the assessment of Basin and its hydrology using Geospatial technology.*
9. *Get exposure to the Groundwater and Watershed Management aspects of GIS.*
10. *Realize the importance of water conservation.*
11. *Get skilled by GIS methods to interlink different water projects.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - III	
Course Code / Title	22GE2PC11 - URBAN GEOGRAPHY	

Objectives

1) *Understand the nature, scope, approaches and recent trends in urban studies*
2) *To provide an overview and theoretical framework of urban geography*
3) *To learn the internal spatial structure and landscapes of cities*
4) *Trace the origin of urban places over time and analyze the factors, stages and characteristics of these places*

Unit: 1	**Introduction:** Nature – Scope and development of Urban Geography - Historic Development of Cities – Definition of urban centres/cities- Urbanization - urban growth – world urbanization – urbanization in India.
Unit: 2	**Urban demography:** Population density models – age and sex structure – Occupational structure – Economic base – Basic and Non basic function – Functional classification of urban centres. Rural urban fringe – Suburbs –concept of city region.
Unit: 3	**Urban morphology:** Land use structure, urban sprawl, umland and periphery, Theories of city structure (Burgess, Hoyt, Harris and Ullman, White), Social area analysis – CBD delimitation – Urban ecology – Quality of urban life.
Unit: 4	**Hierarchy of urban and urban issues**: Rank size rule – Christaller's central place concepts – Urban problems- Urban poverty – Slums – environmental Pollution – water supply in urban areas - transport Network- Urban Flood- Urban crime.
Unit: 5	**Geoinformatics for Urban Studies:** Concept and History of urban planning, Urban Policy and programmes in India – Geoinformatics in urban planning-Land use Land cover classification-Spatial distribution analysis through Geoinformatics – urban change detection analysis through Geoinformatics –Case studies in India and Tamil Nadu.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Smart City Planning and Management, City Greening, MRTS, Modern transport

References:

1. Barrett, H., Hall, T. (2018). Urban Geography. United Kingdom: Routledge.
2. Carter, H. (1995): The Study of Urban Geography (4th Edition), Arnold,London
3. Dickinson, R.E. (1964): City and Region, Routledge, London.
4. Mandal R.P (2008) A Textbook-Urban Geography, Concept Publishing Company
5. Misra R. P & K.V. Sundaram (1971) Regional planning and Development, University of Mysore.
6. Mohammed Ishar Hasan (2014) Population geography, Rawat Publications.
7. Northam R.M (1975) Urban Geography, John Wiley Sons, New York.
8. Paul L. Knox and Linda McCarthy (2011), Urbanization: An Introduction to Urban Geography. Englewood Cliffs, NJ: Prentice Hall, 3rd edition.
9. Prakasa Rao, V.L.S. (2003): Urbanisation in India: Spatial Dimensions, Concept, New Delhi.
10. Richa Mehta (2014) Population geography, Srishti book distributors, New Delhi.
11. Sameer Sharma (2021) Urban planning and geography. PHI Learning Private Limited
12. Urvija Shanker (2014) Population pattern and urban development, Rajesh publications.

Web sources:

1. *https://www.owen.k12.ky.us/userfiles/257/Classes/17727/APHGModelsofUrbanStructure.pdf*
2. *Journal of Urban Technology*
3. *https://www.thoughtco.com/overview-of-urban-geography-1435803*

Course Outcomes:

On completion of the course the student will:

1. *Assess state-wise variation and trends of urbanization*
2. *Learn to analyze census data to measure urban growth*
3. *Explain the concept of Urbanization.*
4. *Analyse the internal structure of cities using appropriate techniques, models and theories.*
5. *Understand the functions, sizes, and spatial arrangements of urban areas*
6. *Describe the development and implications of the urban built environment and landscape.*
7. *Analyze the internal structure and shape of cities*
8. *Identify and analyze the problems of housing, slums and civic amenities*
9. *Use remote sensing data to analyse urban expansion and field based research.*
10. *Develop a skill to prepare urban land use map from satellite images.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - III	
Course Code / Title	22GE2PC12 - INDUSTRIAL AND TRANSPORT GEOGRAPHY	

Objectives

1) *The Objectives of this course are to understand the location of major manufacturing activities with the support of various industrial location theories and models*
2) *To provide knowledge to the learners about major industrial regions.*
3) *Acquaint the students with different modes of transportation and theoretical framework relating to transport costs, hierarchies and accessibility.*

Unit: 1	**Introduction:** Nature, scope and recent trends in Industrial and Transport Geography - Location factor of Industries - centralization and decentralization of industrial enterprises - Horizontal, vertical and diagonal linkages of modern industries - Methods of measuring the spatial distribution of manufacturing industries.
Unit: 2	**Industries and Theories:** Types of industries and determining factors - Alfred Weber's theory of industrial location - Hoover theory - Losch theory – Sergeant Florence theory – The Moses model – The hotelling model - Modern refinements to least cost theory, New trends in industrial geography.
Unit: 3	**Industrial Regions:** Important industrial regions of the world: North American region, European region, Industrial region of Russia, Asian region, Other isolated industrial regions - Major industrial regions of India - The changing character of geographical concentration and impact of technological change.
Unit: 4	**Transportation Systems, Structure and Process:** Relative significance of different modes of transport - Intermodal transportation - Transport costs - Theories related to freight rate structure - Terminal costs - Transportation and spatial structure: linkages, nodes and hinterlands - Idealized process of transport development.
Unit: 5	**Transport Network:** Network structure- Measurement of connectivity -Graph theoretic measures: gamma and alpha index -Measurement of accessibility - matrix measures: accessibility and shortest-path matrix -Allocation models - Gravity models - Ullman's triad - Applications of gravity model. Recent trends: Application of GIS and GNSS in transport planning.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Ease of transport and services - Foreign investment in industrialization – modern transportation systems – Smart Transportation systems.

References:

1. Alexanderson, C: (2005) Geography of Manufacturing, Prentice Hall, Mumbai.
2. Choudhary, M R (2003): Industrial Geography of India.
3. Cidell, J. (2021). An Introduction to Transportation Geography: Transport, Mobility, and Place. United States: Rowman & Littlefield Publishers.
4. Estall, R C & Buchanan, R O: Industrial Activity and Economic Geography, Hutchinson & Co. London.
5. Newman, M. (2010) Networks: An Introduction. Oxford University Press, Oxford.
6. Rodrigue, J.P., Claude C. and Brian S.(2006) The Geography of Transport Systems, Routledge, New York.
7. Saxena H.M.(2007) Rawat publications New Delhi.
8. Taaffe, E.J., H.L. Gauthier and M.E. O'Kelly (1996) Geography of Transportation, 2ndEdition, Prentice Hall, New Jersey.

9. Tapas Pal (2015) Industrial Geography An Indian Perspective, Bridge Center, Buzau.
10. Tolley, R., Turton, B. J. (2014). Transport Systems, Policy and Planning: A Geographical Approach. United Kingdom: Taylor & Francis.

Web Sources:

1. *https://transportgeography.org/*
2. *https://cbpbu.ac.in/userfiles/file/2020/STUDY_MAT/GEO/null.pdf*
3. *https://www.eolss.net/sample-chapters/c01/E6-14-03-04.pdf*
4. *https://ncert.nic.in/textbook/pdf/legy108.pdf*

Course Outcomes:

On completion of the course the student will:

1. *Students can understand about the industrial geography, its nature, scope, and different study methods.*
2. *To know the location of different industries and theories of industrial location.*
3. *Students acquire knowledge to explain about major industrial region of the world.*
4. *Learner can examine the transportation systems, network, measurement of accessibility, its hierarchies, hinterlands, models of network changes, gravity models.*
5. *Students learn about importance of modern transport systems.*
6. *To study the transport and its basics, physical, economic, social and cultural and modes of transportation, land ways, water ways, and airways and all its functions.*
7. *Map and interpret data on production, economic indices, transport network and flows.*
8. *Understand the evolution of varied types of transport development activities*
9. *Analyze the factors of location of Ullman's concept.*
10. *Map and interpret data matrix measures: accessibility and shortest-path matrix, transport network and flows*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - III	
Course Code / Title	22GE2PC12 - SPATIAL ANALYSIS	

Objectives

1) *To provide an overview of an introduction to the range of statistical techniques used in the analysis of spatial (geographic) data.*
2) *To prepare, manipulate, display and analyse spatial data.*
3) *To synthesise and present high-quality GIS-based outputs in a report format*

Unit: 1	**Concept of spatial organization:** Physical and relative space - Spatial structure and arrangements – Location and distance: – Straight line – Shortest path – Manhattan (Rectilinear) - Location: Single and multiple locations and regions.
Unit: 2	**Analysis of point entity:** Distribution and density: Centrography – Near neighbourhood and reflexive neighbour - Mapping density analysis (Isometry, Desymetry) – Point buffers.
Unit: 3	**Analysis of line entity:** Network topology – Connectivity analysis: Shortest path and total connectivity (one edge to n (diameter) edges - Detour index and allocation assignment- Accessibility - Buffers.
Unit: 4	**Analysis of area entity / surface:** Index of concentration and diversification – Interpolation techniques – Trend surface analysis (TSA) – Gravity potential model – Spatial portioning – Thiession polygon.
Unit: 5	**3D and 4D modelling:** DTM / DEM - TIN and Grid – Contour – Slope -Hill shading – Watershed and Viewshed – Space and Time representation (4D) - Modelling: Soil erosion, Plume dispersion model – Surface water and Groundwater modelling – Urban distance decay.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Spatial autocorrelation, Spatial interpolation, Spatial regression, Spatial interaction

References:

1. Abler, R., Adams, J. S., and Gould, P., (1971). Spatial organization: The geographer's view of the World, Englewood Cliffs, N.J., Prentice-Hall. Englewood Cliffs.
2. Burrough, P. A.., (1986). Principles of Geographical Information Systems for Land Resource Assessment. Oxford University Press Inc., New York.
3. Konecny, G., (2014), Geoinformation: Remote Sensing, Photogrammetry, and Geographic Information Systems (2nd Edition), CRC Press.
4. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W., (2001), Geographic Information Systems and Science, Wiley.
5. Mitchell, a.., (1999). The ESRI Guide to GIS Analysis Volume 1: Geographical Patterns and Relationships, Environmental Systems Research Institute, Inc., Red Lands, California.
6. Mitchell, a.., Booth Bob, and Crosier Scott, (2002). ArcGIS Spatial Analyst Environmental Systems Research Institute, Inc., Red Lands, California.
7. Prakash, A., (2021), Remote Sensing and Geographical Information System, Academic Aspirations.
8. Reddy, A. M., (2008), Textbook of Remote Sensing and Geographic Information System, B.S. Publication.
9. Sahu, K. C., (2022)Textbook of Remote Sensing and Geographical Information Systems, Atlantic Publishers and Distributors (P) Ltd.
10. Tsung Chang Kang, (2002). Introduction to Geographic Information Systems, Tata McGraw-Hill Publishing Company Limited, New Delhi.Shimada, M., (2022), Imaging from Spaceborne and Airborne SARs, Calibration, and Applications (SAR Remote Sensing), CRC Press.

Web Sources

1. *https://www.hexagongeospatial.com/products/power-portfolio/erdas-imagine*
2. *https://www.bentley.com/en/products/product-line/modeling-and-visualization-software/microstation*
3. *https://www.innovyze.com/en-us/products/infoworks-icm*
4. *https://jblindsay.github.io/ghrg/Whitebox/index.html*

Course Outcomes:

On completion of the course the student will:

1. *Students are able to gain knowledge on Concept of spatial organization, Physical and relative space, Location and distance.*
2. *Analyse point entity including distribution and density, Centrography, Near neighbourhood and reflexive neighbours.*
3. *Describe mapping density analysis (Isometry, Dissymmetry) and also point buffers.*
4. *Understand knowledge on analysis of line entity includes network topology, connectivity analysis, shortest path and total connectivity analysis.*
5. *Enable the learner to choose the suitable type of technique based on application*
6. *Discuss on detour index and allocation assignment and accessibility and buffers.*
7. *Students can gain knowledge on analysis of area entity / surface, Index of concentration and diversification and interpolation techniques.*
8. *Examine the trend surface analysis (TSA), gravity potential model, and spatial portioning and thiession polygon.*
9. *Prepare 3D and 4D modelling of the surface area.*
10. *Justify spatial analysis is one of the decision making tool*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - III	
Course Code / Title	22GE2PC13 - GEOSPATIAL DATA ANALYSIS FOR RESOURCE MANAGEMENT (P)	

Objectives

1) *To introduce advanced knowledge on performing editing digital spatial data*
2) *To perform advance vector and raster analysis*
3) *To perform advance image processing*

Ex.No: I	Drainage And Watershed Analysis
Ex.No: II	Transport Network Analysis
Ex.No: III	Land use / Land cover Mapping
Ex.No: IV	Land use / land cover Changes Detection
Ex.No: V	Multidimensional Analysis
Ex.No: VI	Rainfall & Cyclone Analysis
Ex.No: VII	Water Quality Analysis
Ex.No: VIII	Drought Analysis
Ex.No: IX	Cluster Analysis
Ex.No: X	Spatial Statistics
Ex.No: XI	Urban Heat Island Analysis
Ex.No: XII	Layout Outputs

Unit 6: Current Contours: Not for Examination Only for Discussion

- ArcGIS Pro, ERDAS, QGIS, and AutoCAD Map 3D

References:

1. Gupta. R.P., (2005). Remote Sensing Geology (2nd Edition), Springer India, New Delhi.
2. High Spatial Resolution Remote Sensing: Data, Analysis, and Applications. (2018). United States: CRC Press.
3. Jensen, J. R., (2006). Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc., New Jersey.
4. Jensen, J. R., (2007). Remote Sensing of the Environment: An Earth Resource Perspective, 2nd Edition, Prentice-Hall Inc., New Jersey.
5. Lawhead, J. (2019). Learning Geospatial Analysis with Python: Understand GIS Fundamentals and Perform Remote Sensing Data Analysis Using Python 3.7, 3rd Edition. India: Packt Publishing.
6. Lillisand. T.M., and Kiefer, P.W., (1998). Remote Sensing and Image Interpretation, John Wiley & Sons, New York.
7. Paul Gibson, and Clare H. Power, (2000). Introductory Remote Sensing: Digital Processing and Applications, Routledge Publisher, London.

8. Richards, J. A. and Jia Xiuping (2005). Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag, Berlin.
9. Richards, J. A. (2013). Remote Sensing Digital Image Analysis: An Introduction. Germany: Springer Berlin Heidelberg.
10. Schwalb-Willmann, J., Dech, S., Wegmann, M. (2020). An Introduction to Spatial Data Analysis: Remote Sensing and GIS with Open Source Software. United Kingdom: Pelagic Publishing.

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1. *https://link.springer.com/article/10.1007/s13201-015-0332-9*
2. *https://rsmcnewdelhi.imd.gov.in/images/pdf/sop.pdf*
3. *https://dtcenter.org/sites/default/files/community-code/met/docs/user-guide/MET-TC_Users_Guide_v4.1.pdf*

Course Outcomes:

On completion of the course the student will:

1. *The purpose of this practical is to advance the students to use GIS & Remote Sensing (RS)*
2. *Perform mastery level use of GIS and Remote Sensing tools*
3. *Can integrate multiple layers in analysis*
4. *Perform advanced analysis in GIS & Remote Sensing platforms*
5. *Can do precise and accurate analysis*
6. *Flexibility of many observation techniques and image processing algorithm*
7. *Area information can be obtained in comparison with traditional way of point wise sampling of earth surface.*
8. *The understanding and modeling urban climatology with its different scales*
9. *Students able to morphometric analysis and prioritization of sub-watersheds are carried out*
10. *Students able to prepare GIS based maps.*

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Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:04
	Semester - III	
Course Code / Title	**22GE2PE03 -** Elective anyone from **List C**	
	1. Health and Wellbeing 2. Environmental Geography 3. Climate Change Vulnerability and Adaptation	

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - III	
Course Code / Title	22GE2PSB2 – SKILL BASED ELECTIVE SUMMER INTERNSHIP	

Objectives

1) *It provide knowledge on GPS survey*
2) *Students can able to understand the basic principles, problems and procedures of GPS surveying in a better manner.*
3) *Demonstrate a clear understanding of the GPS signal, codes and biases*
4) *Discuss the practical applications of GPS and the implications of its modernization*

1	The students asked to take a small task related to data collection and mapping around his / her village
2	He / She may visit the field during the week days or summer vacation and prepare a report of 15 pages and submit for evaluation.
3	The task may be encouraged to the GNSS and simple GIS mapping techniques

Current Contours: Not for Examination Only for Discussion

- Total Station, DGPS Survey

References:

1. Ghilani, C.D. and Wolf, P.R. (2012)Elementary Surveying :An Introduction to Geomatics, 13th ed., Pearson Education, Inc., New Jersey.
2. Hofmann-Wellenhof, B., H. Lichtenegger, and J. Collins.(1994), *GPS Theory and Practice*. Springer,
3. Jan Van Sickle (2015) GPS for Land Surveyors, 3rd Edition, CRC Press
4. Pijushkanti Saha, Partha Basu (2014) Advanced Practical Geography, Books and Allied(P) Ltd, Kolkata.
5. Punmia, B.C., Ashok, J.K. and Arun, K.J. (2005) Surveying-1, Vol. 1, Laxmi Publications, New Delhi.
6. Rampal, K.K (2011)Surveying, PragatiPrakashan, Meerut.
7. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996
8. Satheesh Gopi, Rasathishkumar, Madhu. N (2007), Advanced Surveying , Total Station GPS and Remote Sensing Pearson education.
9. Shivam Pandey (2020), Basic Concept of Remote Sensing, GPS and GIS, Sankalp Publication
10. Subramanian, (R), (2012), Surveying and Levelling, Oxford University Press, Second Edition.
11. Wells, D.E., et al. (1986) Guide to GPS Positioning, Canadian GPS Associates, Canada.

Web sources:

1. *U.S. Coast Guard Navigation Center Website*
2. *University NAVSTAR Consortium Website*
3. *SCIGN Data Portal Website*
4. *https://onlinecourses.nptel.ac.in/noc19_ce39/preview*

Course Outcomes:

On completion of the course the student will:

1. *Understand satellite signals, types of signals, and integer ambiguity*
2. *Describe the error sources in GPS measurements*
3. *Apply optimal insights into land surveying using GPS*
4. *Demonstration of GPS surveying followed by processing of collected data.*
5. *Examine the Working principles of total station and GPS instruments*
6. *Propagation of EMR through atmosphere and corrections for its effects*
7. *Recall the functioning various types total station and GPS equipments and their applications*
8. *Formulate various techniques available for surveying and mapping with total station and GPS.*
9. *Analyse Coordinate Systems and GPS Site Calibrations*
10. *Evaluate GPS measurements and perform a GPS Site Calibration.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits: 02
	Semester - III	
Course Code / Title	22GE2PVA2 - ARTIFICIAL INTELLIGENCE (AI) FOR GEOGRAPHICAL ANALYSIS	

Objectives

1) *To understand the basic concepts of Artificial Intelligence and identify the AI problems and domains.*
2) *To provide search techniques to solve the problems.*
3) *To represent and access the domain specific knowledge.*
4) *Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems*

Unit: 1	**Introduction:** Brief history-intelligent systems-Categorization of intelligent systems-component of AI program-foundation of AI-Sub-areas of AI-Application of AI-Future of AI
Unit: 2	**Problems and techniques:** AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems
Unit: 3	**Knowledge representation issues**: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem
Unit: 4	**Uniformed search strategies**: Breadth-First search-uniform cost search-Depth-First search-Analysis of search method
Unit: 5	**Expert systems** – Introduction to Expert systems – Definition – Importance of Expert systems-characteristics features of Expert system-application of Expert systems-Different categories of Expert systems – Case studies discussion of geographical problems

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Knowledge Engineering- AI techniques for games-AI for health application-theory of machine learning-natural language processing-emerging technologies

References:

1) *Dan W. Patterson, (2007),"Introduction to AI and ES", Pearson Education.*
2) *Deepak Khemani(2002), "Artificial Intelligence", Tata McGraw Hill Education.*
3) *Elaine Rich and Kelvin Knight (1991), Artificial Intelligence, , TMH, 2nd Edition.*
4) *George F Luger (2002), Artificial Intelligence, , 4th Edition, Pearson.*
5) *Janaki Raman.V.S, Sarukesi, K, Gopalakrishnan,P* (2016)*Foundations of Artificial Intelligent and Expert Systems, MacMillan India limited.*
6) *Kevin Night, Elaine Rich, and Nair B.,(2008), "Artificial Intelligence", McGraw Hil.l*
7) *M.Tim jones(2008)-Artificial Intelligence: A System Approaches(computer science),Jones and Bartlett publishers Inc,; First Edition*
8) *Russell (2015) Artificial Intelligence A Modern Approach,,3 nd Edition Pearson.*
9) *Russell/Norvig (2022), Artifical Intelligence: A Modern Approach | Fourth Edition| By Pearson*
10) *William F.Clocksin and Christopher S. Mellish (2003),Programming in Prolog:Using the ISO Standard,Fifth Edition,Springer.*

Web Sources

1. *https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/*
2. *https://analyticsindiamag.com/a-complete-tutorial-on-expert-systems/*
3. *https://www.javatpoint.com/artificial-intelligence-tutorial*
4. *https://www.tutorialspoint.com/artificial_intelligence/index.htm*
5. *https://www.w3schools.com/ai/*

Course Outcomes:

On completion of the course the student will:

1. *Demonstrate the fundamental understanding and history of AI.*
2. *Understand the nature of AI problems and task domains of AI.*
3. *Apply the appropriate search procedures to solve the problems by using best algorithms.*
4. *Analyse and select the suitable knowledge representation method.*
5. *Analyse the search method*
6. *Find solutions to complex AI problems using various AI tools*
7. *Manipulate the acquired knowledge and infer new knowledge.*
8. *Demonstrate the development of AI systems by encoding the knowledge.*
9. *Explain the expert systems and Application*
10. *Learn the basic concepts of AI & ML and apply in various research areas like image processing, speech recognition and Medical diagnostics etc.,.*

Course Code	Name of the Course	Credits	Teaching Hours	Maximum Marks		
				CIA	ESE	Total
Semester-IV						
22GE2PC14	Research Methodology & IPR	5	5	25	75	100
22GE2PC15	Disaster Studies	5	5	25	75	100
22GE2PEIB1	Digital Photogrametery	5	5	25	75	100
22GE2PC16	Dissertation and Viva Voce	5	15	25	75	100
		20	**30**			

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:05
	Semester- IV	
Course Code / Title	22GE2PC14 - RESEARCH METHODOLOGY & IPR	

Objectives

1) *To understand the basic concept of research, types and its methods*
2) *To provide suitable steps of the Research Design.*
3) *To give an idea of data collection and its processing methods*

Unit: 1	**Research:** Meaning – Need for scientific research – types of research – approaches to geographical research; traditional and scientific – identification of fields, sub field and themes.
Unit: 2	**Logic in Research:** Hypothesis, concepts and facts, principles, law, theory and their implication in geographical research – the science of geography – role of models – research trends in geography. Research Design: Selection of the topic – statement of the problem – formulation of hypothesis, testing of hypothesis – time schedule – literature survey – role of internet – bibliography**.**
Unit: 3	**IPR:** Intriduction **-** Types of Intellectual Property **-** Fundamentals of Patent Law - Evolution of the patent system - Patentability Requirements - Patentable Subject Matter; Fundamentals of Right Law - Originality Of Material – Rights of Reproduction
Unit: 4	**Data Acquisition and Analysis**: Collection of data – sources of data; primary and secondary – structuring the data – data transformation – quantitative revolution in geography – quantitative techniques in analysis of data; sampling techniques – correlation, regression – digital elevation model
Unit: 5	**Thesis Writing:** Organization of the thesis**:** The preliminaries, text and reference materials – drafting of thesis – final evaluation – language and presentation (form and style) – writing of abstract, reports – research – research project proposal.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Interdisciplinary Approach - Advancement in GI – Technology - Handling with Real Time Data - e-Resources and Communication - Diversity in Research - Concentration of Research in Large Scale - Modelling in Geography - Research Ethics

References:

1. Basil Gomez, John Paul Jones., (2010). Research Methods in Geography: A Critical Introduction, John Wiley & Sons, New York.
2. Business Research Methods- Alan Bryman & Emma Bell, Oxford University Press.
3. C.R.Kothari,C.R,(2019) Research Methodology, Fourth Revised Edition, New Age international (p) Ltd., Piblication. New Delhi.
4. Daniel Montello, Paul Sutton, (2006). An Introduction to Scientific Research Methods in Geography, SAGE.
5. Goyal, R. (2010). Research Methodology for Health Profession. India: Jaypee Brothers Medical Publishers Pvt. Limited.
6. Handbook of Research on Advanced Research Methodologies for a Digital Society. (2021). United States: IGI Global.
7. Sinha, S.C. and Dhiman, A.K., (2002) Research Methodology, Ess Ess Publications. 2 volumes.
8. Tan, W. (2017). Research Methods: A Practical Guide for Students and Researchers. Japan: World Scientific.
9. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
10. Wadehra, B.L. (2000) Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing

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1. *https://research.com/research/how-to-write-research-methodology*
2. *https://www.indeed.com/career-advice/career-development/research-methodology*
3. *https://library.tiffin.edu/researchmethodologies/whatareresearchmethodologies*
4. *https://www.researchgate.net/publication/319207471_HANDBOOK_OF_RESEARCH_METHODOLOGY*

Course Outcomes:

On completion of the course the student will:

1. *Understand some basic concepts of research and its methodologies*
2. *Search for, select and critically analyse research articles and papers*
3. *Prepare literature review*
4. *Formulate and evaluate research questions*
5. *Develop a research proposal or industry project plan*
6. *Gain experience with instrument development and data collection methods*
7. *Gain experience with ethics proposals*
8. *Organize and conduct research (advanced project) in a more appropriate manner*
9. *Students will strengthen their ability to write academic papers, essays and summaries using the process approach*
10. *Students will heighten their awareness of correct usage of English grammar in writing and speaking*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:05
	Semester -IV	
Course Code / Title	22GE2PC15 - DISASTER STUDIES	

Objectives

1) *The objective of this course is to provide students an exposure to disasters, their significance*
2) *Various types of disaster and risk managements were discussed.*
3) *This multidisciplinary course will also enable students to recognize the increasing vulnerability of the planet in general and India in particular to disasters.*

Unit: 1	**Introduction:** Nature and scope of disaster studies- Definition – Meaning -, Dimensions & Scope of Disaster Management - Disaster Management Cycle - Hazard, Risk and Vulnerability.
Unit: 2	**Social Science Perspectives of Disasters**: Definition, Concepts and Theories around the key terms in disaster studies (Understanding of Disaster, Risk, Hazard, Vulnerability, Resilience).
Unit: 3	**Ecology and Environment:** Dams – Pollution- Climate Change, Effluent Discharges, Human Consumption as cause of environmental destruction and increased vulnerability of ecosystems- Geoinformatics for disaster studies.
Unit: 4	**Natural Disasters**: Meaning and nature of natural disasters, their types and effects Hydrological Disasters - Flood, Flash flood, Drought, cloud burst Geological Disasters- Earthquakes, Tsunamis, Landslides, Avalanches, Volcanic eruptions, Mudflow -Disasters and GIS Applications (Regional Imbalance, Health Issues, Fragile areas and Critically Endangered Zones).
Unit: 5	**Biological Disasters and Disaster Management Issues**: Diseases and human health: Epidemics – disease spread – GIS analysis; Ecological degradation – bio-diversity loss –population extinction – forest fire impacts – overlay analysis – GIS in environmental modelling - Disaster Management: United Nations, Central and State Governments of India in Disaster Management - Institutional and Policy Framework – Disaster Prevention and Mitigation –Preparedness.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- CBRN – Chemical disasters, biological disasters, radiological disasters, nuclear disasters Fire – building fire, coal fire, forest fire, Oil fire- Wind related- Cyclone, Storm, Storm surge, Tidal waves, Heat and cold Waves, Climatic Change , Global warming , Sea Level rise , Ozone Depletion, Man – made Disaster.

References:

1. Carter, N. (1991), Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila.
2. Chandan Ghosh, Dookie Kim, Pijush Samui (2018), Integrating Disaster Science and Management: Global Case Studies in Mitigation and Recovery. Netherlands: Elsevier Science.
3. Clements, B., Casani, J. (2016), Disasters and Public Health: Planning and Response. Netherlands: Elsevier Science.
4. Etkin, D. (2014). Disaster Theory: An Interdisciplinary Approach to Concepts and Causes. Netherlands: Elsevier Science.
5. Govt. of India (2008), Vulnerability Atlas of India. BMTPC, New Delhi.
6. Govt. of India (2011), Disaster Management in India. Ministry of Home Affairs, New Delhi.
7. Janki Andharia,(2020), Disaster Studies: Exploring Intersectionalities in Disaster Discourse. Singapore: Springer Nature Singapore.
8. Kapur, A. (2010), Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.
9. Modh, S. (2010), Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.
10. Savindra S. and Jeetendra S. (2013), Disaster Management, Pravalika Publications, Allahabad.

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1. *https://publichealthdisasters.eu/document-library/*
2. *https://ndma.gov.in/*
3. *https://ourworldindata.org/natural-disasters*
4. *https://www.ifrc.org/our-work/disasters-climate-and-crises*
5. *https://reliefweb.int/report/world/2021-global-natural-disaster-assessment-report*

Course Outcomes:

On completion of the course the student will:

1. *To know about hazards, disasters and catastrophes and also Disaster Management*
2. *Gain knowledge about causes and effects of Earthquakes, Volcanic hazards, Landslide and GIS case studies for earthquake, volcano and landslide.*
3. *Acquire knowledge on Origin, types, effects and damage assessment of Cyclones and Floods*
4. *To learn about preparation of GIS based parameters and layers and flood prone area analysis and management, risk assessment and also GIS case studies for cyclones and floods.*
5. *Students would know about causes and an effect of Drought and Desertification, GIS based management strategies and also GIS case studies for drought and desertification.*
6. *Students can able to Study about Atmospheric Disasters like Ozone layer depletion, green house / global warming, acid rain, snow melt, sea level rise related problems and GIS case studies for Atmospheric Disasters.*
7. *Students would able to study about Nuclear, Chemical / Industrial and Mining Disasters and also Marine Disasters like Oil spill and chemical pollution, coastal erosion and deposition and also coastal zone management strategies and GIS case studies for anthropogenic disasters.*
8. *Capacity to analyse and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.*
9. *Capacity to manage the Public Health aspects of the disasters.*
10. *Study about Biological Disasters like Epidemics, Ecological degradation, bio-diversity loss, population extinction, Coral / mangrove depletion, forest fire and GIS case studies and also about Disaster Management, Central and State Governments of India in Disaster Management, Institutional and Policy Framework, Disaster Prevention and Mitigation etc.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:05
	Semester - IV	
Course Code / Title	22GE2PEIB1 –DIGITAL PHOTOGRAMMETRY	

Objectives

1) *To acquire knowledge in basic concepts of Photogrammetry and Mapping.*
2) *Generate digital orthophotos from various high-resolution images.*
3) *To develop understanding about basic concepts of image geometry and measurement of aerial Photograph*
4) *The course provides excellent base and confidence to quick joining in GIS and photogrammetry industries.*

Unit: 1	**Digital photogrammetry:** Development of digital photogrammetry – Components: hardware – software, data acquisition: scanners - platforms: Aircrafts – UAV – satellites (CARTOSAT, GEOEYE, WORLDVIEW, Kompsat-3, Pléiades-HR.
Unit: 2	**Stereo image analysis:** interior orientation – exterior orientation – aerial triangulation – Ground Control points, stereo mode: anaglyph – polarization - flicker.
Unit: 3	**Terrain Analysis:** DEM – DSM – DTM – contour extraction and editing – ortho rectification – resampling - mosaic: simple and seamless, 2D and 3D feature extraction.
Unit: 4	**Close range photogrammetry:** Introduction – platforms – image acquisition systems: CCD – Laser – planning and processing – applications.
Unit: 5	**Photogrammetric Modelling and Applications:** 3D visualization - Large scale mapping – infrastructure mapping – forensic - archaeology and disaster.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Photogrammetric Products
- Digital Photogrammetric Workstations
- Stereo Plotter &Analytical Plotter &Softcopy Workstation
- Automatic Object Recognition
- Pipeline Ortho fixing

References:

1. Egels, Y., Kasser, M. (2001). Digital Photogrammetry. United Kingdom: CRC Press.
2. Ghosh, S. K. (2005). Fundamentals of Computational Photogrammetry. India: Concept Publishing Company.
3. IGI Global (2019) Geospatial Intelligence: Concepts, Methodologies, Tools, and Applications. United States:
4. Karl Kraus (2007) Photogrammetry – Geometry from Images and Laser Scans, Walter de Gruyter, Berlin.
5. Kraus, K. (2011). Photogrammetry: Geometry from Images and Laser Scans. Germany: De Gruyter.
6. Olague, G. (2016). Evolutionary Computer Vision: The First Footprints. Germany: Springer Berlin Heidelberg.
7. Wilfried Linder (2003) Digital Photogrammetry: Theory and Applications, Springer – Verlag, Berlin Heidelberg.
8. Wolf. P.R., (1974). Elements of Photogrammetry, McGraw Hill books Co., London.
9. Yves Egels, Michel Kasser (2002) Digital Photogrammetry, Taylor & Francis Group, London, UK.
10. Zhilin Li, Jun Chen, Emmanuel Baltsavias (2008) Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences, CRC Press, Taylor & Francis Group, London, UK.

Web sources:

1. *https://alicevision.org/#photogrammetry*
2. *https://manufactur3dmag.com/top-8-best-photogrammetry-software-free-paid/*
3. *https://www.3dnatives.com/en/photogrammetry-software-190920194/*
4. *https://opengeospatialdata.springeropen.com/articles/10.1186/s40965-017-0027-2*
5. *https://www.sculpteo.com/en/3d-learning-hub/3d-printing-software/photogrammetry-software/*

Course Outcomes:

On completion of the course the student will:

1. *Students can acquire knowledge on the Development of Digital Photogrammetry, its Software and Hardware components.*
2. *Understand the concepts of Stereo image analysis includes interior orientation, exterior orientation and aerial triangulation.*
3. *Extract data from aerial photography*
4. *Analyse DEM, DSM, DTM and Contour Extraction and edition and also Ortho Rectification.*
5. *Recall on 2D and 3D feature extraction.*
6. *Students can obtain knowledge on image acquisition systems, CCD, Laser's planning and processing and its applications.*
7. *Students can able to know about 3D visualization and large-scale mapping.*
8. *Describe about Photogrammetric Modelling.*
9. *Evaluate modelling applications in Infrastructure Mapping, Forensic, Archaeology and Disaster.*
10. *The development of a full-custom electronic acquisition system designed for readout of large-area active matrix flat-panel imaging arrays is reported.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:15
	Semester - IV	
Course Code / Title	22GE2PC16 - Dissertation and Viva Voce	
DISSERTATION AND VIVA VOCE		

Elective Course List

Group A	1. Advanced Python for GIS 2. Geography of Tourism 3. Rural Development
Group B	4. Remote Sensing, GIS, GNSS 5. Geography of Tamil Nadu 6. Word Regional Geography
Group C	7. *Health and Wellbeing* 8. *Environmental Geography* 9. Climate Change Vulnerability and Adaptation

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - I	
Course Code / Title	22GE2PE01 - ADVANCED PYTHON FOR GIS ANALYSIS	

Objectives

1) *To introduce the fundamentals of Python Programming.*
2) *To teach about the concept of Functions in Python.*
3) *To impart the knowledge of conditional statement, looping and functions.*
4) *To learn about testing and files in python.*
5) *To explore the object-oriented programming, Graphical programming aspects of python with help of built in modules.*

Unit: 1	**Introduction to Python:** Features, basic syntax, Writing and executing simple program, Basic Data Types such as numbers, strings, etc Declaring variables, Performing assignments, arithmetic operations, Simple input-output.
Unit 2:	Sequence Control – Precedence of operators, Type conversion Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops Control statements: Terminating loops, skipping specific conditions
Unit 3:	Strings - Unicode - Formatting - String Methods - Bytes - Encoding - Regular Expressions. CLASSES- Defining Classes - Instantiating Classes - Instance Variables - Generator Expressions
Unit 4:	Functions: Defining a function, calling a function, Advantages of functions, types of functions, function parameters, Formal parameters, Actual parameters, anonymous functions, global and local variables
Unit 5:	Database connectivity in Python: Installing mysql connector, accessing connector module module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statement- executing transactions, understanding exceptions in database connectivity.

Unit 6: Current Contours: Not for Examination Only for Discussion

- NumPy arrays-three dimension plotting in Matplotlib-geographic data with base map-visualisation with seaborn

References:

1. Allen B. Downey,(2016), “Think Python: How to Think Like a Computer Scientist”, Second Edition, Shroff, O‘Reilly Publishers, (http://greenteapress.com/wp/thinkpython/
2. Allen Downey, Jeffrey Elkner, Chris Meyers, & quot (2002), How to Think Like a Computer Scientist - Learning with Python”, Green Tea Press.
3. Allen Downey, Jeffrey Elkner, Chris Meyers,(2002), "How to Think Like a Computer Scientist - Learning with Python”, Green Tea Press.
4. Balagurusamy E(2017), Problem Solving using Python Mc Graw Hill Education.
5. Charles Dierbach,(2013), “Introduction to Computer Science using Python”, Wiley India Edition, First Edition.
6. Guido van Rossum, Fred L. Drake Jr.,(2011),“An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition.
7. Joel murach, Michael urban”Murach’s python programming”,SPD ,(2017), 1 ST Edition Reema Thareja, “Python Programming using Problem Solving Approach”, Oxford University Press, First edition.
8. John V Guttag, (2013), “Introduction to Computation and Programming Using Python”, Revised and Expanded Edition, MIT Press.
9. Lambert (2017), Fundamentals of Python Programming Cengage Publications.
10. Reema Thareja,(2017), Python Programming - Oxford University Press.

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1. *www.spoken-tutorial.org*
2. *https://bugs.python.org/file47781/Tutorial_EDIT.pdf*
3. *https://www.tnstate.edu/faculty/fyao/COMP3050/Py-tutorial.pdf*
4. *https://www.javatpoint.com/python-tutorial*
5. *https://www.tutorialspoint.com/python/index.htm*

Course Outcomes:

On completion of the course the student will:

1. *Remember the concept of operators, data types, looping statements in Python programming.*
2. *Represent compound data using Python lists, tuples, dictionaries.*
3. *Decompose a Python program into functions.*
4. *Understand the concepts of Input / Output operations in file.*
5. *Apply the concept of functions and exception handling*
6. *Demonstrate significant experience with python program development environment*
7. *Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statement*
8. *To know the usage of modules and packages in Python*
9. *To familiarize with file concepts in Python*
10. *Read and write data from/to files in Python Programs*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - I	
Course Code / Title	22GE2PE01 - GEOGRAPHY OF TOURISM	

Objectives

1. *To familiarize the students with aspects of tourism which have a bearing on subject matter of geography;*
2. *To orient the students to the logistics of tourism industry and the role of tourism in regional development;*
3. *To understand the impact of tourism on physical and human environments.*

Unit: 1	**Introduction:** Nature and Scope of Geography of Tourism- Meaning and Definition of tourism. Importance of tourism- Tourism as an interdisciplinary Subject- Recent Trends in Tourism Geography- Geographical Parameters of Tourism by Robinson.
Unit 2:	**Factors affecting tourism development:** Physical Factors –Socio – Cultural Factors**,** Trends and Patterns- Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage, Geo-tourism.
Unit 3:	**Recent Trends of Tourism**: International and Regional; Domestic (India); Eco-Tourism, Sustainable Tourism, Meetings Incentives Conventions and Exhibitions
Unit 4:	**Impact of Tourism**: Economy- Socio-cultural aspects- Environment- Sustainable Development of Tourism
Unit 5:	**Tourism in India:** Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal Areas; India's World Heritage Sites and National Geological Monuments National Tourism Policy

Unit 6: Current Contours: Not for Examination Only for Discussion

- Global Tourism Transport Database (GTTD), UNWTO based GTTD, flawed global tourism data, tourism'simpact on Climate Change, lack of operationalization at theglobal level, knowledge gaps and misleading information in developing countries

References:

1. *Alan A. Lew,(2017), New Research Paradigms in Tourism Geography, Routledge,*
2. *Dhar, P.N,(2006), International Tourism: Emerging Challenges and Future Prospects. Kanishka, New Delhi.*
3. *Hall, M. and Stephen, P.(2006), Geography of Tourism and Recreation –Environment, Place and Space, Routledge, London.*
4. *Jagbir S.(2014), Eco-Tourism" Published by - I.K. International Pvt. Ltd. S25, Green Park Extension, Uphaar Cinema Market, New Delhi, India.*
5. *Kamra, K. K. and Chand, M.,(2007), Basics of Tourism: Theory, Operation and Practise, Kanishka Publishers, Pune.*
6. *Milton D.(1993), Geography of World Tourism Prentice. Hall, New York.*
7. *Nelson V.(2017), An Introduction to the Geography of Tourism, Rowman & Littlefield.*
8. *Page, S. J,(2011), Tourism Management: An Introduction, Butterworth Heinemann–USA,*
9. *Robinson, H. A, (1996), Geography of Tourism. Macdonald and Evans, London.*
10. *Widawski K. and Wyrzykowski J. (2017), The Geography of Tourism of Central and Eastern European Countries, Springer.*

Web sources

1. *https://www.ttdconline.com/*
2. *http://www.iata.org/training/courses/Pages/geography-travel-planning-tttg53.aspx*
3. *http://tourism.gov.in/scheme-rural-tourism*
4. *https://serc.carleton.edu/teachearth/index.html*
5. *http://travelgeography.libsyn.com/ This is a blog site that offers travel and tourism insights, drawing upon research, theory and personal experiences from a geography and social science perspective.*

Course Outcomes:

On completion of the course the student will:

1. *Outline the dimensions of travel, analyse influences on tourism demand.*
2. *Identify and reflect on the factors that motivate tourist travel and aid their selection of a travel destination.*
3. *Have sound knowledge on geographical, environmental and socio-cultural aspects of tourism in India.*
4. *Locate and identify the countries, main cities and physical features of the world continents with particular emphasis on Europe, North America, South America and Australia*
5. *Examine the different elements of geography and their relationship with tourism.*
6. *Identify key tourism attractions from an international and global dimension.*
7. *Describe the major climatic elements that affect tourism and identify the world climatic zones.*
8. *Examine the ethnic culture and religions of major tourism destinations*
9. *Analyse relations between consumers of tourism and the providers of tourism services*
10. *Examine statistical sources of tourist data and identify how tourism statistics are compiled.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - I	
Course Code / Title	22GE2PE01 – RURAL DEVELOPMENT	

Objectives

1. *To familiarize the students rural and urban sectors*
2. *Understand about Panchayati Raj System in rural development*
3. *To analyse healthcare service in rural areas.*

Unit: 1	**Introduction:** The concept of Nation, State, Constitution, Government, Democracy, Decentralization and its significance in Rural Development.
Unit 2:	**Principles of Rural Economic Development:** Planning the Rural Development. Tools for Rural Economic Analysis. Land use – Land Holding, Land Reforms Marginal Lands. Panchayati Raj System, Agriculture and Allied Sectors, Seasonality and Need for Expanding Non-Farm Activities, Co-operatives, PURA.
Unit 3:	**Agriculture:** Agricultural Finance – Need for Agricultural Finance, Sources of Agricultural Finance Kisan Credit card, the role of NABARD in Rural Development- Area Based Approach to Rural Development: Drought Prone Area Programmes, PMGSY.
Unit 4:	**Rural Literacy and Development:** Causes for Low Literacy Rate, Remedial measures to Increase the literacy in rural area. Approach to Rural Development: SJSY, MNREGA, Jan DhanYojana and Rural Connectivity.
Unit 5:	**Rural Development Programmes**: Concepts, approaches and strategies of Rural Development-Rural Development in Five year Plans. Dynamics of RD in India- Rural unemployment and under employment-Role of Zilla and Mandal Panchayats in RD.

Unit 6: Current Contours: Not for Examination Only for Discussion

- NGO's and paradigm shifts – their implications on Education, Women Empowerment, Health, Disaster management, Girl Child and Weaker Section.

1. Anand, Subhash.,(2013): Dynamics of Rural Development, Research India Press, Delhi
2. Gilg, A. W., (1985): An Introduction to Rural Geography, Edwin Arnold, London.
3. Krishnamurthy, J.,(2000): Rural Development - Problems and Prospects, RawatPubls.,Jaipur
4. Lee, D. A. and Chaudhri, D. P,(1983): Rural Development and State, Methuen, London.
5. Misra, R. P., (ed.), (1985): Rural Development: Capitalist and Socialist Paths, Vol. 1,Concept, New Delhi.
6. Misra, R. P., and Sundaram, K. V., (eds.)(1979): Rural Area Development: Perspectives and Approaches, Sterling, New Delhi.
7. Palione, M., (1984): Rural Geography, Harper and Row, London.
8. Ramachandran, H., and Guimaraes, J.P.C., (1991): Integrated Rural Development in Asia–Leaning from Recent Experience, Concept Publishing, New Delhi.
9. Robb, P.,(1983): Rural South Asia: Linkages, Change and Development, Curzon Press.
10. Singh, R.B., (1985): Geography of Rural Development, Inter India, New Delhi.
11. Sreedhar G, Rajasekhar D,(2014) Rural Development in India, Concept Publishing Company.
12. Tahir Hussain, Mary Tahir , Riya Tahir (2020), Fundamentals of Rural Development, Dreamtech Press.
13. UNAPDI (1986):Local Level Planning and Rural Development: Alternative Strategies.

Web sources

1. *https://www.nabard.org/*
2. *http://nirdpr.org.in/*
3. *https://nrega.nic.in/*
4. *https://sdgs.un.org/topics/rural-development*

Course Outcomes:

On completion of the course the student will:

1. *Appreciate the concepts, needs and various approaches to rural development;*
2. *Understand the strong economic bases of rural areas of India;*
3. *Appreciate the area based and target group based approaches and provision of services to rural development.*
4. *Define the rural society and social structure of rural areas*
5. *Identify the demographic structure of rural areas*
6. *Elucidate PMGSY and paradigm shifts – their implications on social sector and women empowerment*
7. *Explain the concept of Voluntary Agencies and NGOs and their roles in development*
8. *Explain the rural literacy and its significance*
9. *Elucidate the unemployment and different model of rural –urban migration*
10. *Understand the growth models of Indian Planning.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - II	
Course Code / Title	22GE2PE02 REMOTE SENSING, GIS, GNSS	

Objectives

1) *Expose the students with concepts of cartography as major components of input and output related to cartography.*
2) *To provide exposure to data models and data structures in GIS and to introduce various Raster and Vector Analysis capabilities.*
3) *To familiarize about the basic principles of remote sensing*
4) *To acquire knowledge about the motion of remote sensing satellites in the space*
5) *To expose the various types of sensors used for remote sensing*

Unit: 1	**Introduction of GIS:** concepts and terminology of GIS, History and development of GIS, components of GIS, applications of GIS; Coordinate Systems - Geographical Coordinate Systems, Projected Coordinate System, map projections; Geospatial data - Data input-existing GIS data, creating new data; attribute data query, spatial data query, raster data query.
Unit: 2	**GIS Data Models and analysis:** Data format: Raster and Vector data formats; Spatial Data Models –Vector and Raster data models, Non- Spatial Data Models, Basic elements of GIS modeling; Spatial interpolation: elements, global methods, local methods, kriging method, comparison of spatial interpolation methods; Vector data analysis: buffering, overlay; raster data analysis– local operations, neighborhood operations, zonal operations; terrain mapping and analysis- DEM and TIN, contour, hill shading, slope and aspect.
Unit: 3	**Remote Sensing:** concepts and terminology of remote sensing, evolution, stages and advantages of remote sensing, spatial data acquisition, Electromagnetic spectrum, Characteristics of electromagnetic radiation, wavelength regions of electromagnetic radiation, types and platforms of sensors – LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD.
Unit: 4	**Thermal Remote Sensing and Microwave Remote Sensing:** Thermal Remote Sensing – Thermal radiation principles; Precision remote sensing – spatial, spectral and temporal precision; Passive and Active Microwave Remote Sensing; RADAR – definition, development, wavelengths, airborne and space borne SLRs and their components; LiDAR – principles, components, accuracy, spectral characteristics of laser and error analysis - Applications of remote sensing.
Unit: 5	**GNSS:** GNSS Segments : Space Segments – User Segments – Survey methods – Major Global constellations (GPS, GLONASS and Beidou) Regional : IRNSS, Applications of GNSS in Geographical Perspective.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- **ArcGIS, QGIS, GNSS, GPS**

References:

1. Aronoff S, Geographic Information System, a Management Perspective, WDL Publications, Ottawa, Canada, 1989.
2. Basudeb Bhatta (2021), Remote sensing and GIS,3 Edition, OUP India
3. Bhatta, B. (2011). Remote Sensing and GIS. India: OUP India.
4. GIS and Remote Sensing Techniques in Land- and Water-management. (2013). Netherlands: Springer Netherlands.
5. Goodchild, M. (1997). Scale in Remote Sensing and GIS. United Kingdom: CRC-Press.
6. Ian Heywood, Sarah Cornelius, Steve Carver,(2011),An Introduction to Geographic Information System, Pearson Education Ltd., India.
7. Jain, M. (2009). GIS and Remote Sensing Techniques. India: Mindsprite Solutions.
8. Kumar, S. (2005). Basics of Remote Sensing and GIS. India: Laxmi Publications.
9. Liu, J. G., Mason, P. J. (2016). Image Processing and GIS for Remote Sensing: Techniques and Applications. Germany: Wiley.

10. Mesev, V. (2008). Integration of GIS and Remote Sensing. Germany: Wiley.
11. Peter A. Burrough and Rachael A. McDonnell, Principles of Geographic Information systems, Oxford University Press, New York, 1998.

Web Sources:

1. *https://csub.libguides.com/c.php?g=561010&p=3875927*
2. *http://guides.lib.berkeley.edu/city-planning*
3. *http://guides.lib.umich.edu/c.php?g=283101&p=1886114*
4. *http://www.semcog.org/*
5. *http://geography.utoronto.ca/department/careers-in-geography-and-planning/*

Course Outcomes:

On completion of the course the student will:

1. *Students will demonstrate knowledge of the foundations and theories of geographic information systems (GIS) and use the tools and methods of GIS*
2. *Analyse GIS solution in different fields*
3. *Students will demonstrate their competence to work individually and as a team to develop and present a client-driven GIS solution.*
4. *Understand the concepts and laws related to remote sensing.*
5. *Acquire knowledge about various remote sensing platforms*
6. *To understand Characteristics of Indian satellite remote sensing and Remote sensing satellites of other countries*
7. *To understand Characteristics of Indian weather satellite and weather satellites of other countries*
8. *Students would get better understanding of thermal remote sensing and principles.*
9. *Discuss on web-based GIS software.*
10. *Explain the principles of thermal and microwave satellites, sensors and their nature of the data.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - II	
Course Code / Title	22GE2PE02 – GEOGRAPHY OF TAMILNADU	

Objectives

1. *To understand physical and cultural landscape of Tamil Nadu*
2. *To analyse soil conditions in Tamil Nadu*
3. *Familiarize population and transport systems in Tamil Nadu.*

Unit: 1	**Physical Landscape:** Physiographic divisions, Drainage- Climate: Seasons, Drought and Flood with case studies, Natural vegetation: classification of forests, forest products and their utility, problems, policies and conservation, Biosphere reserves and Wildlife conservation.
Unit: 2	**Soil and Agriculture:** Soil: types, characteristics and problems, conservation, Agriculture: salient features, determinants, irrigation, major crops and their distribution, Agricultural regions, problems and remedies, latest techniques- Green, white and blue revolution, aquaculture, sericulture, horticulture, poultry farming, dry farming, urban agriculture and agribusiness.
Unit: 3	**Minerals and Industries:** Minerals: classification and distribution of metallic and non- metallic resources, problems in mining and conservation of minerals, biotic resources, energy resources: conventional and non-conventional resources, energy crisis and conservation, Industries: determinants, distribution of major industries, industrial regions, problems, multinational corporations.
Unit: 4	**Population, Urbanization and Contemporary issues:** Population: Distribution, growth, population pyramid, problems, policies, Settlements: classification, slums and associated problems, problems of urbanization, Natural hazards
Unit: 5	**Transport, Trade and Tourism:** Transport: Road, railways, waterways and airways, Communication: postal, telecommunication and print media, Trade: major exports and imports, international trade, policies, Tourism: types, problems, eco- tourism

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Environmental issues, Social issues, Protest action, Population explosion, Effectiveness of policies, Water crisis, Cauvery river water, Sustainable development , Electoral policies, Caste system-High level of corruption, Lack of social innovation, Poverty and mal nutrition.

References:

1. *Gopal Singh (1988), Geography of India – Athma Ram & Sons, Delhi – 1988.*
2. *Poduval R.N(1987), Food grain Economy of Tamil Nadu Problems and Prospects, Emerald Publishers, Chennai.*
3. *Prithvish Nag & Smitha Sengupta (1999), Geography of India – Concept publishing company – New Delhi.*
4. *R.L. Singh (1995),India Regional Geography – VBS publishers and Distributors Ltd., New Delhi – 1995.*
5. *Ramesh ,A,and Tiwari,P.S (1983), Basic Resource Atlas of Tamil Nadu, University of Madras -1983.*
6. *Ranjet Tirtha & Gopala Krishnan (1996), Geography of India – Rawat Publications, Jaipur.*
7. *Tamil Geographies: Cultural Constructions of Space and Place in South India. (2008). United States: State University of New York Press.*
8. *Velappan D (1986), Economic Development of TamilNadu – Emeral Publishers, Chennai.*

Web Sources:

6. *https://en.climate-data.org › Asia › India › Tamil Nadu (climate)*
7. *www.forests.tn.gov.in/pages/view/tn-forest-types (forests)*
8. *agritech.tnau.ac.in/agriculture/agri_soilgroups.htm (soil and agriculture)*
9. *amingranites.com/ (minerals)*

10. *www.tnmine.tn.nic.in/ (mining)*
11. *www.tnenvis.nic.in/tnenvis_old/major_indus.htm (major industries)*

Course Outcomes:

On completion of the course the student will:

1. *Enhance the students experience themselves in the geographical space they occupy, with a social implication to how they live in it.*
2. *Understand the physical feature that makes their social, economic and political interaction.*
3. *Raise the feel responsible as citizens and empowered as people.*
4. *Helps to understand the resources and functioning of the local state.*
5. *Guides to explore the community aspects, togetherness, tradition and relationships, within the state.*
6. *Realizes the individual initiatives in changing the place they live, with stronger passions and larger vision.*
7. *Evolves national scope and boundary.*
8. *Initiates the understanding of the landscapes and the human interaction with it.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester VII	
Course Code / Title	22GE2PE02 – WORLD REGIONAL GEOGRAPHY	

Objectives

1. *This course aimed to educate to the learners about world natural regions and their geographical characteristics.*
2. *This course provides the knowledge about distribution of resources in the different location of the world.*
3. *To acquire knowledge about economic regions in the world.*

Unit: 1	**Conceptual Base:** Regional Geography: Concepts, Approaches, Methods and Significance; Major World Regions and blocks (of macro, meso and micro levels) on various delimitation bases specially with reference to Natural, Political, Economic, Trade and Development Regionalization.
Unit: 2	Natural Regions of the World: Physical Regions, Vegetation Regions, Climatic Regions, Bio-geographical Regions and Biomes
Unit: 3	**Resource and Cultural Regions:** Resource Regions, Population Regions and Cultural Regions of the world
Unit: 4	**Economic Regions:** Agricultural Regions of the World; Industrial Regions of the World; Micro Agro-Industrial Regions of USA, Japan and China.
Unit: 5	**Regional Planning and Development:** Important concepts, approaches and methods of Regional Development and their application with special reference to India.

Unit: 6 Current Contours: Not for Examination Only for Discussion

- United States and Canada, Geography of the U.S.S.R, Tectonic Geology of the Himalaya, South East Asia

References:

1. *Airriess, C. A. (2010). World Regional Geography: A Development Approach. United Kingdom: Pearson Prentice Hall.*
2. *Hobbs, J. J. (2012). Fundamentals of World Regional Geography. United States: Cengage Learning.*
3. *Hobbs, J. J. (2016). Fundamentals of World Regional Geography. United States: Cengage Learning.*
4. *India: A Regional Geography. (1993). India: National Geographical Society of India.*
5. *Moseley, W. G., Fouberg, E. H. (2017). Understanding World Regional Geography. United Kingdom: Wiley.*
6. *Pulsipher, L. M., Johansson, O., Pulsipher, A., Goodwin, C. M. (2017). World Regional Geography: Global Patterns, Local Lives. United States: W. H. Freeman.*
7. *Short, J. R. (2019). World Regional Geography: A Short Introduction. United States: Oxford University Press.*
8. *West, R. (2021). World Regional Geography: The Essentials. (n.p.): Kendall Hunt Publishing Company.*
9. *White, G., Chacko, E., Bradshaw, M., Dymond, J. (2010). Essentials of World Regional Geography. United Kingdom: McGraw-Hill Education.*
10. *World Regional Geography: A Development Approach. (2013). Germany: Pearson Education.*

Web Sources

1. *https://courses.lumenlearning.com/atd-herkimer-worldgeography/*
2. *http://caitiefinlayson.com/worldregional/*
3. *https://catalog.sjsu.edu/preview_course_nopop.php?catoid=10&coid=42438*
4. *https://saylordotorg.github.io/text_world-regional-geography-people-places-and-globalization/*
5. *https://www.alvinisd.net/cms/lib/TX01001897/Centricity/Domain/377/Climate.pdf*

Course Outcomes:

On completion of the course the student will able to:

1. *Understand about basic concepts, approaches and importance of world regional geography.*
2. *Explain about various world natural regions such as Vegetation Regions, Climatic Regions.*
3. *Get knowledge about world cultural regions.*
4. *Enhance knowledge on various resource regions of the world.*
5. *Evaluate the different economic regions of the world such as agricultural, industrial regions.*
6. *Understand about regional planning and development.*
7. *Attain knowledge on approaches and methods of Regional Development.*
8. *Realize and enhance the skill and knowledge on the importance of regional study.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - III	
Course Code / Title	22GE2PE03 - HEALTH AND WELLBEING	

Objectives

1) *Health is one of the basic factors to determine the quality of life.*
2) *The study provides knowledge to the students about the various diseases and effects caused to the human communities*
3) *The problem-solving and decision-making to learn to be stress free in health.*

Unit: 1	**Introduction:** Nature, scope and development of health Geography -Traditional and contemporary approaches -Concept of Health and Diseases -Reproductive Health – Dimension of Health -Human diseases -Classification -Infectious, Degenerative and chronic, inherited and genetic diseases- geographic location and health
Unit: 2	**Types of Diseases** Nutrition -Deficiency related diseases -Geographical perspectives of Communicable and Non-communicable diseases -Epidemic, Endemic and Pandemic nature of diseases - Major Tropical diseases -Malaria, Filariasis and Leprosy - Cancer and Heart attack – Airborne Diseases,- corona, Monkey disease - Social diseases -HIV / AIDS, STD
Unit: 3	**Disease Ecology -**Determinants of diseases -Interplay of environmental, cultural, socio-economic and ecological factors -Gender and health -Diseases of the rich and poor - Disease diffusion -Concepts -Dynamics of major diseases -Migration and Disease -Travel Medicine
Unit: 4	**Medical Cartography -**Measurement techniques of diseases - Disease mapping techniques at macro, and micro levels -Medical statistics -Epidemiological methods in disease measurement and analysis -Measurement of Morbidity and Mortality
Unit: 5	**Health Care Delivery System -**Hierarchy of medical services -Planning for manpower, infrastructure and service facilities of health care -Rural and urban disparities - Health education -Improved Health care delivery system -GIS in Public Health surveillance and monitoring -Environmental and Health data management

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Causes of Genetic diseases –Availability of medical management system –Need for Health Education – Importance of Health Monitoring

References:

1. Bonita, R., Beaglehole, R., Kjellstrom, T. (2006) Basic epidemiology (link is external), 2nd Ed. World Health Organization (WHO), Geneva, Switzerland. Pp 219
2. Books for References Textbook of Social and Preventive Medicine (2015) -Park, 23th edition, Bhandi,
3. Cromley, E.K. & McLafferty, S.L. (2012) GIS and Public health. 2nd Edition. Guilford Press. New York. pp 503. ISBN 978-1-60918-750-7.
4. Geographical Aspects of Health and Disease in India (1985) Rais Akthar and Learmonth Concept,
5. Geography of Health: (2007) A Treatise on Geography of Life and Death in India - Misra, R.P., Concept Publishing Company,
6. Geography and Health (2007) Hussain, A, Mahaveer & Sons, New Delhi,
7. Health and Diseases: Dynamics and Dimensions (2000) Surendra Singh & Misra, New Royan ook Company,
8. Medical Geography: Progress and Prospects (1986) Pacione, Michael Croom,
9. Quammen, D. (2012) Spillover: Animal Infections and the Next Human Pandemic. 1st Edition. ISBN-

13: 978-0393346619.

10. Tribal Health and Medicines (2004) Kalla &Joshi, Concept Publishing Company,

Web Sources

1. *https://www.who.int/news-room/feature-stories/mental-well-being-resources-for-the-public*
2. *https://nvbdcp.gov.in/*
3. *https://www.cdc.gov/hiv/basics/whatishiv.html*
4. *https://main.mohfw.gov.in/Organisation/Departments-of-Health-and-Family-Welfare/national-cancer-control-programme*
5. *https://www.nhp.gov.in/*

Course Outcomes:

On completion of the course the student will:

1. *Have in-depth understanding of the spatial organization of geography, ecological, economic, socio-cultural and political determinants of human health.*
2. *Understand and critically engage with theories related to health geography.*
3. *understand and develop my physical, mental and spiritual wellbeing and social skills*
4. *Familiar with different methodological approaches used in health geography research.*
5. *understand that adults in my school community have a responsibility to look after me, listen to my concerns and involve others where necessary*
6. *Synthesize evidence, interpretations and debates within health geography.*
7. *learn about where to find help and resources to inform choices*
8. *Critically review the links between population health and place/location, including social, built and natural environments.*
9. *Analyze the connections between personal health and the healthcare delivery system- past, present and future.*
10. *Evaluate the impact of systems, policies, and practices on the healthcare system, both nationally and globally.*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester -III	
Course Code:	22GE2PE03 - ENVIRONMENTAL GEOGRAPHY	

Objectives

1. *The course describes about the various environmental issues.*
2. *This course aimed to discuss about the importance of environmental management.*
3. *Learners can acquire knowledge on different ecosystems.*
4. *The course discusses the relation between the human and environment.*

Unit: 1	**Environmental Geography**: Meaning and Scope of Environment Geography, Basic Principles of Environmental Geography - Composition and types of Environment, Ecological Principles, Man – Environment relationship - Restoration of Ecology.
Unit 2:	**Ecosystem :** Concept and components, Tropic levels, Food chains and food webs, Energy flow in the ecosystem, Ecosystem stability, High land – low land interactive system, human ecological adaptation.
Unit 3:	**Environmental degradation:** Types, Processes , causes of Environmental degradation, population growth and environment, Agriculture development and Environmental degradation, deforestation and Environmental degradation, urbanization and Environmental degradation, industrial development and Environmental degradation.
Unit 4:	**Man induced changes in environment:** Environmental pollution - Air, water, noise, solid waste. Environmental hazards, i.e. earth as warehouses, flood, famines, landslides, avalanches, forest fires, impact of green revolution and extinction of species.
Unit 5:	**Environmental Management : Concept and approaches :** Ecosystem Management Strategies, Environmental Dimension in Planning – Sustainable Development, Eco-Development, Limits to growth , Environmental Consciousness, National Environmental Policies and Programms, Environmental Impact assessment, Rio Summit, Kyoto Protocol & Carbon Trading.

Unit 6: Current Contours: Not for Examination Only for Discussion

- U.S. Environmental Protection Agency, Ecosystem- Global climatic change, - Genetic Modification.

References:

1. *Anderson J.M. (1981): Ecology for Environmental Science: Biosphere, Ecosystems and Man, Arnold, London.*
2. *Balakrishnan, M., 1998. Environmental Problems and Prospects in India, in Das, R.C., et.al. Oxford & IBH Pub., New Delhi.*
3. *Canter Chary, L. W. 1996: Environmental Impact Assessment, 2nd edition, McGrawHill, New York*
4. *Chichester: Marsh, W.M. and Grossa, J.M. (1996): Environmental Geography: Science Land use and Earth Systems, John Wiley & Sons.*
5. *Das, M.C. 1993, Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.*
6. *Dr. Alka Gautam(2013): Environmental Geography, Sharada Pustak Bhavan, Allahabad*
7. *Farmer, A. 1997. Managing Environmental Pollution, Routledge, London*
8. *Gilpin, A. 1996: Dictionary of Environment and Sustainable Development, John Wiley and Sons Ltd.,*
9. *Goudie, Andrew (1984) : The Nature of the Environment, Oxford Katerpring Co. Ltd.*
10. *Huggett, R.J. 2002. Fundamentals of Biogeography, Routledge, London & New York.*
11. *Savindra Singh (2015),Environmental Geography, Pravalika Publications*
12. *Saxena HM (2021), Environmental Geography 3rd Ed. Rawat Publications*

Web sources

1. *https://gacbe.ac.in/pdf/ematerial/18MGE14E-U1.pdf*
2. *https://education.nationalgeographic.org/resource/ecosystem*
3. *https://www.sciencedirect.com/topics/earth-and-planetary-sciences/environmental-degradation*
4. *https://interestingengineering.com/science/11-ways-humans-impact-the-environment*
5. *https://www.epa.gov/ems/learn-about-environmental-management-systems*

Course Outcomes:

On completion of the course the student will:

1. *have a knowledge and understanding of the dynamic nature of man- environment relation.*
2. *able to understand the concept and different forms of ecosystem and their mutual relation in the form of energy flow, food chain and food web and food pyramid etc.*
3. *Are able to realize the human ecological adaptation and the influence of human on environment both at global as well as regional scales with reference to different forms of pollution and environmental degradation.*
4. *Are able to understand the need, methods and efforts at global and national level in order to mitigate the environmental degradation through various planning strategies for sustainable development.*
5. *Understand the environment from different perspectives*
6. *Examine the geographical explanations for biological diversity of the world*
7. *Develop an environment perceptive when approaching complex development issues.*
8. *Evaluate the vulnerability of ecosystem services*
9. *Demonstrate methodological procedure for conducting Environment Impact Assessment*
10. *Appreciate and recognize the complexity and value of ecosystem*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	Semester - III	
Course Code / Title	22GE2PE03 – CLIMATE CHANGE: VULNERABILITY AND ADAPTATION	

Objective:

1. *This course aimed to discuss theories and vital sign on Climate change*
2. *To provide knowledge about circulation of Climatic components and its impact measured by remotely sensed data.*
3. *Learners can acquire knowledge on approaches to incorporate vulnerability and adaptation in development projects*

Unit: 1	**Concepts and strategies** - Definition and issues: Definition, Types of adaptation (Anticipator, reactive, human, natural), Systems, Scales, and Actors - Methods of adaptation: - Vulnerability and resilience: Concept, definition, methodology and case studies - Sector –wise adaptation strategy (agriculture, forests, water resources, coastal resources, fisheries, human health), adaptation potential and challenges
Unit: 2	**Costs and Benefits** - Framework for estimating benefits and cost to adaptation - Linking variability to climate changes - Case examples - Economic and policy instruments to promote adaptation
Unit: 3	**Adaptive Capacity** - Introduction to Adaptive Capacity: Definition, concept and issues - Determinants of adaptive capacity: Economic resources, Technology, Information and skills, Infrastructure, Equity and Institution. - Methods of enhancing adaptive capacity in sectors: Agriculture, Forestry - Methods of enhancing adaptive capacity in sectors: Social, Rural, Urban, Coastal.
Unit: 4	**Adaptation and Development** - Tools to address climate risks in development activities - Tools and approaches to incorporate vulnerability and adaptation in development projects - NAPAs, CBA, ALM, APF,SEA,CC-DARE -Disaster risk reduction-policy and plans
Unit: 5	**Sustainable forest management** - Present area -Reduction - Strategies - Adaptation

Unit: 6 Current Contours: Not for Examination Only for Discussion

- Coastal zone management - Notification - Ocean development - Mangrove ecosystem - Initiative and mitigation of coastal hazards

References:

1. *Adger WN, Eakin H, Winkels A (2009) Nested and teleconnected vulnerabilities to environmental change. Frontiers in Ecology and the Environment, 7(3): 150-157.*
2. *Benzie M, Persson A (2019) Governing borderless climate risks: moving beyond the territorial framing of adaptation. International Environmental Agreements, 19: 369-393.*
3. *Climate Change Vulnerability and Adaptation in Asia and the Pacific: Manila, Philippines, 15–19 January 1996. (2013). Netherlands: Springer Netherlands.*
4. *Dupuis J, Knoepfel P (2013) The adaptation policy paradox the implementation deficit of policies framed as climate change adaptation. Ecology and Society, 18(4): Article 31.*
5. *Ensor JE, Wennström P, Bhatterai A, Nightingale AJ, Eriksen S, Sillmann J (2019) Asking the right questions in adaptation research and practice: seeing beyond climate impacts in rural Nepal. Environmental Science and Policy, 94: 227-236.*
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Web Sources

1. *https://www.ipcc.ch/report/ar6/wg2/*
2. *https://www.who.int/publications-detail-redirect/9789240036383*
3. *https://unfccc.int/resource/docs/publications/impacts.pdf*
4. *https://unfccc.int/resource/cd_roms/na1/v_and_a/*

Course Outcomes:

On completion of the course the student will:

1. *Understand various climatic vulnerability and associated issues*
2. *Enhance adaptive capacity among the student through learning this course.*
3. *Realize and analyze about climatic vulnerability issues*
4. *Get knowledge to minimize the severe ness of vulnerability.*
5. *To addresses the vulnerable risk and management.*
6. *Can evaluate climatic vulnerability risk.*
7. *Find the conservation measures for vulnerability.*
8. *Educate to others about vulnerability and ways of adaptation.*