M.Sc. GEOGRAPHY

(FIVE-YEAR INTEGRATED PROGRAMME)

(2022 – 2027)

REGULATIONS
&
CURRICULUM STRUCTURE

BHARATHIDASAN UNIVERSITY

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M.Sc. GEOGRAPHY (FIVE YEAR INTEGRATED) PROGRAMME

Choice Based Credit System [CBCS]

Regulations and Syllabus (2022-2027 onwards)

REGULATION and SYLLABUS

PROGRAMME

M.Sc. Geography (Five-year Integrated) 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 five 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

A candidate who has passed in Higher Secondary School Examination (10+2 pattern)conducted by State Governments / CBSE or an equivalent examination of other Board accepted by the Syndicate of this University, as equivalent thereto are eligible for admission to M. Sc. Geography (Five-year Integrated) programme.

Admission for the programme will be based on the aggregated average of the performance of the candidate in their Higher Secondary School Examination and also through the entrance test / interview conducted by the Department for this purpose, if necessary.

After successful completion of first three years / 6 semesters, without any arrear, the candidate will be awarded B.Sc. Degree in Geography. The student, who has completed first six semesters without any arrear, can further proceed for another two year / 4 semesters, to obtain M.Sc. degree in Geography*.

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 semesters, either 6 or 10 whichever is applicable.

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 (Five-year Integrated) only after he /she has passed all the examinations and earned the minimum required credits (i.e. 230 credits) prescribed to the programme.

Notwithstanding, after completion of first three years / 6 semesters without any arrear and earned the minimum required credits (i.e. 140 credits), the candidate shall be eligible for the conferment of the B.Sc. Degree in Geography*.

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.

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* Subject to Approval of the University

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 ERSI ArcGIS 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.

M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME

Choice Based Credit System [CBCS]

CURRICULUM STRUCTURE (2022-2027 onwards)

Semester	Part	Course Code	Title of the Course	Credits	Instruction Hrs/week		Marks		Total
					L	T/P	CIA	ESE	
I	1	GL011	Language Course : Tamil I / French I	3	6	--	25	75	100
	2	GL012	Language Course : English I	3	6	--	25	75	100
	3	GC013	Earth System Science	4	4	--	25	75	100
	3	GC014	Cartography	4	4	--	25	75	100
	3	GE015	Elective - *Any One from Elective List*	3	3	--	25	75	
	3	GA016	Allied - I Geology	4	4	--	25	75	100
	4	GV017	Value Education	2	3	--	25	75	100
			Credits - 23						
II	1	GL021	Language Course : Tamil II / French II	3	6	--	25	75	100
	2	GL022	Language Course : English II	3	6	--	25	75	100
	3	GC023	Core Course: Physical Geography	4	4	--	25	75	100
	3	GC024	Map Scale Projection and Terrain Visualization (P)	4	--	5	40	60	100
	3	GA025	Allied - I Geology (P)	4	--	4	40	60	100
	4	GV026	Environmental Studies	2	3	--	25	75	100
	5	GV027	Gender Studies	2	2		25	75	
		VAC-I	Geography of Tourism	2	--	--	25	75	--
			Credits - 24						
III	1	GL031	Language Course : Tamil III / French III	3	6	--	25	75	100
	2	GL032	Language Course : English III	3	6	--	25	75	100
	3	GC033	Climatology	4	4	--	25	75	100
	3	GC034	Representation of Climatic Data (P)	4	--	4	40	60	100
	3	GA035	Allied - II Statistics I	4	4	--	25	75	100
	3	GE036	Elective - *Any One from Elective List*	3		--	25	75	100
	4	GN037	Non-Major Elective - *Any One from Other University Depts.*	2	3	--	25	75	100
	3	GS038	Skill Based Elective - Information Technology	2	3	-	25	75	100
			Credits - 25						
IV	1	GL041	Language Course : Tamil IV / French IV	3	6	--	25	75	100
	2	GL042	Language Course : English VI	3	3	--	25	75	100
	3	GC043	Human Geography	4	4	--	25	75	100
	3	GC044	Economic and Industrial Geography	3	3	--	25	75	100
	3	GA045	Allied - II: Statistics – II (P)	4	4	--	25	75	100
	3	GE046	Elective - *Any One from Elective List*	3	3	--	25	75	100
	4	GN047	Non-Major Elective –Anyone from other University Depts.	2	3	--	25	75	100
	5	GS048	Extension Activities – NCC/NSS/YRC/Sports	2	--	--	25	75	100
	3	GS049	Skill Based Elective: Field Survey	2	--	2	40	60	100
		VAC-II	Geographical Outline of Continents	2	2		25	75	100
			Credits - 28						

V	3	GC051	Settlement Geography	4	4	--	25	75	100
	3	GC052	Agricultural Geography	4	4	--	25	75	100
	3	GC053	Geography of Asia	4	4	--	25	75	100
	3	GC054	Surveying (P)	4	--	4	40	60	100
	3	GC055	Biogeography	3	3	--	25	75	100
	4	GS056	Soft Skills	2	2	--	25	75	100
	3	GC057	Minor Dissertation	--	2	--	-	-	-
	3	GE058	Elective - *Any One from Elective List*	3	3	--	25	75	100
	3	GS059	Skill Based Elective - Principles of GIS	2	--	2	25	75	100
			Credits - 26						
VI	3	GC061	Social and Cultural Geography	5	5	--	25	75	100
	3	GC062	Political Geography	5	5	--	25	75	100
	3	GC063	Geography of India	5	5	--	25	75	100
	3	GC064	Map Interpretation (P)	4	--	4	40	60	100
	4	GS065	Skill Based Elective QGIS & SagaGIS	5	--	5	25	75	100
	3	GC057	Minor Dissertation	4		4			100
		VAC-III	Geochemistry	2	2		25	75	100
			Credits - 29						
VII	3	GC071	Geomorphology	4	5	--	25	75	100
	3	GC072	Population geography	4	5	--	25	75	100
	3	GC073	Quantitative Techniques in Geography	4	5	--	25	75	100
	3	GC074	Digital Cartography / Geohydrology	4	4	--	25	75	100
	3	GC075	Techniques of Mapping, Analysis and Image Interpretation (P)	4	--	4	40	60	100
	3	GE076	Elective - *Any One from Elective List*	3	4	--	25	75	100
			Common Seminar / Library / Colloquium		3				
			Credits - 23						
VIII	3	GC081	Applied Climatology	4	5	--	25	75	100
	3	GC082	Geographical Thought	4	5	--	25	75	100
	3	GC083	Regional Planning / Sustainable Management	4	5	--	25	75	100
	3	GC084	GIS Data Analysis (P)	4	--	4	40	60	100
	3	GE085	Elective - *Any One from Elective List*	3	3	--	25	75	100
	3	GN086	Non-major Elective –Anyone from other University Depts.	2	3	--	25	75	100
	3	GS087	Skill Based Elective- Data Collection Field Work	2	--	2	25	75	100
		VAC-IV	Open Source GIS	2	3	-	25	75	100
			Credits – 25						
IX	3	GC091	Watershed Studies	4	5	--	25	75	100
	3	GC092	Urban Geography	4	5	--	25	75	100
	3	GC093	Spatial Analysis / Industrial and Transport Geography	4	5	--	25	75	100
	3	GC094	Geospatial Data Analysis for Resource Management (P)	4	--	5	40	60	100
	3	GE095	Elective - *Any One from Elective List*	3	4	--	25	75	100
	3	GS096	Skill Based Elective - Summer Internship	3	--	--	--	100	100
	4	GN097	Non-major Elective –Anyone from other University Depts.	2	3	--	25	75	100
		VAC-V	AI for Geographical Analysis	2	3	--	25	75	100
			Credits - 26						

X	3	GC101	Research Methodology & IPR	5	5	-	40	60	100
	3	GC102	Disaster Studies	5	5	-	40	60	100
	3	GCEIB	Digital Photogrammetry	5	5	-	40	60	100
	3	GP102	Dissertation and Viva-Voce	5	--	15	--	100	100
Credits - 20									
MINIMUM CREDITS REQUIRED FOR THE 5-YEAR INTEGRATED M.SC. GEOGRAPHY PROGRAMME: 249									

Code System

GC013 – 'G' – Geography

G**C**013 – 'C' – Type of the course (C – Core; E – Elective; L – Language; A – Allied; N – Non-Major Elective; S – Skill based studies; V – Value Education; P – Project)

GC**01**3 – '01' – Semester

GC01**3** – '3' – Sl. No. of the Course

Other Abbreviations

L - Lecture T/P - Tutorial/Practical CIA - Continuous Internal Assessment ESE - End Semester Examination

List of Elective Courses

	Elective Courses	Teaching Hours	Credits
1	Oceanography	3	3
2	Geo-informatics	3	3
3	Soil Geography	3	3
4	Geography of Tamil Nadu	3	3
5	Industrial and Transport Geography	3	3
6	Natural Resource Management	3	3
7	Techniques in Physical Geography	3	3
8	Geography of Africa and Australia	3	3
9	Remote Sensing & GIS	3	3
10	Techniques in Human Geography	3	3
11	C++ Programming	3	3
12	Digital Image Processing	3	3
13	Health and Well being	3	3
14	Urban GIS	3	3
15	Basics of Python Programming	3	3
16	Advanced Python for GIS Analysis	3	3

Non-Collegiate Courses							
Course Code	**Name of the Course**	**Year (preferably)**	**Credits**	**Teaching Hours**	**Maximum Marks**		
					CIA	**CEE**	**Total**
VAC-I	Geography of Tourism	I	2	30	25	75	100
VAC-II	Geographical Outline of Continents	II	2	30	25	75	100
VAC-III	Geochemistry	III	2	30	25	75	100
VAC-IV	Open Source GIS	IV	2	30	25	75	100
VAC-V	AI for Geographical Analysis	V	2	30	25	75	100
OLC	Online Course: Swayam/MOOC/ . . . . / Department Online Courses	III	2	--	--	--	--
OLC	Online Course: Swayam/MOOC/ . . . . / Department Online Courses	IV/V	2	--	--	--	--
FPI01	Field Project/Internship	I	--	--	--	--	--
FPI02	Field Project/Internship	II	--	--	--	--	--
FPI03	Field Project/Internship	III	--	--	--	--	--
FPI04	Field Project/Internship	IV	--	--	--	--	--
FPI05	Field Project/Internship	V	--	--	--	--	--

Value-Added Courses (VAC) and Online Course are non-Grading Courses, that is, they will not be included for the calculation of CGPA but are compulsory Courses for the award of the Degree. The VACs must be oriented towards employability skill, industry need, technical training, A Department should offer at least one VAC in each semester. A student is permitted to do only two VACs and only one online Course for the entire period of the Programme. The Departments are expected to advice the students to undergo one Value-Added Course in each year of the Programme and an Online Course preferably in the first year of the Programme. These Courses should be on the subject of the Programme. The Departments need to give proper guidelines to the students on these courses. Coordinator(s) may be appointed for guiding the students on these two forms of Courses. The Departments need to keep a complete record of students registered to these Courses, date of registration, date of completion of the Courses, Copy of the Course Completion Certificates. These Certificates/details to be submitted to the CoE along with the results of Semester Examinations.

Field Project/Internship is compulsory for each year. The departments should collect the Field Project Reports (typed, 4-5 pages)/certificate of internship.

Programme Outcomes

- PG graduates are **Professionally Competent** with characteristic **Knowledge-bank, Skill-set, Mind-set** and **Pragmatic Wisdom** in their chosen fields.
- PG graduates demonstrate the desired sense of being **seasoned** and exhibit unequivocal **Spiritedness** with excellent qualities of productive contribution to **society** and **nation** in the arena Science and Technology.
- PG graduates are mentored such that they exert **Leadership Latitude** in their chosen fields with **commitment to novelty** and **distinction**.
- PG graduates are directed in understanding of ethical principles and responsibilities, moral and social values in day-to-day life thereby attaining **Cultural** and **Civilized** personality.
- PG graduates are able to **collate** information from different kinds of sources and gain a coherent understanding of the subject.

Programme Specific Outcomes:

1. Demonstrate an ability to develop a research proposal and carry out independent research
2. Have an in-depth understanding of, and mastery of the literature in, at least one particular geographic subfield
3. Demonstrate an ability to present and defend research work in oral, written, and graphic forms
4. Students will exhibit professional behaviour and ethical practice during the conduct of their research
5. Students will identify, examine and explain the emerging science in their discipline
6. Discuss both orally and in writing the subject matter related to their discipline.
7. Able to effectively display visual GIS findings in a public presentation following established cartographic principles and display visually stimulating, spatially accurate graphics
8. Incorporated cartography and findings into a logical and aesthetically pleasing presentation using Microsoft's PowerPoint

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester I	
Course Code / Title	**GC013 - EARTH SYSTEM SCIENCE**	

Objectives

1) *The course explains about the origin and evolution of earth.*
2) *The learners can understand various cosmic abundance of elements of the earth.*
3) *The course describes various processes of dynamic earth.*
4) *The course would discuss the basic concepts and theories related to earth system.*

Unit: 1	**Earth as a Planet:** The emergence and evolution of earth system science - General characteristics and origin of the Universe -Solar System and its planets -The terrestrial and Jovian planets - Meteorites and Asteroids - Earth in the solar system: Origin, size, shape, mass, density, rotational and revolution parameters - Origin of atmosphere, Ocean and Life.
Unit: 2	**Solid Earth, Hydrosphere, Atmosphere and Biosphere:** Mechanical layering of the Earth: lithosphere, asthenosphere, mantle and core - Concept of Isostasy - Formation of core, mantle, crust, atmosphere, hydrosphere and biosphere - Convection in Earth's core and production of its magnetic field - Geothermal gradient and internal heat of the Earth.
Unit: 3	**Cosmic abundance of elements:** Distribution of elements in solar system and in Earth Composition of the Earth –Geochemical cycles - Properties of common elements in Earth - Concepts of geochemical cycles.
Unit: 4	**The Dynamic Planet:** Pace of change - Igneous, Sedimentary and Metamorphic processes - rock cycle - Continental drift - Wegener's continental drift theory - Palaeomagnitism - Sea floor spreading - Plates and plate motion - Oceanic current system and effect of Coriolis force.
Unit: 5	**Earthquake and volcanism:** Earthquake: Causes and effects, Earthquake belts, seismic waves and internal constitution of the Earth - Volcanoes and volcanism, types and distribution of volcanoes - Tsunamis - World distribution.

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

- Recent Earthquakes in India and World –A global view of Tsunami-Volcanoes – Tonga Volcanic eruption and tsunami January 2022.

References:

1. Christopherson, R. W. and Birkeland, G. H., (2012) Geosystems: An Introduction to Physical Geography (8th edition), Pearson Education, New Jersey.
2. Emiliani, C. (1992). Planet Earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.
3. Grotzinger, J., Jordan, T.H., Press, F and Siever, R. (2007) Understanding Earth (Fifth Edition). W. H. Freeman and company, New York.
4. Marshak, Stephen (2018) Earth: Portrait Of A Planet, W. W. Norton & Company
5. Mc Geary, D. and Plummer, C. C., (1994) Earth Revealed, W. C. B. Publishers, Dubuque.
6. Savindra Singh (2021) Physical Geography, Pravalika publication, Allahabad.
7. Siddhartha K. (2020) The Earth's Dynamic Surface: A Book of Geomorphology, Kitab Mahal Publishers., New Delhi.
8. Strahler, A. H. and Strahler, A N., (2001) Modern Physical Geography (4th Edition), John Wiley and Sons, Inc., New York.
9. Tarback, E. J. and Lutgens, F.K. (2006). Earth Science. Pearson Prentice Hall, New Jersey.
10. Valdiya K S (2010). The Making of India, Geodynamic Evolution. Macmilan Publishers India Ltd.

Web source

1. *https://www.researchgate.net/publication/338559466_The_emergence_and_evolution_of_Earth_System_Science*
2. *http://www.yorku.ca/szeto/eats3020/Ch2Isostacy.pdf*
3. *https://atmos.washington.edu/~dennis/501/BeckyAlexander_slides.pdf*
4. *https://empslocal.ex.ac.uk/people/staff/gv219/classics.d/Persson98.pdf*
5. *http://www.jsce.or.jp/committee/2004sumatra/chapter_5.pdf*

Course Outcomes:

On completion of the course the student will:

1. *Understand about the atmosphere, hydrosphere, and lithosphere, including their interaction and interrelationships with the biosphere and asthenosphere.*
2. *Obtain knowledge about how interactions within and between geosystems give rise to emergent behaviours of the Earth system.*
3. *Gain knowledge on planning and improving economy politics and decision making for climate change and its impacts, adaptation to these impacts, sustainable development, alleviation of poverty in natural / unnatural disasters, rational use of natural resources, to understand the social and societal issues.*
4. *Explore how these interactions change with time through our study of earth system history*
5. *Acquire basic geological, geochemical, geophysical, analytical and modeling skills to function as professionals in the geosciences.*
6. *Get knowledge about an academic platform that support interdisciplinary and research-oriented approach for understanding and evaluating the systems originating from nature and human.*
7. *Understand about the cosmic abundance of various elements in the earth.*
8. *Get knowledge on Oceanic current system, effect of Coriolis force, earthquake, volcanoes and tsunami.*
9. *Explain about magnetic field, geothermal gradient and internal heat of the Earth.*
10. *Able to imagine about origin and general characteristics of the Universe, galaxy and solar system.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester I	
Course Code/ Title	GC014 - CARTOGRAPHY	

Objectives

1. *The course would discuss the basic concepts of Map and scale.*
2. *The concepts of Spherical earth and various types of Projection systems are taught.*
3. *Students would acquire the knowledge about the usage of conventional signs and symbols to interpret the various topographic maps.*

Unit: 1	**Map and Scale:** Nature and scope of cartography – map - types of maps - map scale: plain linear, statement, diagonal and comparative, representative fraction.
Unit: 2	Geodesy: Basic geodesy – spherical, ellipsoidal and geoidal earth - general principles of map projections – classification – cylindrical, conical and zenithal projections – coordinate systems - UTM – choice of projections.
Unit: 3	**Map Compilation and Layout:** Enlargement and reduction – compilation - selection of details - generalization - symbolization – map design and layout - lettering - lettering methods - positioning of letters.
Unit: 4	**Map Production and Reproduction:** Mechanics of map construction - map reproduction methods: tradition and modern.
Unit: 5	**Map Reading:** Conventional signs and Symbols - content of SOI, OS and US sheets – Interpretation of SOI topographical maps, atlases and thematic maps.

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

- GIS and cartography- Mobile and Virtual mapping- Open Street Maps.

References:

1. *Judith A. Tyner (2014), Principles of Map Design, Guilford Press, New York.*
2. *Kraak M.J. (2010) Cartography: Visualization of Geospatial Data (3rd edition), Pearson Education Ltd., London.*
3. *Misra, R.P. and Ramesh, A. (1986) Fundamentals of Cartography, Concept Publishing Company, Delhi.*
4. *Monkhouse, F.J. and Wilkinson, H.R. (1994) Maps and Diagrams, Methuen, London.*
5. *Robinson, A.H. et al. (2009) Elements of Cartography, John Wiley & Sons, U.S.A.*
6. *Sarkar A. K. (1997) Practical Geography: A Systematic Approach, Oriental Longman, Calcutta.*
7. *Siddhartha K. and Mukherjee S.(2013) Geography Through Maps, Kisalaya Publications Pvt. Ltd, New Delhi.*
8. *Singh, R.L. and Dutt, P.K. (1979) Elements of Practical Geography, Kalyani Publishers, New Delhi*
9. *SINHA M.M.P & Seema Bala(2021) Advanced Cartography and Practical Geography, Rajesh Publications, Darya Ganj, Delhi.*
10. *Steers, J.A. (1970) An Introduction to the Study of Map Projections, University of London Press, London.*

Web source

1. *http://www.press.uchicago.edu/books/HOC/index.html*
2. *http://www.cartography.org.uk/wp-content/uploads/2017/06/Maplines-Spring-2009.pdf*
3. *http://frenchlessonsaustralia.com.au/french-vocabulary/#Construction_construction*
4. *http://geokov.com/education/utm.aspx*
5. *https://www.e-education.psu.edu/geog160/c3_p14.html*

Course Outcomes:

On completion of the course the student will:

1. *Familiarize concepts of scale and projection system.*
2. *Understand cartography as a science of communication.*
3. *Understand the use of projection system in specific maps.*
4. *Familiarizes the usage of conventional signs and symbols.*
5. *Create new maps through collecting different data.*
6. *Use various internet map sources.*
7. *Gain knowledge about different types of map production and reproduction techniques.*
8. *Understand map as a decision making tool.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester I	
Course Code / Title	**GA016 - ALLIED - I GEOLOGY**	

Objectives

1) *To explains the origin of the planetary objects, solar system and earth*
2) *The students are introduced to the general geology, structural geology, crystallography and mineralogy which constitute a portion of the basic components of geology*
3) *The topics chosen aim to provide a working knowledge of geology for use in their own discipline and for competitive examinations.*

Unit: 1	**General Geology:** Definition and scope of Geology - origin of solar system: Nebular and Planetesimals hypotheses - constitution and composition of earth's interior -methods of determining the age of the earth - earthquakes and their effects - seismograph and seismogram - Richter's scale of earthquake intensity - volcanoes
Unit: 2	**Structural Geology**: Definition and scope of structural Geology - concept of rock outcrop - dip and strike of rock formations - folds: definition - parts - types: anticline, syncline, symmetrical, asymmetrical, isoclinal and recumbent folds - anticlinorium and synclinorium - faults: definition – parts - types: normal, reverse, strike, dip, oblique, parallel and step faults - joints and unconformities.
Unit: 3	**Mineralogy and Crystallography:** Mineralogy: definition of mineralogy and mineral - physical, chemical and optical properties of minerals - rock forming silicates and other minerals - Crystallography: definition of crystallography and crystals - morphological characters of crystals: faces – forms – edges - symmetry elements of crystals.
Unit: 4	**Palaeontology and Stratigraphy:** Palaeontology: definition of palaeontology and fossils - modes of preservation in sedimentary rocks - uses of fossils - morphological characters - geological age of micro and macro fossils - Stratigraphy: definition and scope of stratigraphy - geological time scale - geological formations in India.
Unit: 5	**Petrology:** Definition of igneous petrology and igneous rocks - forms of igneous rocks: sill, lopolith, laccolith, phacolith, dyke, and batholith - definition of sedimentary rocks and sedimentary petrology - primary structures of sedimentary rocks: common bedding, cross-bedding, current-bedding, and graded-bedding - surface structures: ripple marks, mud-cracks, and rain prints - definition of metamorphic rocks - metamorphism and metamorphic process - agents of metamorphism.

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

- Interpretation of geological maps.
- Dynamic and kinematic analyses of rocks
- Geodynamic processes and the interaction between the rock
- Development and use of mathematical models simulating natural processes as well as artificial interventions

References:

1. Earle, S. (2019). Physical Geology. Canada: BCcampus, BC Open Textbook Project.
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8. Norton, W. H. (2022). The Elements of Geology. Czechia: DigiCat.
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10. Roy, A. B. (2010). Fundamentals of Geology. United Kingdom: Alpha Science International, Limited.

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2. *https://www.ngu.no/en/topic/structural geology#:~:text=Structural%20geology%20is%20a%20subdiscipline,that%20act%20within%20the%20Earth.*
3. *https://opengeology.org/Mineralogy/11-crystallography/*
4. *https://www.britannica.com/science/Earth-sciences/Paleontology-and-stratigraphy*
5. *https://opengeology.org/petrology/01-introduction-to-petrology/*

Course Outcomes:

On completion of the course the student will:

1. *Get knowledge of geology for use in their own discipline or for competitive examinations.*
2. *Obtain knowledge and experience in the application of geological principles to the investigation of mineral resources.*
3. *Gain fundamental skills associated with geological project management, supervision, and decision-making processes.*
4. *Demonstrate and gain knowledge to correctly interpret geologic maps.*
5. *Get ability to identify and explain the formation of a rock suites, ore deposits, structures and rock-forming minerals*
6. *Acquire basic knowledge of geology to real-life problems besides the use of computational and mathematical knowledge and tools.*
7. *Manage & execute their geological plans to meet desired goals within realistic constraints such as economic, environmental, social, political, ethical, health and safety and sustainability.*
8. *Gain knowledge regarding the availability and application of state of art tools viz., computer software, modern instrumentation, novel technologies, for their applicability in geological activities.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester I	
Course Code / Title	GV017 - VALUE EDUCATION	

Objectives

1) *Value education refers to a set of learning and activities ranging from training in physical health, mental hygiene, etiquette and manners, appropriate social behaviour, civic rights and duties to aesthetic training.*
2) *The main intent of this course is to make students aware of the fact that the whole world is now a community of interdependent nations*
3) *To study the survival and well-being of the people of the world depends on mutual cooperation.*

Unit: 1	**Philosophy of Life:** Human life on earth - purpose of life - meaning and philosophy of life - the law of nature - glorifying all form of life in this universe - protecting nature / universe.Human life on earth - purpose of life - meaning and philosophy of life - the law of nature - glorifying all form of life in this universe - protecting nature / universe.
Unit: 2	**Individual Qualities:** Basic culture - thought analysis - regulating desire - guarding against anger - to get rid of anxiety - the rewards of blessing - benevolence of friendship - love and charity - self tranquillity/peace.
Unit: 3	**Social Values:** Family - peace in family - society - the law of life - brotherhood - the pride of womanhood - five responsibilities of man: to himself, to his family, to his environment, to his society and to the universe in his lives - thriftiness / economics - health - education – governance – patriotism - people's responsibility / duties of the community - world peace.
Unit: 4	**Mind Culture:** Mind culture - life and mind - bio-magnetism - universal magnetism (self-realization) - genetic centre - thought action - short term memory - expansiveness - thought – waves - channelizing the mind - meditation - spiritual value.
Unit: 5	**Tending Personal Health:** Structure of the body - the three forces of the body - life body relation - natural causes and unnatural causes for diseases - methods in curing diseases - simple physical exercises.

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

- Bulling-Anger Control-Yoga poses to calm your mind-Social Networks-Behaviour issues.

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1. Brindhamani, M. (2011). Peace and Value Education. India: DISCOVERY PUBLISHING HOUSE PVT Limited.
2. Environmental Health And Value Education. (2008). India: Deep & Deep Publications.
3. G. U. Pope (2002), Thirukkural with English Translation, Uma Publication
4. Gupta, N. (2000). Human Values in Education. India: Concept Publishing Company.
5. Patil, Y. (2015). Value Education: Need of the Hour. (n.p.): CreateSpace Independent Publishing Platform.
6. Shukla, R. P. (2004). Value education and human rights. India: Sarup & Sons.
7. Singh, Y. (2007). Value Education. India: APH Publishing Corporation.
8. Value Education for Health, Happiness and Harmony, The World Community Service Centre, Vethathiri Publications
9. ValuesEducation and Lifelong Learning: Principles, Policies, Programmes. (2007). Germany: Springer.
10. Values in Science Education: The Shifting Sands. (2020). Germany: Springer International Publishing.

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1. *https://graciousquotes.com/life-philosophy/*
2. *https://www.lifehack.org/866233/personal-qualities*
3. *https://cdn2.hubspot.net/hubfs/885685/Factsheets/Documents/UnderstandingYourPersonalQualitiesFactsheet_PersonalEffectiveness_February2016_v1.pdf*
4. *https://www.socialvalueint.org/what-is-social-value*
5. *https://studenthealth.georgetown.edu/personal-health/*

Course Outcomes:

On completion of the course the student will:

1. *Demonstrate knowledge of personal and interpersonal responsibilities, ethical principles consonant with Christian tradition, and moral reasoning.*
2. *Recognize contextual factors, such as cultural, historical, professional, and ethical frameworks, in responding to issues or situations and addressing contemporary problems.*
3. *Apply theory to practice in responding to issues or situations and addressing contemporary problems in academic and/or other real-world settings.*
4. *Collaborate and work cooperatively with others of diverse backgrounds and perspectives.*
5. *We promote the holistic health of the University community through innovative and responsive programs, services, and policies*
6. *Incorporate diverse and even contradictory points of view in responding to issues or situations and addressing contemporary problems.*
7. *Use knowledge and the methods of inquiry and analysis appropriate to the physical or natural sciences, the social sciences, and mathematics to develop well-reasoned solutions to local and global issues.*
8. *Review existing knowledge and synthesize it in original ways to clarify meaning, develop a broader perspective, or present a new point of view.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester II	
Course Code / Title	GC023 - PHYSICAL GEOGRAPHY	

Objectives

1) *The objective of this course is to introduce the basic concepts in physical geography*
2) *This course on physical geography is structured to cover the components of climatology, geomorphology and oceanography.*
3) *By studying this course, students could be able to understand about the different spheres of the earth.*

Unit: 1	**Energy–Atmosphere System:** Weather and climate - Atmospheric composition, mass and structure - Solar energy - Seasons - Energy and heat - Energy balance - Air Temperature: controlling factors - vertical, horizontal and seasonal distribution - Air pressure: vertical, horizontal and seasonal distribution - Winds: driving forces - tricellular theory - planetary, monsoon and local winds - upper atmospheric circulation.
Unit: 2	**Atmospheric Moisture & Climate Systems:** Global hydrological cycle - Humidity - Evaporation - Condensation - Clouds and Fog - Precipitation: types - patterns - Air masses and fronts - Atmospheric disturbances - Climatic classification - Climate Change - Global warming.
Unit: 3	**Geomorphic Processes & Agents:** Exogenous processes - Gradation - Weathering: types - factors - Formation of regolith and soils - Mass-movement processes - Drainage Basins and Drainage Patterns - Fluvial processes: erosion, transportation and deposition - Fluvial landforms - Concept of cycle of erosion - Rejuvenation - Underground water - Karst Topography.
Unit: 4	**Wind, Glacial & Coastal Processes:** Wind Processes: erosion, transportation and deposition - Aeolian landforms - Fluvial desert landforms - Glacial processes - Glacial landforms - Glacio-fluvial deposits - Coastal processes - Coastal landforms - Coral formations - Coasts and coastlines.
Unit: 5	**Ocean Water and Oceanic Circulations:** Configuration of ocean floor - Temperature, salinity and density of ocean water: controlling factors - distribution - Circulation of oceanic waters: waves, tides and currents - Currents of the Atlantic, Pacific and Indian oceans - Ocean deposits - Classification.

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

- Global warming and climate change- Effects of El Nino-Cyclones- Rainfall Rhythm.

References:

1. Barry, R.G. & Chorley, R.J., (1998) Atmosphere, Weather and Climate, Routledge, London.
2. Christopherson, R. W. and Birkeland, G. H., (2012) Geosystems: An Introduction to Physical Geography (8th edition), Pearson Education, New Jersey.
3. Das Gupta, A &Kapoor, A.N., (2001) Principles of Physical Geography, S.C. Chand & Company Ltd. New Delhi.
4. Dayal, P., (1996) A Text book of Geomorphology. Shukla Book Depot, Patna.
5. Khullar, D.R., (2012) Physical Geography, Kalyani Publishers, New Delhi.
6. LAL D.S, (2021) Physical Geography, Sharda Psutak Bhawan, Allahabad.
7. Lal, D S (2005) Climatology, Sharda Pustak Bhawan, Allahabad.
8. Savindra Singh (Rep.2021) Physical Geography, Pravalika Publications, Allahabad.
9. Sharma, R. C. &Vatal, M., (1970) Oceanography for Geographers, Chaitanya Publishing House, Allahabad.
10. Strahler, A. H. and Strahler, A N., (2001) Modern Physical Geography (4/E), John Wiley and Sons, Inc., New York.

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2. *https://nios.ac.in/media/documents/316courseE/ch11.pdf*
3. *https://eartheclipse.com/science/geology/different-types-of-weathering.html*

4. *https://www.sciencedirect.com/topics/earth-and-planetary-sciences/coastal-landform*
5. *https://www.clearias.com/movements-ocean-waves-tides-currents/*

Course Outcomes:

On completion of the course the student will:

1. *Understand part of the complex physical and biological environment in which human beings live.*
2. *Gets an idea regarding basic processes that influence the characteristics and spatial relationships of climate, water cycle and vegetation*
3. *Obtain knowledge regarding interactions of solar energy with the Earth's atmosphere and surface, and how atmospheric circulation, precipitation, and weather systems are generated.*
4. *Gain knowledge regarding cycling of water and other Earth resources within the living zone - the biosphere.*
5. *Understand how these cycles, together with the flows of energy, influence the nature and distribution of ecosystems and vegetation.*
6. *Get knowledge on the effect of pollution on the atmosphere.*
7. *Acquire knowledge regarding early methods used by scientists to date the age of the earth before investigating current earth formation theory; discuss reasons for geomorphological variation across the earth's surface; and review the tectonic and gradational landform processes that shape our physical environment.*
8. *Able to explore about concepts relating to temperature, air pressure and atmospheric moisture and the global and local effects of atmospheric variability on weather patterns and also examine global and local climatic patterns and their classification.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester II	
Course Code / Title	GC024 - MAP SCALE PROJECTION AND TERRAIN VISUALIZATION (P)	

Objectives

1) *The practical course trains the students to construct various map scale and projections.*
2) *Different types of directions and its significance are discussed.*
3) *This practical course inculcates critical knowledge of cartographical principles and techniques in representation of terrain to the students.*

Ex.No: I	Map Scale - Construction of Graphical, Comparative and Diagonal Scale
Ex.No: II	Enlargement and Reduction of Maps
Ex.No: III	Combination of Maps
Ex.No: IV	Determination of True North Bearings and Conversion of Bearings
Ex.No: V	Construction of Map Projections - Cylindrical - Conical and Zenithal Map Projections
Ex.No: VI	Identification and Choice of Map Projections
Ex.No: VII	Introduction to Map Projection Software
Ex.No: VIII	Methods of Representation of Relief and Preparation of a Contour Map
Ex.No: IX	Visualization of Relief Features by Contours
Ex.No: X	Drawing of Profiles and Calculation of Gradient and Slope
Ex.No: XI	Methods of Average Slope Determination
Ex.No: XII	Representation of Relief on a Block Diagram

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

- GIS Software-Internet maps, DEM, Projection Software, 3D Digital terrain modeling

References:

1. Gopal Singh (1998) Map Work and Practical Geography (4th Edition), Vikas Publishing House, Ahmedabad.
2. King, C. A.M (1966) Techniques in Geomorphology, Edward Arnold, London.
3. Misra, R.P. and Ramesh, A. (1986) Fundamentals of Cartography, Concept Publishing Company Delhi.
4. Monk House, F.J. and Wilkinson, H.R. (1973) Maps and Diagrams, Methuen & Co Ltd, London.
5. Saha, P. and Basu, P. (2014) Advanced Practical Geography, Books and Allied Ltd., Kolkatta.
6. Sarkar A. K. (1997) Practical Geography: A Systematic Approach, Oriental Longman, Calcutta.
7. Singh, R.L. and Singh, R. P. B. (2009) Elements of Practical Geography, Kalyani Publishers, New Delhi.
8. Singh, R.L. and Singh, R. P. B. (2009) Elements of Practical Geography, Kalyani Publishers, Delhi.
9. Steers, J.A. (1970) An Introduction to the Study of Map Projections, University of London Press, London.
10. Zulfequar Ahmad Khan, M.D., (1998) Text book of Practical Geography, Concept Publishing Company, New Delhi.
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2. *https://lib.bsu.edu/collections/gcmc/tutorials/pdfs/mapscartographymapprojections.pdf*
3. *https://sites.math.washington.edu/~king/coursedir/m445w05/as/projects/Universal%20Transverse%20Mercator%20Geometry3.pdf*
4. *https://www.uou.ac.in/sites/default/files/slm/GE-103.pdf*
5. *http://downloads2.esri.com/support/documentation/ao_/710understanding_map_projections.pdf*

Course Outcomes:

On completion of the course the student will:

1. *Obtain map, scale, projection knowledge and can prepare different types of maps.*
2. *Get confidence to construct and use different projections for maps.*
3. *Get familiar with different types of directions.*
4. *Able to perform map reduction and enlargements for various purposes.*
5. *Creates consciousness about plotting physical data and understanding physical features*
6. *Get confident in interpreting topographic and physiographic maps.*
7. *Learn various drawing skills to represent the terrain.*
8. *Understand and visualize terrain features from maps.*
9. *Apply statistical techniques to represent the spatial data.*
10. *Learn Map Projection Software and GIS software.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester II	
Course Code / Title	GA025 - PRACTICAL - ALLIED - I GEOLOGY (P)	

Objectives

1) *The practical course trains the students in structural geological mapping.*
2) *The students acquire basics about crystallography, mineralogy and petrology.*
3) *The course outlines the paleontological concepts, to identify different types of fossils.*

Unit: 1	Structural Geology: Geological cross section - geological symbols and profiles.
Unit: 2	Crystallography: Morphological characters of crystals: faces - forms - edges - Symmetry elements of crystals (normal class of different crystal systems).
Unit: 3	Mineralogy: Megascopic and microscopic identification and physical description of the minerals.
Unit: 4	Palaeontology: Identification and morphological characters of mega fossils (phylum Mollusca, phylum brachiopoda, phylum arthopoda)
Unit: 5	Petrology: Megascopic identification of igneous, sedimentary and metamorphic rocks

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

- Fossil Discoveries-Climate Change-Gemstones.

References:

1. Burr, F. (2018). The Elements of Practical Geology As Applicable to Mining, Engineering, Architecture, &c: With Notices of the Mines and Mineral Productions of Great Britain. United States: Creative Media Partners, LLC.
2. Dougal Dixon (1992) the Practical Geologist: The Introductory Guide to the Basics of Geology and to Collecting and Identifying Rocks, Simon and Schuster, New York.
3. Genge, M. J. (2020). Geological Field Sketches and Illustrations: A Practical Guide. United Kingdom: Oxford University Press.
4. Groshong, R. H. (2006). 3-D Structural Geology: A Practical Guide to Quantitative Surface and Subsurface Map Interpretation. Germany: Springer Berlin Heidelberg.
5. Guhey, R. (2017). Geology: Principles and Practical Manual. India: New India Publishing Agency.
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1. *https://www.rmg.co.uk/stories/topics/origin-solar-system*
2. *https://www.ngu.no/en/topic/structuralgeology#:~:text=Structural%20geology%20is%20a%20subdiscipline,that%20act%20within%20the%20Earth.*
3. *https://opengeology.org/Mineralogy/11-crystallography/*
4. *https://www.britannica.com/science/Earth-sciences/Paleontology-and-stratigraphy*
5. *https://opengeology.org/petrology/01-introduction-to-petrology/*

Course Outcomes:

On completion of the course the student will:

1. *Prepare geological profiles of an area.*
2. *Gain knowledge to interpret geologic maps.*
3. *Get confidence in identifying different rock types.*
4. *Create curiosity about the economic significance of minerals.*
5. *Able to apply the basic knowledge of geology in sustainable management.*
6. *Acquire knowledge of chemical composition of minerals and its importance.*
7. *Discuss about the composition and types of igneous, sedimentary and metamorphic rocks.*
8. *Able to identify different fossils in field.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester II	
Course Code / Title	**GV026 - ENVIRONMENTAL STUDIES**	

Objectives

1) *This course aimed to discuss about the importance of environmental studies.*
2) *The course describes about the functions of environment around us.*
3) *Learners can acquire knowledge on different ecosystems.*
4) *The course discusses the relation between the human and environment.*

Unit: 1	**Introduction:** Definition, nature, scope and importance of environmental studies - Need for public awareness on environment - Natural Resources: Forest resources, Water resources, Mineral resources, Energy resources, Land resources, Food resources - Renewable and non-renewable resources - Natural resources and associated problems - Role of an individual in conservation of natural resources – sustainable development.
Unit: 2	**Ecosystems:** Concept of an ecosystem - Structure and function - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids – Characteristic features and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems - **Biodiversity**: Biodiversity and its conservation - Hot-spots of biodiversity - Threats to biodiversity - India as a mega-biodiversity nation - Endangered and endemic species of India - In-situ and Ex-situ conservation of biodiversity.
Unit: 3	**Environmental Pollution**: Definition –types, causes, effects and controls measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear hazards - Role of an individual in prevention of pollution – **Solid waste management:** Causes, effects and control measures of urban and industrial wastes - **Disaster management**: floods, earthquake, cyclone, landslides, Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
Unit: 4	**Social Issues and the Environment**: Urban problems related to energy - Water conservation, rainwater harvesting, watershed management - Resettlement and rehabilitations of people; its problems and concerns - Wasteland reclamation - Consumerism and waste products. Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act. Issues involved in enforcement of environmental legislation - Public awareness.
Unit: 5	**Human Population and the Environment:** Population growth, variation among nations - Population explosion - Family Welfare Programme - Environment and human health – Human rights – Environmental Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Field work: Visit an ecosystem to study and document environmental assets – Visit a local polluted site.

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

- SardarSarovar Project-Sariska Tiger Reserve-RajasthanOrissa – Olive Ridley Turtles-A case study of pesticide pollution in India - Bhopal Gas Tragedy-Global Warming and Climate Change – Food Waste –Biodiversity Loss – Plastic Pollution – Melting Ice Capes and Sea Level Rise – Ocean Acidification – Fast Fashion Textile Waste etc.

References:

1. Abhik Gupta, Susmita Gupta (2021) Environmental Studies: Principles and Practices, SAGE Publications Pvt. Ltd; 1st edition
2. Bharucha, E., (2003) Textbook for Environmental Studies, UGC, New Delhi and BharatiVidyapeeth, Pune.
3. Chandna R. C., (2002) Environmental Geography, Kalyani, Ludhiana.

4. Chiras D. D. and Reganold J. P., (2005) Natural Resources Conservation: Management for a Sustainable Futures, Prentice Hall.
5. Cunninghum W. P. and Cunninghum M. A., (2004) Principals of Environmental Science: Inquiry and Applications, Tata Macgraw Hill, New Delhi.
6. Goudie A., (2001) The Nature of the Environment, Blackwell, Oxford.
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2. *https://sc-s.si/joomla/images/Ecosystems.pdf*
3. *https://www.who.int/news-room/fact-sheets/detail/biodiversity-and-health*
4. *https://elaw.org/system/files/Chapter%208%20Disaster%20Management.pdf*
5. *https://www.svce.ac.in/wp-content/uploads/2021/01/EVS-UNIT-4.pdf*

Course Outcomes:

On completion of the course the student will:

1. *Able to understand the importance of environment.*
2. *Gain knowledge about various resources available in the ecosystem.*
3. *Acquire knowledge about the functions and processes in various ecosystems.*
4. *Understand about the importance of biodiversity and essentials of it conservation.*
5. *Acquire knowledge on various disaster and it impacts on environment.*
6. *Get the information about various pollution and pollutants.*
7. *Understand the different environmental Acts and its importance..*
8. *Articulate the interdisciplinary context of environmental issues*
9. *Recognize the relation between human and environment.*
10. *Achieve the consciousness of environment and wildlife conservation through this course.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester II	
Course Code/ Title	**GV027 - GENDER STUDIES**	

Objectives

1. *To make students aware of strengths and Weakness of Gender.*
2. *To develop sensitivity towards both genders in order to lead an ethically enriched life.*
3. *To promote attitudinal change towards a gender balanced ambience and women empowerment.*
4. *To create awareness about the policy interventions at different levels and scales.*

Unit: 1	Introduction: Concepts of Gender: Sex, Gender, Biological Determinism, Patriarchy, Feminism, Gender Discrimination, Gender Division of labour, Gender Stereotyping, Gender Sensitivity, Gender Equity, Equality, Gender Mainstreaming, Empowerment.
Unit: 2	Women's Studies vs Gender Studies: UGC's Guidelines-VII to XI Plans, Gender Studies: Beijing Conference and CEDAW, Exclusiveness and Inclusiveness.
Unit: 3	Areas of Gender Discrimination: Family, Sex Ratio, Literacy, Health, Governance, Religion Work Vs Employment, Market, Media, Politics, Law, Domestic Violence, Sexual Harassment, State Policies and Planning.
Unit: 4	Women Development and Gender Empowerment: Initiatives, International Women's Decade, International Women's Year, National Policy for Empowerment of Women, Women Empowerment Year 2001, Mainstreaming Global Policies.
Unit: 5	Women's Movements and Safeguarding Mechanism: In India National /State Commission for Women (NCW), All Women Police Station, Family Court, Domestic Violence Act, Prevention of Sexual Harassment at Work Place Supreme Court Guidelines, Maternity Benefit Act, PNDT Act, Hindu Succession Act 2005, Eve Teasing Prevention Act, Self Help Groups -73rd and 74th Amendment for PRIS.

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

- Femicide, First-wave feminism, Gender-Neutral language, Radical Feminism, Women in a non-traditional occupation, and Women's Suffrage.

References:

1. *Arya Sadhna., (2000). Women, Gender Equality and the State, New Delh :Deep &Deep Publication.*
2. *Bhasin Kamala., (2004). Understanding Gender: Gender Basics, New Delhi: Women Unlimited.*
3. *Bhattacharya Malini., (2002). Sexual Violence and Law, Kolkata; West Bengal Commission for Women.*
4. *Jane Pilcher & Imelda Whelehan. (2020), Key concepts in Gender Studies, SAGE Publications Ltd.*
5. *Mishra. O.P., (2001). Law Relating to Women & Child, Allahabad:Central Law Agency.*
6. *Mohanty Manoranjan., (2004). (ed.,) Class, Caste, Gender: Readings in Indian Government and Politics-5 New Delhi: Sage Publications.*
7. *Pludi. A Michele., (2004). (ed.,) Guide to the Psychology of Gender, London: Praeger Publisher.*
8. *Rajadurai.S.V & Geetha.V., (2007). Themes in Caste Gender and Religion, Tiruchirappalli Bharathidasan University.*
9. *Rao Anupama., (2003). (ed.,) Gender & Caste: Issues in Contemporary Indian Feminism, New Delhi.*
10. *Sakshi., (1999). Sexual Harassment at the Workplace – A Guide, New Delhi.*

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1. *https://daily.jstor.org/reading-list-gender-studies/*
2. *https://www.youtube.com/watch?v=qxs6-AjgWSU*
3. *https://www.ebsco.com/products/research-databases/gender-studies-database*
4. *https://www.unwomen.org/*
5. *http://ncw.nic.in/*

Course Outcomes

On completion of the course the student will:

1. Recall gender as a social construct.
2. Identify the ways gender, power, privilege, and oppression play out across a range of cultures and human experiences.
3. Demonstrate an understanding of gender as it intersects with sexuality, race, ethnicity, religion, class and other critical variables.
4. Examine and challenge social norms about what it means to be a woman or man in a society.
5. Appraise justice and equality for all, which is a fundamental for gender equality.
6. Compare the intersection of gender with other categories such as ethnicity, sexuality, class and nationality.
7. Collect information about topics like- media, sexuality, race, ethnicity, history involving women, and multiculturalism.
8. Demonstrate knowledge about the ways that women throughout the world are resisting gender oppression and organizing to reshape their own communities.
9. Select suggestionsby considering options for contributing to positive change in gender related issues.
10. Evaluate the complex and gendered social, economic, and political aspects of globalization that disproportionately disadvantage and impact women in various locations around the world..

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester II	
Course Code/ Title	VAC I - GEOGRAPHY OF TOURISM	

Objectives

1. *To describe the geographic basis for the location of tourism attractions and destination areas.*
2. *To understand the relationships between the physical and cultural factors influencing tourism.*
3. *To discuss the interrelation of geography and tourism and world travel patterns.*
4. *To create awareness about the importance of tourism in India.*

Unit: 1	**Introduction:** Definition, Concepts, Nature and Scope, Inter-Relationships, Recreation and Leisure, Factors affecting growth and nature of tourism- Historical, natural, socio-cultural and economic
Unit: 2	**Parameters and Types:**Geographical Parameters of Tourism by Robinson, Type of Tourism- Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage, Geo-tourism, Global Tourism Industry, United Nations World Tourism Organization (UNWTO).
Unit: 3	**Recent Trends and future**: International, Regional and Domestic, Eco- Tourism, Sustainable Tourism, Meetings, Incentives, Conventions and Exhibitions (MICE), Trends of Pilgrimage Tourism, GlobalizationandTourism, Rebuilding post pandemic tourism, Tourism industry in 2030.
Unit: 4	**Impact of various sectors:** Economy, Environment, Society, Role of foreign capital and impact of globalisation on tourism, Theories in TourismSustainable Development Goals and Tourism- Goal 8 and 9.
Unit: 5	**Tourism in India:** Tourism Infrastructure,National Geological Monuments,National heritage sites, National Tourism Policy, Case Studies of Himalaya, Desert, Coast and islands, Incredible India Tourism.

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

- Hospitality industry, Tour operators, Travel agent, Technical glossary.

References:

1. Alan, A. Lew, (2017).New Research Paradigms in Tourism Geography, Routledge.
2. Ankur Dogra., (2020). Geography of Tourism, Akinik Publications.
3. Dhar, P.N. (2006). International Tourism: Emerging Challenges and Future Prospects. Kanishka,Delhi.
4. Hall, M. and Stephen, P. (2006). Geography of Tourism and Recreation – Environment, Place and Space, Routledge, London.
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, Oxford.
9. Singh, Jagbir (2014). “Eco-Tourism, I.K. International Publisher. New Delhi.

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1. *https://www.bbc.co.uk/bitesize/guides/z2nnqty/revision/1*
2. *https://www.unwto.org/*
3. *https://www.incredibleindia.org/content/incredible-india-v2/en.html*
4. *https://sdgs.un.org/topics/sustainable-tourism*
5. *https://www.tamilnadutourism.tn.gov.in/*

Course Outcomes

On completion of the course the student will:

1. *Describe the tourism geography and related cognitive framework.*
2. *Identify and understand geographical approaches to tourism and categories of tourism places, spaces and landscapes.*
3. *Discuss the main steps of tourism development and impacts on various sectors.*
4. *Explains the efficient factors of improving on urban tourism.*
5. *Identify the impacts of tourism on national, regional and local economy, environment and society.*
6. *Appraise the basic concepts and geographical parameters of tourism.*
7. *Examine the recent trends and patterns of tourism development in India.*
8. *Evaluates the sustainability of tourism plans.*
9. *Interprets the importance of human, cultural, environment characteristics on tourism*
10. *Estimate the spatial issues of tourism change and development, as well as the contested issues regarding tourism's contribution to overall local development.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester III	
Course Code / Title	**GC033 - CLIMATOLOGY**	

Objectives

1. *To know the elements of weather and climate and their impacts at different scales.*
2. *To comprehend Earth's climates and the factors that influence and control them.*
3. *To understand the structure, composition, and interaction of the atmosphere.*
4. *To identify the factors that operates and changes over time and the applications of climatology.*

Unit: 1	**Introduction :** Definition - Atmosphere – composition: gases, water vapour and dust particles-structure: Troposphere, stratosphere, Ozonosphere, Ionosphere and Exosphere – insolation heat budget-Factors affecting the distribution of insolation: Angle of incidence, Duration of sunshine, Solar constant, Distance between the earth and the sun and Transparency of the atmosphere– Processes of Heat energy transfer.
Unit: 2	**Atmospheric:** pressure and winds: pressure gradient – pressure variations – vertical variation and horizontal variation of air pressure – seasonal variation in pressure pattern – Winds: factors affecting wind motion – geostrophic wind-Beaufort Scale – general circulation of atmosphere: surface wind system – Latitudinal shifting of wind belts – jet stream -local winds**.**
Unit: 3	**Precipitation** – humidity – definition – types – factors affecting potential evapotranspiration and actual evapo-transpiration – dew point - temperature change – condensation – forms of Precipitation.
Unit: 4	**Air masses:** Definition– classification. Atmospheric disturbances: cyclones and anticyclones - temperate cyclones: front – frontogenesis – types – Characteristics – frontolysis**.**
Unit: 5	**Climate Classification:** Koppen – Thornthwaite –climatic change – weather forecasting – methods and trends– green house effects – ozone depletion – human comfort zones.

Unit: 6 Current Contours: [Not for Examination]

Extreme Climatic events: global warming- Glacial melting-extreme heat wave in world history- Hurricane Ida- European summer floods - Flooding in China- Monsoon floods, India and Nepal

References:

1. Barrett, E. (2019). Climatology from Satellites. United Kingdom: Taylor & Francis.
2. Climatology. (2022). United States: LARSEN & KELLER EDUCATION.
3. Jones & Bartlett Learning; 4 editions, Climatology, Louisiana State University, Baton Rouge, 2017.
4. Lal, D.S. (2019), Chaitanya Publishing House, Allahabad.
5. Majid Husain, (Rep.2020), Fundamentals of Physical Geography.
6. Rohli, R. V., Vega, A. J. (2017). Climatology. United States: Jones & Bartlett Learning.
7. Smith, K., (1975), Principles of Applied Climatology, McGraw Hill Book Co., London.
8. Smith, K., Principles of Applied Climatology, McGraw-Hill, 1975.
9. Thornthwaite C.W., an Approach toward a Rational Classification of Climate, in Geogr. Review, 1948.
10. Trewartha, G.T., (1968), An Introduction to Climate, McGraw Hill Book Co., New York.

Web Sources:

1. https://swayam.gov.in/course/4242-physical-geography-ii-climatology-oceanography
2. https://www.britannica.com/science/climatology
3. https://www.ncdc.noaa.gov/
4. http://www.realclimate.org/
5. https://stories.undp.org/cop27-a-chance-to-act

Course Outcomes:

On completion of the course the student will:

1. *Acquired the basics knowledge of the atmosphere and its layer structure.*
2. *Discuss the atmospheric wind circulation and its significance on the weather changes.*
3. *Identify the distribution and dynamics of temperature in vertical and horizontal manure.*
4. *Classify the types of clouds, characteristics and their significance.*
5. *Explain the usage of various meterological instruments and their climatic measurements, which provide the intensity of natural calamities.*
6. *Categorise the climatic classification at the global and regional levels and identify the factors of climatic change.*
7. *Distinguish the instruments that are used by the forecast the climatic conditions of environment.*
8. *Illustrate the various forms of precipitation, and their effects on the environment.*
9. *Interpreted the sources of the air masses and the formation of different cyclones and their interrelationship with fronts.*
10. *Analyse the various climatic events, like hurricanes, floods, global warming, etc., on a global scale.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester III	
Course Code / Title	GC034- REPRESENTATION OF CLIMATIC DATA (P)	

Objectives

1. *To understand the primitive and modern techniques of climatic data visualization.*
2. *To categorize the methods using different climatic data sets.*
3. *To identify the suitable methods for different climatic variables.*
4. *To give critical knowledge of cartographic principles and techniques in climatic data to the students.*

Ex. 01	Representation of Climatic Data by Isopleth
Ex. 02	Climatic Line Graphs
Ex. 03	Columnar Diagrams
Ex. 04	Rainfall Dispersion Diagrams
Ex. 05	Climatograph
Ex. 06	Rainfall Variability
Ex. 07	Rainfall Deviation Graph
Ex. 08	Water Balance
Ex. 09	Wind-Rose Diagrams
Ex. 10	Climographs
Ex. 11	Ergograph
Ex. 12	Synoptic Weather Charts

References:

1. Ashis Sarka., (2019) the text book of practical geography A systematic approach, 3rd edition.
2. Gopal Singh (1998) Map Work and Practical Geography (4th Edition), Vikas Publishing House, Ahmedabad.
3. Kalbach, J. (2020). Mapping Experiences. United States: O'Reilly Media.
4. Monk House, F.J. and Wilkinson, H.R. (1973) Maps and Diagrams, Methuen & Co Ltd, London.
5. Practical Geography: A Systematic Approach. (2015). India: Orient Blackswan.
6. Practical Geography: A Systematic Approach. (2015). India: Orient Blackswan.
7. Saha, P. and Basu, P. (2014) Advanced Practical Geography, Books and Allied Ltd., Kolkatta.
8. Sharma, J.P. (2014). Practical Geography Rastogi Publications, Meerut.
9. Singh, R.B. (2003). Practical work in Geography Pt I NCERT, New Delhi.
10. Singh, R.L. and Singh, R. P. B. (2009) Elements of Practical Geography, Kalyani Publishers, New Delhi.

Course Outcomes:

On completion of the course the student will:

1. *Understand the basic concepts of the climate data and its importance.*
2. *Define the primitive methods of climatic data interpretation.*
3. *Describe the essentials of the techniques and climatic data.*
4. *Identify the appropriate techniques for plotting various climatic data sets.*
5. *Explain the different weather conditions like cool, cold, warm, and hot using a climatograph method.*
6. *Identify the water level and wind direction can be visualised by the method of water balance.*
7. *Categorise the wind direction can be analysed by the wind rose diagram.*
8. *Differentiate the methods that using for the rainfall analysis and their visualization.*
9. *Interpret the weather charts, and it provides confidence in understanding the weather reports.*
10. *Compared with modern and primitive methods, these are used for the visualisation of climatic data sets.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester III	
Course Code / Title	**GA035 - ALLIED - II STATISTICS - I**	

Objectives

1. *This course is to introduce the basic concepts of statistics to the students of geography.*
2. *This allied course will help the students to understand the purpose, meaning, and use of statistics in geographical studies.*
3. *By studying this course, students could be able to apply statistical techniques to real geographical problems.*

Unit: 1	**Introduction:** Statistical Methods for Geography - Scientific method and mathematical notation - Descriptive Statistics - Measures of central tendency: Mean, Median, and Mode - Measures of Dispersion: Range, Variance, Standard Deviation, z-score, Skewness, Kurtosis and Histograms.
Unit: 2	**Probability:** Probability Concepts - Discrete Probability Distributions: Uniform, Binomial and Poisson Distributions - Continuous Probability Distributions - Probability Models - Central Limit Theorem and Confidence Intervals
Unit: 3	**Hypothesis Testing and Sampling:** Sources of Data - Sampling - Hypothesis Testing: z-test and t-test - Analysis of Variance (ANOVA).
Unit: 4	**Correlation and Regression:** Covariance - Pearson's Correlation Coefficient - Spearman's Rank Correlation Coefficient – Correlation and Geographic Problems -Regression Analysis.
Unit: 5	**Spatial Patterns:** Data Reduction: Factor Analysis and Cluster Analysis

Unit: 6 Current Contours: [Not for Examination]

- Trend analysis – Forecasting – Geo-statistics

References:

1. Hammond, P. and McCullagh, P. S., (1978) Quantitative Techniques in Geography: An Introduction, Oxford University Press, New York.
2. Pal, S. K. (1998) Statistics for Geoscientists, Tata McGraw Hill, New Delhi.
3. Rogerson,P. A. (2001) Statistical Methods for Geography, Sage Publications, New Delhi.
4. Gareth James (2013). An Introduction to Statistical Learning: with Applications in R, Springer Science & Business Media.
5. Dennis D. Boos (2013). Essential Statistical Inference: Theory and Methods, Springer Science & Business Media.
6. Andy Field (2013) Discovering Statistics Using IBM SPSS Statistics, 4th Edition, Sage Publications, London.
7. George A. Morgan (2011). IBM SPSS for Introductory Statistics, Taylor & Francis.
8. Ajai, S. G. and Sanjaya, S.G. (2009) Statistical Methods for Practice and Research, Sage Publications, New Delhi.
9. Lyman Ott (2015). An Introduction to Statistical Methods and Data Analysis, Cengage Learning.
10. Ding-Geng (Din) Chen, Karl E. Peace (2021) Applied Meta-Analysis with R and Stata.

Web Sources:

1. https://machinelearningmastery.com/
2. https://www.hackerrank.com/domains/ai/machine-learning
3. https://newonlinecourses.science.psu.edu/stat857/node
4. http://www.unc.edu/courses/2006spring/geog/090/001

Course Outcomes:

On completion of the course the student will:

1. *Frame problems using multiple mathematical and statistical representations of relevant fields of geography.*
2. *Familiarizes the properties of parametric, semi-parametric and nonparametric testing procedures.*
3. *Interpret and communicate the results from statistical analysis.*
4. *Apply probability and the mathematical models of statistics in geographical research.*
5. *Recognize the importance of applying mathematical and statistical thinking in geospatial dimensions.*
6. *Able to carry out appropriate hypothesis tests.*
7. *Get confidence in surveying and sampling.*
8. *Perform statistical forecasting with geospatial data.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester III	
Course Code / Title	GS038 – SBE - INFORMATION TECHNOLOGY	

Objectives

1) *This skill based elective course is intended to acquaint the students with basic skills of information technology.*
2) *By studying this course, the students could be able to acquire basic knowledge of computers, multimedia, computer networking and internet.*
3) *They will also get aware about emerging trends in IT, cyber laws and computer ethics.*

Unit: 1	**Introduction:** Definition-Information Systems – basic components of a computer System (Control Unit, ALU, Input/Output Functions and characteristic), Memory-RAM, ROM, EPR OM, PROM and other types of Memory Computer Software Need, Types of Software's – System Software, Application Software. System Software – Operating System, utility Program, Programming languages, Assemblers, Compilers, Interpreter.
Unit: 2	**Computer Networks and Internet:** Overview of WWW - Web browsers - E-mail: servers, protocols, clients - FTP - Network communication and protocols- Wires and wireless communication and standards– LAN – WAN – WiFi – DNS-Network hardware.
Unit: 3	**Cosmic abundance of elements:** Distribution of elements in solar system and in Earth Composition of the Earth - General concepts about geochemical cycles - Properties of common elements in Earth - Concepts of geochemical cycles.
Unit: 4	**Emerging Trends:** Popular programming languages - Cloud computing –IT in mobile applications – Analytics: data analytics, predictive analytics and social analytics – IT in social media - 3D printing- Artificial intelligence.
Unit: 5	**Cyber Laws and Issues:** Cyber Laws - IT Act of India 2000 - Digital Signature - Security, Privacy and Control - Intellectual Property Rights - Computer ethics – Environmental issues

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

- Documentary Series on Artificial Intelligence-Robotics-3DPrinter-3D printed bionic hand controlled-machine learning.

References:

1. Advances in Computer Science and Information Technology: First International Conference on Computer Science and Information Technology, CCSIT 2011, Bangalore, India, January 2-4, 2011. Proceedings, Part I. (2010). Germany: Springer.
2. Dennis, P.C., Kim, F., Kunal, S., & Cathleen, M. (1998). Information Technology: The Breaking Wave, McGraw-Hill College
3. Fox, R. (2013). Information Technology: An Introduction for Today's Digital World. United States: CRC Press.
4. Frick, E. (2019). Information Technology Essentials Volume 1: Introduction to Information Systems. (n.p.): Independently Published.
5. Lucas, H. C. (2000). Information Technology for Management. India: Irwin/McGraw-Hill.
6. P Stephen, D. (2000). Understanding Information Technology. Stanley Thornes Publishers Ltd. London
7. Rajaraman, V. (2006) Introduction to Information Technology. Prentice-Hall India Pvt. Ltd., New Delhi.
8. Sinha, P., Sinha, P. K. (2016). Information Technology: Theory and Practice. India: Prentice Hall India Pvt., Limited.
9. Special Topics in Information Technology. (2019). Germany: Springer International Publishing.
10. Talukdar, M. (2021). Dictionary of Computer & Information Technology. India: Prabhat Prakashan.

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1. https://3dprint.com/213337/3d-printed-youbionic-hand-update/
2. https://3dprintingindustry.com/news/3d-printing-industry-protolabs-design-competition-winner-announced-2018-awards-update-133063/
3. https://www.chemarc.com/content/focus-on-3d-printing--news--updates

Course Outcomes:

On completion of the course the student will:

1. *Begin their career as a system administrator, systems analyst, web administrator network analyst, designer or administrator, computer programmer, database administrator or database designer.*
2. *Analyze best practices and research to determine appropriate design of integrated IT systems.*
3. *Conduct original research that contributes to professional and actionable knowledge in an applied environment.*
4. *Recommend IT strategies that support enterprise mission and Objectives following tenets of professional, social, and ethical responsibility.*
5. *familiarize with networking concepts and protocols (http, smtp)*
6. *Critically evaluate, analyse and synthesise a complex issue or theory from an information technology area to arrive at a conclusion or decision.*
7. *Design, implement and recommend effective Information and Communications Technology (ICT) solutions to complex business problems.*
8. *Creates a consciousness of IT act and cyber laws.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IV	
Course Code / Title	GC043 - HUMAN GEOGRAPHY	

Objectives

1. *To acquaint the students with the nature of man-environment relationship.*
2. *The course would discuss human evolution, habitats and culture (religion & language).*
3. *The topics describes population composition, distribution and patterns.*
4. *The students will be aware of sustainable methods for developments.*

Unit: 1	**Human Geography:** Definition, Nature and Scope, Fundamental concepts in human geography (Place, Space and Landscape), Understanding of man-nature relationship: Determinism, Possibilism and Neo-determinism.
Unit: 2	**Human Races: Evolution – Major races:** Caucasoid, Mongoloid and Negroid – Distribution - Racial conflicts and racial prejudice - Human Habitats: Mode of life in Equatorial regions, Tropical deserts, Temperate grasslands and Tundra region – Culture: Culture and Identity - Sex and gender - Ethnicity - Globalization and cultural change.
Unit: 3	**Religion & Language:** World's major religions: Hinduism, Buddhism, Christianity, Islam and Judaism - Sacred spaces - Language relationships and dynamics - Major world languages – Communication: Types and development.
Unit: 4	**Population**: Spatial pattern of population distribution - factors influencing spatial distribution - Population composition - Population growth - Problems of over population and under population - optimum population - Migration: types, causes and consequences.
Unit: 5	**Sustainable development**: Concept, Indicators and measures of development (economic, social and environmental), Global pattern of development, inter- regional variation, HDI. Geopolitics: Boundaries and frontiers - States, Nations and Citizenship - Imperialism and colonialism - Human rights – Globalization

Unit: 6 Current Contours: [Not for Examination]

Economic War, Illegal Immigrations, Pandemic affecting social life, Fading of Cultural & traditional practices

References:

1. Agnew. J, (1996) Human Geography An Essential Anthology , Wiley, New Delhi .
2. Amit Harichandran & M.A. Chaudhany (2010), Human Geography –Global Vision Publishing,New Delhi.
3. Finlayson C, (2021), Introduction to Human Geography, Pressbooks publication.
4. Gillespie C.A. , (2021), 5 Steps to a 5: AP Human Geography, McGrawhill Publications
5. Goh Cheng Leong (2010),Human & Economic Geography ,Oxford University Press.
6. Henn S, Miggelbrink J, Hörschelmann K,(2021)Research Ethics in Human Geography, Routledge
7. Husain M, (2011), Human Geography (Fourth Edition)-Rawat Publications, Jaipur.
8. Paul .L.Knox,(2015) Human Geography place and Regions in Global Context -6th Edition, Pearson India.
9. Rueda A, (2021), AP Human Geography 2021 and 2022 Study Guide, Test Prep Books
10. S.C.Bhalia (2008) Human Geography concept and Issues-Attantic Publishers New Delhi.

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1. https://vlacs.org/competencies/ap-human-geography/
2. https://study.com/academy/course/ap-human-geography-exam-prep.html
3. https://study.com/academy/subj/social-science/geography.html
4. http://geography.utoronto.ca/department/careers-in-geography-and-planning/

Course Outcomes:

On completion of the course the student will:

1. *Familiarises the basic and advanced concepts of human geography.*
2. *Inculcates dichotomies in geography.*
3. *Gain knowledge about the global human habitats and culture.*
4. *Gain knowledge about different races and their evolution.*
5. *Understand the major world religions and languages in practice.*
6. *Creates awareness about the population growth and problems.*
7. *Understand the nature and locational factors of rural and urban settlements.*
8. *Gets a better understanding of geopolitical issues.*
9. *Familiarises the concept of state, nation and the role of citizens.*
10. *Learn the evolution of Culture and language in different regions.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	Semester IV	
Course Code / Title	GE044 – ECONOMIC GEOGRAPHY	

Objectives

1. *To know the fundamental concept of economic geography*
2. *To understand the resources and their classification.*
3. *To appreciate for the applications, models and their usage in the study.*
4. *To create awareness of the importance of technologies like GIS and Remote sensing on economic and network systems.*

Unit: 1	**Introduction:** Nature, scope and recent trends of economic geography - spatial organization economic activities - Sectors of economy: primary, secondary tertiary, quaternary and quinary - Impact of economic activities on environment.
Unit: 2	**Resources:** Classification: renewable and non-renewable – World Distribution: Livestock - Forestry - Agriculture – Minerals Distribution: Metallic, on-metallic and Energy minerals-Metallic minerals: Silver, Chromium, Tin, Nickel, Copper, Iron, Lead, Aluminium, Gold, and Zinc –Non-Metallic Mineral Distribution: Diamond, mica, Gypsum - Energy Minerals Distribution: Coal, petroleum, natural gas –- Conservation of resources - resources and sustainability.
Unit: 3	**Industries:** Factors affecting location of industries - Theories and models of industrial location: Weber, Losch – Types of Industry: Large industry, small industry, cottage industry - Major industries Distribution: iron and steel, textile, chemicals, cement, paper, ship building and knowledge based industries – major Industrial regions of world.
Unit: 4	**Transport and Communication:** Modes of transport: Roads, Railways, Waterways, Airways and Pipelines – World Distribution: Road, Railways: trans-Continental railways, union pacific railways, Cape to Cairo railways, Perth-Adelaide railways, National railways – Waterways: Inland water ways: Europe, North America, Asia, Africa, South America, Australia – Ocean Ways: North Atlantic ocean route, Suez canal or Mediterranean Asiatic route, Cape of good hope route, panama canal route south Atlantic route, trans-pacific route-Airways - Geographical factors - Ports and Harbours - communication systems: radio, television, satellite, internet and social media.
Unit: 5	**Trade: Internal trade:** Major imports and exports - International trade: Factors - pattern – Spatial structure of trade flow - World trade Blocks: WTO, APEC, SAARC, EU and ASEAN - Globalization and economic development.

Unit: 6 Current Contours: [Not for Examination]

World Trade Fair, G20 Conference, SDG, GDP

References:

1. Goh Cheng Leong & Morgan, G.C. (1982) Human and Economic Geography, 2nd Edition, Oxford University Press, New Delhi.
2. Knox, P. & Marston, S. (2013) Human Geography: Places and Regions in Global Context, 6th Edition, Pearson Education, New Delhi
3. Prithwish Roy (2014) Economic Geography - A study of Resources, New Central Book Agency, Kolkata.
4. Cidell, J. (2021). An Introduction to Transportation Geography: Transport, Mobility, and Place. United States: Rowman & Littlefield Publishers.
5. Saxena, H.M. (2013) Economic Geography, Rawat Publications, Jaipur.
6. Debt and Austerity: Implications of the Financial Crisis. (2020). United Kingdom: Edward Elgar Publishing.
7. Tapas Pal (2015) Industrial Geography An Indian Perspective, Bridge Centre, Buzau.
8. Yadav, P. (2021). Geographical Perspectives on International Trade. Switzerland: Springer International Publishing.
9. Barnes, T. J., Christophers, B. (2017). Economic Geography: A Critical Introduction. Germany: Wiley.
10. Hodder, B. W., Lee, R. (2015). Economic Geography. United Kingdom: Taylor & Francis.

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2. https://www.un.org/development/desa/dpad/publication/world-economic-situation-and-prospects-september-2022-briefing-no-164/
3. https://link.springer.com/chapter/10.1007/978-1-4757-6873-2_1#:~:text=A%20transportation%20system%20can%20be,be%20applied%20to%20different%20contexts.
4. https://scholar.google.com/scholar?&q=Manheim%20M.%20%281979%29.%20Fundamentals%20of%20transportation%20systems%20analysis%20MIT%20Press%2C%20Cambridge%2C%20Mass.
5. https://scholar.google.com/scholar_lookup?&title=Urban%20transportation%20networks.%20Prentice%20Hall&publication_year=1985&author=Sheffi%2CY

Course Outcomes:

On completion of the course the student will:

1. *Acquire generalized ideas about the fundamentals of economic geography*
2. *Familiar about the resources types*
3. *Discus about mineral distribution the world*
4. *Identify the minerals, energy resources and their world's distribution.*
5. *Categorize the manufacturing industries on economic activities, and their spatial distribution.*
6. *Analyse the transport systems and their pros and corns.*
7. *Demonstrate the world distributions of the major transport systems.*
8. *Differentiate the distributions ports and harbours their characteristics.*
9. *Evaluate the importance of global trades and trade blocks.*
10. *Appraise the development of trade and globalization.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IV	
Course Code / Title	GA045 - ALLIED - II STATISTICS - II (P)	

Objectives

1. *The objective of this course is to impart practical skills on statistics to the students.*
2. *This practical course will help the students to analyse and apply various statistical techniques through software packages.*

Ex. I	Descriptive Statistics
Ex. II	Comparing Means
Ex. III	Creating Graphs and Charts
Ex. IV	One-Sample t-Test
Ex. V	Independent Samples t-Test
Ex. VI	Analysis of Variance (ANOVA)
Ex. VII	Chi-Square Test of Independence
Ex. VIII	Correlation Analysis
Ex. IX	Regression Analysis
Ex. X	Factor Analysis

References:

1. Ajai, S. G. and Sanjaya, S.G. (2009) Statistical Methods for Practice and Research, Sage Publications, New Delhi.
2. Andy Field (2013) Discovering Statistics Using IBM SPSS Statistics, 4th Edition, Sage Publications, London.
3. Pal, S. K. (1998) Statistics for Geoscientists, Tata McGraw Hill, New Delhi.
4. Rogerson, P. A. (2001) Statistical Methods for Geography, Sage Publications, New Delhi.
5. Peter Bruce and Andrew Bruce (2017) Practical Statistics for Data Scientists, O′Reilly Publications, London.
6. Peter Bruce ,Andrew Bruce , Peter Gedeck (2020) Practical Statistics for Data Scientists, Essential Concepts Using R and Python , O′Reilly Publications, London.
7. Lyman Ott (2015). An Introduction to Statistical Methods and Data Analysis, Cengage Learning.
8. Ding-Geng (Din) Chen, Karl E. Peace (2021) Applied Meta-Analysis with R and Stata.

Course Outcomes:

On completion of the course the student will:

1. *Frame problems using multiple mathematical and statistical representations of relevant structures and relationships and solve using standard techniques.*
2. *Demonstrate knowledge of the properties of parametric, semi-parametric and nonparametric testing procedures*
3. *Interpreting and communicating the results of a statistical analysis*
4. *Probability and the mathematical foundations of statistics*
5. *Recognize the importance and value of mathematical and statistical thinking, training, and approach to problem solving, on a diverse variety of disciplines*
6. *Communicate quantitative ideas both orally and in writing to a range of audiences.*
7. *Successfully completing upper level methodological statistics courses as set forth in the statistics program requirements.*
8. *Carrying out in these courses exercises or small projects that incorporate data presentation.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester IV	
Course Code / Title	GS049 - SKILL BASED ELECTIVE - FIELD SURVEY	

Objectives

1. *The main objective of the field survey is to conduct physical, social and economic survey of a chosen village/town.*
2. *The exercises of this course will familiarize the students to prepare base map of the study area; to identify physical features on the ground; and to understand the basic socio-economic characteristics of village/town/households.*
3. *The course, students will be evaluated based on critical field-survey report in addition to photographs, sketches, maps and diagrams.*

Unit: 1	**Base Map:** Selection of area/unit to be investigated – Collection of topographic and cadastral maps – Preparation of base map
Unit: 2	**Physical Features:** Study of salient landform processes and features, soil, water, flora and fauna - Observe the relationship between physical features and land use / land cover - Report writing.
Unit: 3	**Land use and Cropping Pattern:** Collection of G-return data - Observe the land use and cropping pattern in the field - Preparation of land use and cropping pattern maps.
Unit: 4	**Population Characteristics:** Collection of demographic data - Study the spatio-temporal changes of population characteristics - Report writing.
Unit: 5	**Socio-Economic Survey:** Problem identification - Designing of questionnaire and sampling method - Data collection - Tabulation - Statistical Analysis - Report writing.

References:

1. Creswell J., (1994) Research Design: Qualitative and Quantitative Approaches Sage Publications.
2. Electric Power Generation, Transmission, and Distribution. (2018). United States: CRC Press.
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.

Course Outcomes:

On completion of the course the student will able to :

1. *Get a confidence in surveying and mapping*
2. *Prepare field sketches*
3. *Apply statistical techniques to field data.*
4. *Prepare land use and land cover maps.*
5. *Convert survey data to tables*
6. *Analyse and interpretation skills.*
7. *Confident in report writing.*
8. *Serves the foundation to prepare a mini and major projects.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester IV	
Course Code / Title	VAC-II - GEOGRAPHICAL OUTLINE OF CONTINENTS	

Objectives

1. *This course will help the students to get knowledge about the physical, political, economic, social and cultural setup of the continents.*
2. *The course will provide a platform to the students to understand the intra-regional and inter-regional linkages that exist in today's world.*
3. *Understanding the continents is important in order to learn current economic strategies used for global dominance.*
4. *The student will able to understand the role of different countries in the near future*

Unit: 1	**The Continents:** Location & Extent of the continents - Boundaries - Countries & Capitals of all continents - Geopolitics - International Trade - Intercontinental Transportation.
Unit: 2	**Europe:** Physiographic divisions - Drainage- Great Lakes - Major climatic regions - Major crops and distribution - Mineral Distribution - Power resources - Transport types- Population - European Union.
Unit: 3	**North America & South America:** Physical Landscape - Drainage - Climatic Regions - Natural Vegetation - Major crops - Agricultural regions - Important Minerals and its distribution - Major industries - Transport Types.
Unit: 4	**Africa:** Relief Feature - Drainage Patterns - Lakes - Major Crops and Distribution - Natural Vegetation and Animal Life - Minerals and distribution - Transportation - Cultural Regions - Distribution and Density of population - Level of Urbanization.
Unit: 5	**Australia:** Physical Features - Drainage Patterns - Main Producers - Major Vegetation Regions and Type of Animals - Minerals and Power resources - Transportation - Trade: Exports and Imports - Population - Urbanization - Major Cities

Unit: 6 Current Contours: [Not for Examination]

Scandinavian renewable energy-Bicycling in Europe-Urbanisation in the united states-The Rush for Mineral Resources -Land Degradation in North Africa

References:

1. Douglas L .Johnson (2009) World Regional Geography, Tenth edition, Pearson Education Inc, New Jersey.
2. Jones, J. (2011). World Regional Maps Coloring Book: Maps of World Regions, Continents, World Projections, USA and Canada. United States: CreateSpace Independent Publishing Platform.
3. Laborde, E. D. (2013). The World in Outline: A Text-Book of Geography. United Kingdom: Cambridge University Press.
4. Lydia Mihelic Pulsipher (2019), World regional Geography, Eight Edition, WH Freeman & Co.
5. Majid Husain (2015) World Geography, Fifth edition, Rawat Publications, Jaipur.
6. Mapho, A. (2021). Geography and Location Map of World Continents and Countries: The Outline Map of Countries Everyone Should Have for Learning Or Creative Idea to Make the Better World Executive Size. Independently Published.
7. Outline Maps on File. (2007). United States: Facts on File.
8. Rand McNally (2009) Atlas of World Geography,
9. Richard G. Boehm (2005), World Geography, Eight Edition, McGrawHill Publications
10. Simon Adams (1996), Geography of the World, DK Publication

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1. https://populationpyramid.net
2. www.ncbi.nlm.nih.gov
3. www.nrcs.usda.gov
4. www.premierafricanminerals.com
5. www.economicwatch.com

Course Outcomes:

On completion of the course the student will:

1. *Acquire an understanding and appreciation of the geographical location and physical features of the continents*
2. *Learn to read, interpret, and generate maps and other geographic representations for soil, agriculture, natural vegetation and wildlife of these continents.*
3. *Reasoning why the immigrants are establishing more and more communities in America and Australia.*
4. *Analyse the available minerals, power resources and industrial activities of these continents.*
5. *Understand the varied features of transport, trade, population status and urbanization characteristics in different continents.*
6. *Understand characteristics of unique ecosystems and solar power potential in equatorial countries.*
7. *Recognise, evaluate and synthesise various views, arguments and sources of knowledge pertinent to solving environmental and social problems of these continents.*
8. *Investigate specific issues- economic, political, social, cultural, and environmental issues of different continents and their interconnectivity.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester V	
Course Code / Title	GC051 - SETTLEMENT GEOGRAPHY	

Objectives

1. *To understand the history and evolution of settlement.*
2. *To create awareness about the theories and concepts of settlement.*
3. *To identify the categorization of the rural and urban settlements.*
4. *To recommend the emerging technologies like, GIS and Remote sensing applications on settlements.*

Unit: 1	**Introduction:** Definition, Scope, Nature, Relation with Other Branches, Classification of Settlement - Origin and growth of settlements - Basic Concepts: rural and urban settlements - hamlet, village, town, city, metropolis, megalopolis and conurbation.
Unit: 2	**Settlement Systems:** Elements of settlement-spacing and hierarchy of settlements - Rank-size rule - Primate city- Central place theory – Hierarchy of settlements in India - Rural-urban dichotomy.
Unit: 3	**Rural Settlement:** Definition, nature and characteristics - Site, situation, and morphology - Types and Patterns –Factors affecting patterns of rural settlements: physical,economical, social, political and cultural – Village patterns in India . Census of India categories of rural settlements
Unit: 4	**Urban Settlement:** Types of Urban on the basis of Population -Urban morphology: Models of Burgess, Hoyt, Harris, and Ullman - Changing morphology of a city - Functional classification of cities: Schemes of Harris, Nelson, and Ashok Mithras Classification of Indian cities - City-region – Planned city.
Unit: 5	**Social Issues and Recent Trends:** Problem of Urbanization–Solutions-Planning Sustainable Development Towns-Changing Pattern of Rural Land use-Sustainable development of Rural Settlement-Recent trends in settlement geography - Application of Geoinformatics.

Unit: 6 Current Contours: [Not for Examination]

Integrated Rural Development Programme- Self Employment Programme-Problems of Implementation-Remedies

References:

1. Daniel, P. (2002) Geography of Settlement, Rawat Publication, New Delhi.
2. Ghosh, S. (2019) Introduction to Settlement Geography, Orient Black swan Pvt. Ltd., Kolkata.
3. Gottdiener, M., Budd, M. Lehtovuori, P. (2016). Key Concepts in Urban Studies, 2nd ed, Sage.
4. Hill, M., Hill, M. R. (2005). Urban Settlement and Land Use. United Kingdom: Hodder Murray.
5. Mandal, R.B. (2001) Introduction to Rural Settlement, Concept Publishing Company, New Delhi.
6. Navakas, M. C. (2018). Liquid Landscape: Geography and Settlement at the Edge of Early America. United States: University of Pennsylvania Press, Incorporated.
7. Ramachandran R. (1991) Urbanization &Urban System in India –Oxford University Press New Delhi.
8. Siddhartha K.& Mukherjer S. (2000), Cities, Urbanization Urban System (Settlement Geography) – Published Kitab Mahal, Allahabad.
9. Singh, R. Y. (2010) Geography of Settlement, Rawat Publication, Jaipur.
10. Wang, L., Wu, X. (2021). Settlement Spaces: Urban Survival Prospects of China's Special Communities: Empirical Study of Four Types of Representative Community Samples. Singapore: Springer Singapore.

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1. *https://study.com/academy/lesson/human-settlements-definition-functions.html*
2. *https://onlinecourses.nptel.ac.in/noc22_hs116/preview*
3. *https://archive.nptel.ac.in/courses/124/107/124107158/*
4. *https://archive.nptel.ac.in/courses/124/105/124105016/*
5. *https://sustainabledevelopment.un.org/partnership/partners/?id=6227*

Course Outcomes:

On completion of the course the student will:

1. *Acquire the fundamentals of the human settlements.*
2. *Study about the history and the evolution of settlements.*
3. *Deliver the context of rural settlements and their determining factors.*
4. *Describe the different programmes involved in rural and urban development.*
5. *Identify the problems of rural and urban settlement.*
6. *Differentiate the models that influence the morphological structures of the urban area.*
7. *Segregate the functional classifications that are provided by the various functional schemes.*
8. *Recognize the concepts and theories that are involved with settlements and their geographical space.*
9. *Summarize the concepts for development the rural and urban settlements.*
10. *Interpret the GIS applications and their contributions in rural and urban planning.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester V	
Course Code / Title	GC052 - AGRICULTURAL GEOGRAPHY	

Objectives

1. *To familiarise the students with the nature, origin, and development of agriculture and to examine the role of agricultural determinants.*
2. *To discuss the developmental, environmental, technological, productivity and social issues in agricultural sector with special reference to India.*
3. *To enlighten the students with the application of various theories, models and techniques of cropping patterns and productivity.*
4. *To instil basic statistical skills and GIS application in agricultural geography.*

Unit: 1	**Introduction:** Nature, scope, origin, development and spread of agricultural activities – Approaches: regional, systematic, commodity and recent - Determinants of agriculture: Physical and Socio-Economic factors - Gene Centres of agriculture - Whittlessey's classification of Agricultural System.
Unit: 2	**Soil, Landuse, Trade:** structure, classification, erosion, problems and remedies, Laboratory determination of soil: Physical and Chemical properties - Land use classification: USGS, NRSC and Nine-fold classification - Agricultural Statistics, World and Indian Agricultural Organizations and Functions – Agricultural trade: Role of WTO in agricultural trade practices, Impact of Liberalization, Privatization and Globalization on agricultural markets.
Unit: 3	**Models and Techniques**:Von Thunen's, Olof Jonasson's and Sinclair's theory – Techniques: crop combination, crop ranking, crop diversification, crop concentration, agricultural productivity, land suitability and land capability - Role of Geoinformatics and GIS in agricultural research studies.
Unit: 4	**Food Availability and Food Security**: Global pattern of food intake, Food availability, Food mile and Case studies - Food deficit and shortages: causes and methods to alleviate, World food security risk – Hunger and Drought: causes and remedies with case study - Global Food Aid and Agricultural Subsidies - Sustainable Development Goals and Global Agriculture-SDG 1, 2 and 13
Unit: 5	**Emerging Perspectives in Agriculture and Government Initiatives with special reference to India:** Characteristics of Indian Agriculture, Green revolution: history, merits, problems and prospects - White, Blue, Pink, Purple, Grey, Red revolutions - Specific problems in Indian agriculture and their management and planning, Employment in the agricultural sector - Modernization in agriculture: Nutritional and Sustainable Agriculture, Organic farming, Poly house agriculture, Agro processing, Agro-tourism, Agro forestry, Precision farming, IOT based Smart farming, Hydroponics, Soil moisture indicator, Climate Smart Agriculture, Drone and RFID technology - Major crops - Agro-climatic and Agro-ecological regions - Agricultural marketing, Nutritional index - National Agricultural Policy.

Unit: 6 Current Contours: [Not for Examination]

Food Loss and Waste, Returning to Conventional Agriculture, Trans boundary pests and diseases, The future farming technology, Future of Food, Emerging innovations in Agri. Tech, Digital Revolution in Agriculture by Food and Agricultural Organization, Technical glossary.

References

1. Ali, M., (1979). Dynamics of Agricultural Development in India. New Delhi: Concept Publication.
2. Brahma Singh., (2020). Precision Farming and Protected Cultivation, New India Publishing Agency-Nipa.
3. Chandra Shekhar Prasad., (2012). Agriculture and Sustainable development in India, New Century Publications.
4. Grigg, D., (1995). An Introduction to Agricultural Geography. London: Routledge.
5. Husain, M., (2020). Agricultural Geography, 2nd Edition, Rawat Publications, New Delhi.
6. Leslie Symons., (2019). Agricultural geography, https://www.amazon.in/Agricultural-Geography-Leslie-Symons-ebook/dp/B08QYKXJRT (Kindle Version).
7. Shafi, M., (2006). Agricultural Geography, Doring Kindersley India Pvt. Ltd., New Delhi.
8. Singh.J and Dhillon, S.S., (2000), Agricultural Geography, Tata Mcgrow – Hill Publishing company Ltd., New Delhi.
9. Symons, L., (1970). Agricultural Geography. London: G. Bell and Sons Ltd.
10. Vaidya, B. C., (1997). Agricultural Land use in India. New Delhi: Manak Publications.

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1. http://www.nrcs.usda.gov/detail/soils/use/worldsoils/ (Soil)
2. https://www.google.co.in/search?q=global+pattern+of+food+intake+map (Global pattern food intake)
3. http://foodsecurityindex.eiu.com (Food Security)
4. http://www.globalissues.org/article/food-aid (Food Aid)
5. http://www.sustainabletable.org/sustainable-agriculture (Sustainable Agriculture)

Course Outcomes

On completion of the course the student will:

1. *Describe and explain spatial variations in agricultural activity over the earth's surface.*
2. *Record the historical perspective of agriculture and its determinants.*
3. *Relate the overview of World and Indian agricultural regions, systems and revolutions, and recent strategies.*
4. *Recognize and restate the diverse sources of knowledge, arguments and approaches pertinent to exploring the agricultural issues and challenges.*
5. *Interpret a sustainable approach towards the agricultural ecosystem with a view to conserve and maintain agricultural practices.*
6. *Analyse the agriculture development, productivity and its impacts on various sectors, with special reference to India.*
7. *Compose the Research skills including scientific report writing, conducting surveys, problem solving, data analysis and project work.*
8. *Revise knowledge, skills and holistic understanding of this discipline that encourages scientific mode of enquiry among the students.*
9. *Appraise the Food security, Sustainable agriculture and Agricultural policies in India.*
10. *Estimate the score of SDG in connection with agricultural development in India and Tamil Nadu.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester V	
Course Code / Title	GC053 - GEOGRAPHY OF ASIA	

Objectives

1. *The Geography of Asia Course enables students to understand the peculiarities of Asian continent with its diverse physical and cultural landscape.*
2. *The physical, political, economic, social and cultural set up of Asia will provide an opportunity for students to evaluate and assess the intra as well as inter linkages and differences within the continent.*
3. *Activities based on Atlas reading and mapping enhances the cognitive skill of the students in memorizing the location of Asia.*

Unit: 1	**Physical Landscape:** Geographical Setting and Situation of Asia – Strategic importance of its location; Asia as a continent of contrast – Physiographic divisions, Drainage, Climate: Characteristics and Major Climatic Regions of Asia; Major Vegetation Types and distribution; Faunal Wealth of Asia and its distribution.
Unit: 2	**Soil and Agriculture:** Soil: Types and Distribution, Characteristics and Problems; Agricultural Determinants – Major Crops and Distribution, Agricultural Regions of Asia, Problems and Prospects of Asian Agricultural System, Scope and Current Status of Sustainable Agriculture with Case Studies.
Unit: 3	**Population and Recent Issues:** Population: Distribution, Types of Population Pyramids relevant in Asia; Cultural Framework: Languages; Race, Ethnicity and Religions, Settlement Pattern, Social and Cultural Issues in Asia. Urbanization: Current Status and Problems.
Unit: 4	**Industries, Mineral, Transport and trade:** Location and Distribution of major minerals; Power Resources -Renewable and Non–Renewable: Types, Distribution and Utilization; Major Industries: Location, Distribution; Transport: Major Types: Distribution and Utilization; Trade: Asia's role in the global economy, Major Exports and Imports, Problems and Prospects in Asian Trade.
Unit: 5	**Environment and Issues:** Major Biodiversity spots in Asia-Challenges to Biodiversity-Climate Change- Disaster Occurrences and Preparedness.

Unit: 6 Current Contours: [Not for Examination]

Historical evolution of Asia and its regions, Persistent Poverty and Regional Backwardness, Geopolitics of Asia, Ethnic and Religious Conflicts, Population Policies, Asia in Future.

References:

1. *Cressey, George B, (1951), Asia's Lands and Peoples, McGraw Hill, New York.*
2. *Douglas L. J., (2009) World Regional Geography, 10th Edition, Pearson Education, Inc., New Jersey.*
3. *Geography of the World: The Essential Family Guide to Geography and Culture (2006), DK Children, UK.*
4. *Husain M. &. Tasawwur Husain Zaidi., (2022) Indian and World Geography, 6th Edition, McGraw Hill Education (India), Noida.*
5. *Hussain M., (2015) World Geography, 5th Edition, Rawat Publications, Jaipur*
6. *Norton Ginsburg (1964), The pattern of Asia, Prentice-Hall, US*
7. *Ranjit Tirtha., (2006) Geography of Asia, Rawat Publications, New Delhi.*
8. *L. Dudley Stamp (1967), Asia: A Regional Economic Geography, Methuen young books, London.*
9. *Susan Mayhew and Anne Penny (1992) The Concise Oxford Dictionary of Geography (Oxford*

Reference S.), Oxford Paperbacks, UK.

10. *Thomas A. Rumney (2010) Geography of South East Asia: A Scholarly Bibliography, University Press of America, India.*
11. *Chaturbhuj Memoria (2022) Geography of Asia 1 Edition, SBPD Publishing House,India*

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1. *https://www.britannica.com/place/Asia*
2. *https://education.nationalgeographic.org/resource/asia/*
3. *http://www.mapsopensource.com/asia-political-map.html(PoliticalfactsofAsia)*
4. *http://www.mapsofworld.com/physical-map/asia.htm(PhysicalofAsia)*
5. *http://www.asiafastfacts.com/asiaclimate.html(ClimateofAsia)*

Course Outcomes:

On completion of the course the student will:

1. *Acquire the general picture of the continent that they are part of.*
2. *Infer the key geographic elements of the region.*
3. *State the factors and conditions contributing to the resultant peculiar physical, demographical, economic, social, and cultural characteristics of Asia.*
4. *Allow the students to illustrate the physical basis, resources, and status of Asia in the twenty-first century in the context of present socioeconomic instability.*
5. *Explore the historical facets of Asia through important themes that pose the grin and glory of the continent.*
6. *Understand the contemporary concerns of Asia using reckoning lenses over the geopolitics and transboundary environmental issues.*
7. *Critically examine the concepts and processes that have resulted in Asia being a world region.*
8. *Assessment of the economic, political, social, cultural, and environmental challenges in Asia and their interconnectedness.*
9. *Enlighten the students about the current scenario of Asia in different aspects.*
10. *Recognize the land and the people of the world in general and Asia in particular, with respect to their distinct and diverse characteristics*.

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester V	
Course Code / Title	**GC054 – SURVEYING (P)**	

Objectives

1. *Surveying is a highly specialized technical discipline, which is concerned with the measurement, representation and management of natural and man-made features.*
2. *Since the course involves extensive field measurements, the students can able to understand the basic principles, problems and procedures of surveying in a better manner.*
3. *The hands-on exercises that incorporated in the course will enable them to handle a range of surveying instruments from traditional chains to modern DGPS, GNSS and Total stations.*

Ex. 1	Chain Surveying: Triangulation and Perpendiculation, Open Traverse and Closed Traverse.
Ex. 2	Prismatic Compass Surveying: Measurement of Bearings and Angles, Open Traverse and Closed Traverse, Bowditch's method for correcting closing error.
Ex. 3	Plane Table Surveying: Radiation, Intersection, Traversing and Resection Methods.
Ex. 4	Determination of Height using Indian Pattern Clinometer: Accessible and Inaccessible method.
Ex. 5	Measurement of Slope using Abney Level: Accessible and Inaccessible method.
Ex. 6	Dumpy Level Surveying: Rise and Fall Method, Collimation Method.
Ex. 7	Laser Meter Surveying: Distance, Area and Volume Measurement.
Ex. 8	Handheld Global Navigation Satellite System Surveying
Ex. 9	Differential Global Positioning System Surveying and Post processing
Ex. 10	Total Station Surveying: Remote Elevation Measurement (REM), Remote Distance Measurement (RDM)

References:

1. Adams, H. (2018). Practical Surveying and Elementary Geodesy United States: Creative Media Partners, LLC.
2. Ghilani, C.D. and Wolf, P.R. (2012) Elementary Surveying :An Introduction to Geomatics, 13th ed., Pearson Education, Inc., New Jersey.
3. Pijushkanti Saha, Partha Basu (2014) Advanced Practical Geography,Books and Allied(P) Ltd, Kolkata.
4. Practical Geography - SBPD Publications. (2021). (n.p.): SBPD Publications.
5. Practical Geography: A Systematic Approach. (2015). India: Orient Blackswan.
6. Punmia, B.C., Ashok, J.K. and Arun, K.J. (2005) Surveying-1, Vol. 1, Laxmi Publications, New Delhi.
7. Rampal, K.K (2011) Surveying, PragatiPrakashan, Meerut.
8. Singh, L.R(2009) Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
9. Van Sickle, J. (2001). GPS for Land Surveyors, Third Edition. United Kingdom: Taylor & Francis.
10. Wells, D.E., et al. (1986) Guide to GPS Positioning, Canadian GPS Associates, Canada.

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1. *https://dreamcivil.com/prismatic-compass/*
2. *https://www.brainkart.com/article/Indian-Clinometer-Survey_1197/*
3. *https://www.engineersupply.com/All-About-Laser-Distance-Measuring-Tools.aspx*
4. *https://www.unoosa.org/oosa/en/ourwork/psa/gnss/gnss.html*
5. *https://dreamcivil.com/total-station-in-surveying/*

Course Outcomes:

On completion of the course the student will:

1. *Able to understand various surveying concepts.*
2. *Able to use laser measuring instruments to measure distance area and volume.*
3. *Do Chain, Plane Table and Compass surveys better.*
4. *Measure accessible and in accessible object heights using clinometers.*
5. *Use GPS instruments to measure coordinates and map the features.*
6. *Use GNSS app and find the location of moving object.*
7. *Familiarise with advance instruments like total station.*
8. *Find the height differences of surface using Dumpy Level.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	Semester V	
Course Code / Title	GC055 - BIOGEOGRAPHY	

Objectives

1. *To understand the biologically inhabited parts of the lithosphere, hydrosphere and atmosphere.*
2. *To acknowledge the significance of varied biotic resources as they form the base of human society.*
3. *To familiarise the different methods and approaches of preservation and conservation of biotic communities which are threatened and endangered and are on the verge of extinction.*
4. *To realise the significant roles of a geographer at local, regional and global levels in the plans and projects of wildlife conservation and management.*

Unit: 1	**Introduction:** meaning, definition, nature and scope, branches, approaches, significance, history and development, concepts, relationship with other disciplines - Biogeographical processes: species evolution, production and distribution - Dispersal of Mammals, Birds, Reptiles, Fishes with case studies.
Unit: 2	**Energy flow, Ecology and Ecosystem:** Energy Flow- trophic levels, food chain, food web - Biogeochemical cycle: hydrological cycle, gaseous cycle, global hydrological balance, Ecology: definition, divisions, scope and development, principles, ecological pyramids, ecological niche - Ecosystem: meaning, concept, properties, types, components, biotic and abiotic, lithospheric, atmospheric and water components - Biomes: definition, Whittaker classification of world biomes - Ecotone: Features, examples.
Unit: 3	**Plant and Animal Geography:** Plant Geography- origin and evolution, classification, distribution of forests in the world, floral bio geographical regions, plant extinction and conservation, global case studies, Anthropogenic effects on plants - Climax vegetation: definition, theories - Animal Geography: origin and evolution, classification, distribution of animals in the world, fauna bio geographical regions, animal extinction and conservation, global case studies, Anthropogenic effects on animals.
Unit: 4	**Island and Marine biogeography**: Island Biogeography- definition, characteristics, development, dispersal of plants and animals in islands, theory, island types and conservation - Marine biogeography: definition, development, characteristics, types of ocean habitats: tropical, temperate, coastal, open ocean habitats - classification of marine organisms: on basis of trophic levels and habitats - Corals: formation, characteristics, distribution, examples, threats and conservation.
Unit: 5	**Conservation Biogeography**: Global Habitat Loss, Special reference to India: biodiversity, biodiversity hotspots, biosphere reserves, threats and management projects, conservation measures, social forestry, forest policies, Sustainable development Goals and Biogeography - Goals 13,14, and 15.

Unit: 6 Current Contours: [Not for Examination]

Climate change, Deforestation and habitat loss, Overexploitation, Invasive species, Pollution, Technical glossary.

References:

1. Bhattacharyya, N., (2003). Biogeography, Rajesh Publications, New Delhi.
2. Clarke, G. L., (1967). Elements of ecology, New York: John Wiley Pub.
3. Dash, M.C., (2001). Fundamental of Ecology, 2nd edition, Tata McGraw-Hill, New Delhi
4. Mal, Suraj and Singh, R.B., (Eds.) (2009). Biogeography and Biodiversity, Rawat Publication, Jaipur

5. Mathur, H.S., (1998). Essentials of Biogeography, Anuj Printers, Jaipur.
6. Richard John Huggett,(2004) Fundamentals of Biogeography, Routledge, London and New York.
7. Savindra Singh., (2020). Biogeography, Pravalika Publications.
8. Sharma, P.D., (2011). Ecology and Environment, Rastogi Publications.
9. Sivaperuman, Chandrakasan et al., (2018). Biodiversity and Climate Change Adaptation in Tropical Islands, Academic Press, London.
10. Whittaker, R.H. (1975) Communities and Ecosystems, MacMillan.

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1. online library.wiley.com
2. www.britannica.com
3. www.nature.com
4. https://kge.zcu.pdf
5. www.eci.ox.ac.uk/publications.pdf

Course Outcomes:

On completion of the course the student will:

1. *List the spatial patterns of biological diversity, and its causes, both in the present and in the past.*
2. *Discuss the ecological and historical foundations for understanding the distribution and abundance of species, and their changes over time.*
3. *Interpret the different aspects of floral and faunal provinces.*
4. *Inspect and apply a detailed knowledge of the principles of applied ecology in relation to the management of natural environments.*
5. *Propose an understanding of the historical and pre-historical influences of humans on the environment.*
6. *Assess the way in which the conservation/environmental movement has developed.*
7. *Appraise the implementation of policies for environmental protection.*
8. *Examine critically human impacts on species distributions and modern conservation strategies.*
9. *Revise the present conservation measures suitable for future.*
10. *Measure the score of SDG in relation with Biogeography in India and Tamil Nadu.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester V	
Course Code / Title	GS056 - SOFT SKILLS	

Objectives

1) *This course on soft skills aimed to incorporate and discuss all aspects of generic skills that include the cognitive elements associated with non-academic skills.*
2) *This course enhances the quality human capital and develops their knowledge, understanding, values and skills as well.*
3) *This course develops the student's personality and proves themselves as good Samaritans of the Society.*

Unit: 1	**Soft Skills Manifestations:** Definition and distinction of ability and skills – Types of skills (hard and soft) – Branches of soft skills (humanitarian, attitudinal, ethical, environmental, situational, communication, knowledgeable and career) – Significance of soft skills.
Unit: 2	**Humanitarian Soft Skills:** Human ethical qualities - Personal chemistry – Attitudinal soft skills – Learning and training – Creative and innovativeness – Thinking skills (holistic, creative, critical, analytical and structured) – Conceptual skills – Organizing skills - Time management – Interpersonal skills.
Unit: 3	**Ethical and Environmental Soft Skills:** Definition of ethics – Ethical soft skills (dependability, personal integrity, positive work ethic, valuing education, common sense, presence of mind, being a well-wisher, going along with the world) - Environmental soft skills – Situational soft skills (Problem solving and conflicts) – Mediator qualities – Non-dimensional experience.
Unit: 4	**Communication Soft Skills:** Communication as information transfer – Ways of communication – Requirements for better communication – Domains of communication – Personal space – Communication levels – Listening – Counselling skills –Written communication: types and forms–Digital communication: tools and types – Communication barriers.
Unit: 5	**Personality Development:** Personality types –Leadership: qualities, acquisition and required skills -Self estimation – Self monitoring – Self motivation – Entrepreneurial spirit – Knowledgeable soft skills (knowledge in mathematics, standard procedures, operation and functioning of mechanical machines and electronic devices) – Career soft skills

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

- Use and practise your interpersonal skills - Strong Work Ethic - Etiquette - Work-Life Balance

References:

1. Ciarruchi, J., Forgas, J. and Mayer, J. (2001) Emotional Intelligence in Everyday Life: A Scientific Inquiry, Psychology Press, Philadelphia.
2. DipaliBiswas (2009) Enhancing Soft Skills, Shroff Publishers and Distributors, Bengaluru.
3. Doty, G. (2001). Fostering Emotional Intelligence in K-8 Students, Corwin Press, Thousand Oaks.
4. Gloria, J. G., Katherine A., John, K. and Brian (2004) Effective Group Discussion, Tata McGraw-Hill, New Delhi.
5. Jagadeesan, G. and Santhanakrishnan, R. (2007).Soft Skills Development. ICFAI University Press. New Delhi.
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7. Peggy C. (2007)The Hard Truth about Soft Skills, Harper Collins Publishers, New York.
8. Radhakrishnan, V., R. Mugundhan and R. Kiruthiga (2016).Feeling good.VVP Publishers, Chennai.
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10. Vernon Booth. (2002) Communicating in Science: Writing a Scientific Paper and Speaking at Scientific Meetings, 2nd ed, Cambridge University Press, Cambridge.
11. Dan White (2021) The Soft Skills Book: The key difference to becoming highly effective and valued (Concise Advice), LID Publishing, United Kingdom

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1. *https://virtualspeech.com/blog/importance-soft-skills*
2. *https://zety.com/blog/interpersonal-skills*
3. *https://www.impactfactory.com/resources/the-seven-barriers-to-great-communications/*
4. *https://www.knowledgehut.com/tutorials/project-management/communication-methods*
5. *https://www.artofliving.org/in-en/personality-development*

Course Outcomes

On completion of the course the student will:

1. *Practice the unique qualities of professional rhetoric and writing style, such as sentence conciseness, clarity, accuracy, honesty, avoiding wordiness or ambiguity, using direct order organization, readability, coherence and transitional devices.*
2. *Get knowledge on Recognize, explain, and use the formal elements of specific genres of organizational communication.*
3. *Gain knowledge about biological, social, and environmental determinants of personality*
4. *Understand about the importance of positive personality.*
5. *Able to groom personality and prove as good Samaritans of the Society.*
6. *Understand the ethical, international, social, and professional constraints of audience, style, and content for writing situations.*
7. *Develop professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors and Service Learning contact representatives.*
8. *Understand the standards for legitimate interpretations of research data within scientific and technical communities.*
9. *Enhance and develop their leadership qualities and skills.*
10. *Acquire skill on problem solving and conflict managing in their personal life.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester V	
Course Code / Title	GS059 – SKILL BASED ELECTIVE – PRINCIPLES OF GIS	

Objectives

1) *This course aimed to introduce the basic concepts of GIS and making the students familiar with the spatial data and spatial data creation and organisation.*
2) *This course discusses an overview of various types of GIS data model including devices used to input the data into GIS.*
3) *This course provides exposure to various data input methods, storage and editing.*
4) *This course introduces the concepts of DBMS and entity modelling.*

Unit: 1	**Fundamentals of GIS:** Concepts and terminology - Spatial information: Spatial vs. non-spatial data, Spatial data models – Raster and Vector, Components of GIS, Hardware/software requirements for GIS.
Unit: 2	**Data Structure & Format:** Raster Data & its Representation: Data Structure, Data Compression, Raster file formats, Vector data representation: Data Structure, Non-topological and topological vector data models, non-topological and topological vector file formats, Comparison between Raster & Vector Data
Unit: 3	**Data Input and Geo-Correction:** Sources of Spatial Data, Data Acquisition Through Scanners and Digitizers, Methods of Digitization, Geometric Transformations of Raster and Vector Data. RMS Error, Sources of Errors in spatial data and, Spatial Data Quality: Accuracy, Precision, Error and Uncertainty
Unit: 4	**Database Management System:** Advantage of DBMS in context of GIS, RDBMS: Concepts and specific features, Object Oriented approach to GIS data management, Basic Concepts of Geodatabase, Linkage between spatial and non-spatial data
Unit: 5	**Spatial Data Analysis and Visualization:** Raster Data Analysis Techniques – Local, Focal, Global and Zonal, Vector Data Analysis- Map Manipulation Techniques, Buffering Overlay Analysis, Distance Measurements, Measuring and Mapping Change, Interpolation. Vector and Raster Data Query: Logical Expressions, Geographic Visualization: Socio-economic thematic maps, The dimensions of spatial data: 2D, 2.5D, 3D and 4D GIS, Current Issues and Trends in GIS

Unit: 6 Current Contours: [Not for Examination]

Hydrological modelling - Land-surface process modelling - Environmental information system development - Ecosystem modelling - Risk and hazard modelling - Integrated Modelling - Web GIS - Mobile GIS

References:

1. Bonham-Carter, G. F. (2014). Geographic Information Systems for Geoscientists: Modelling with GIS. United Kingdom: Elsevier Science.
2. Burrough, P. A., Lloyd, C. D., Mcdonnell, R. A. (2015). Principles of Geographical Information Systems. United Kingdom: Oxford University Press.
3. Campbell, J., Burkhart, N., Shin, M. E. (2018). Essentials of Geographic Information Systems. United States: FlatWorld.
4. Chang, K. T., (2006), Introduction to Geographic Information Systems, Tata McGrawHill.
5. Geographic Information Systems and Science. (2019). (n.p.): IntechOpen.
6. Huang, B. (2017). Comprehensive Geographic Information Systems. Netherlands: Elsevier Science.

7. Konecny, G., (2014), Geoinformation: Remote Sensing, Photogrammetry, and Geographic Information Systems (2nd Edition), CRC Press.
8. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W., (2001), Geographic Information Systems and Science, Wiley.
9. McDonnell, R. A., Burrough, P. A., Lloyd, C. D. (2015). Principles of Geographical Information Systems. United Kingdom: OUP Oxford.
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1. *https://www.studocu.com/in/document/anna-university/geographic-information-system/unit-i-notes/17790796*
2. *https://www.researchgate.net/publication/323945547_Fundamentals_of_GIS/figures*
3. *http://www.gdmc.nl/oosterom/PoGISHyperlinked.pdf*
4. *https://siesce.edu.in/docs/resources/Writeups%20for%20QGIS%20_63238.pdf*
5. *https://spyro-soft.com/a-guide-to-geospatial-data-analysis-visualisation-mapping*

Course Outcomes:

On completion of the course the student will be able to::

1. *Understand the nature, components and applications of GIS.*
2. *Develop skills in sourcing, manipulating and interpreting spatial data.*
3. *Critically discuss the applications of GIS in a variety of fields.*
4. *Display knowledge of the multifarious data sources commonly used in GIS.*
5. *Understand the importance of data modelling in the storage of such data.*
6. *Appreciate the functionality of the ArcGIS software, including basic expertise in analysis, classification, query and integration of vector and raster data and its visualisation.*
7. *Apply appropriate cartographic principles in the construction of maps.*
8. *Perform spatial analysis tasks and generate outputs using GIS software.*
9. *Understand and explain the concepts of DBMS and entity modelling.*
10. *Discusses about various types of GIS data model and their applications.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester VI	
Course Code / Title	**GC061 - SOCIAL AND CULTURAL GEOGRAPHY**	

Objectives

1. *The Objectives of this course are to familiarize the students with the understanding of the society and culture through concepts and theories.*
2. *The course describes diversity of cultures and the relationship between cultures and pattern of living and economic development.*
3. *The students would also be able to identify the issues / problems confronting various social and cultural groups in the world as well as in India.*

Unit: 1	**Social Geography:** Nature, scope and recent trends of social geography – Approaches to social geography – Social geography in the realm of social sciences - Elements of social geography: ethnicity, tribe, dialect, language, religion and caste
Unit: 2	**Space and Society:** Concept of social space - Material space - Theories on origin of society - Social structure and Social processes - Geographical bases of social formation -Social differentiation and region formation -Social change - Patterns and bases of rural and urban society
Unit: 3	**Social Well-being:** Concepts of social well-being -Physical quality of life - Human development - Measurement of human development: social, economic and environmental indicators - Social geographies of inclusion and exclusion
Unit: 4	**Cultural Geography:** Nature and scope of cultural geography -Traditions of cultural geography- Components of culture - Cultural landscape - Cultural Hearth, Cultural diffusion and acculturation - Cultural realms and cultural regions - Bases of cultural diversity - Globalization and cultural change
Unit: 5	**Socio-Cultural Patterns of India:** Evolution of socio-cultural regions of India -Indian unity and diversity -Tribal formation - Linguistic heterogeneity - Communal and religious configuration - Social-transformation and changes in India

Unit: 6 Current Contours: [Not for Examination]

Globalization and cultural change – heritage – importance of tribal culture, Role of Technological changes in Cultural Development - Current social issues

References:

1. Aijazuddin Ahmad (2012), Social Geography of India –Concept Publishing Company Pvt Ltd, New Delhi.
2. Aijizuddin Ahmed (2007) Social Geography Rawat Publication Jaipur.
3. Casino V. J. D., Jr., (2009) Social Geography: A Critical Introduction, Wiley Blackwell.
4. Cater J. and Jones T., (2000) Social Geography: An Introduction to Contemporary Issues, Hodder Arnold
5. David Atkinson (2007) Cultural Geography Rawat Publication Jaipur.
6. G.s. mohanty (2005) Social and Cultural Geography- Isha books.
7. Panelli R., (2004): Social Geographies: From Difference to Action, Sage.
8. Rachel P., Burke M., Fuller D., Gough J., Macfarlane R. and Mowl G., (2001): Introducing Social Geographies, Oxford University Press

9. Smith S. J., Pain R., Marston S. A., Jones J. P., (2009): The SAGE Handbook of Social Geographies, Sage Publications.
10. Valentine G., (2001): Social Geographies: Space and Society, Prentice Hall
11. Sen Jyortirmoy, (2016), A Textbook of Social and Cultural Geography, Kalyani Publishers; 3rd edition,India
12. S.D. Maurya (2022), Cultural Geography, Sharda Pustak Bhawan, Publication,India

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1. *https://rashidfaridi.com/2018/02/06/social-geography-conceptoriginnature-and scope/*
2. *https://www.nios.ac.in/media/documents/331courseE/L26%20INDIAN%20SOCIETY%20TRIBAL%20RURAL%20AND%20URBAN.pdf*
3. *https://www.jstor.org/stable/2787065*
4. *https://lotusarise.com/cultural-region-of-the-world-upsc/*
5. *https://lotusarise.com/cultural-regions-of-india-geography-upsc/*

Course Outcomes:

On completion of the course the student will:

1. *Understand the nature, scope, and concept, relationship between culture and social environment.*
2. *Examine the cultural complex and traits of culture and its concepts.*
3. *Evaluate to civilization and various cultural development and cultural system according to religion, language and geography, and global cultural changes.*
4. *Understand various theories related to origin of society and pattern of rural and urban society.*
5. *Get broad knowledge in core concepts and approaches in social geography.*
6. *Understand and analysis about social relations, cultural identity and social inequality.*
7. *Develop skills of constructive criticism and analysis and apply these to mainstream issues within social and cultural geography.*
8. *Enhance knowledge in history of our society, traditions, culture and present conditions.*
9. *Develop skills to analyse the social problems in the society and can find a real time solutions.*
10. *Find and evaluate various social problems and conduct research on these topics.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester VI	
Course Code / Title	**GC062 - POLITICAL GEOGRAPHY**	

Objectives

1. *To familiarize the essential concept of the subject.*
2. *To understand the impressions of states and nations.*
3. *To identify the significance of theories and their prominence in political power.*
4. *To create awareness of emerging political challenges and their impact on the economic crisis.*

Unit: 1	**Introduction:** Meaning, nature and scope of political geography – Recent trends in political geography – Approaches to political geography - Major traditions in political geography- Relevance of political geography in international relations.
Unit: 2	**States and Nations:** Concepts of Nations – State and Nations – Types of Nation -Elements of the State - Shape, Size of States, Territory and Sovereignty - Frontiers and boundaries - Unitary States and federal States - Forms of governance - Nationalism and national building.
Unit: 3	**Geopolitics:** Development of geopolitics - Global strategic views: Heartland theory, Rimland theory, Organic theory and Domino theory – Sea power: Geopolitical significance of the Indian Ocean - Recent trends in Geopolitics: Meta-geopolitics.
Unit: 4	**Electoral Geography:** History of electoral studies - Geography of voting and representation - Geographic influences on voting pattern - Voting system in India: Factors affecting voting systems - Electoral distortion and bias: Gerrymandering and Malapportionment - Electoral mapping.
Unit: 5	**Political Realm of India:** Governance system in India – Changing Political maps of India - Emergence of new states - Unity and Diversity: Centripetal and centrifugal forces - Interstate issues - Federal India - Political relation of India - Geo-political problems of Border States.

Unit: 6 Current Contours: [Not for Examination]

Brexit UK Leaving the EU - Political Geography of Resource Conflicts: Russia –Ukraine war – Water Sharing Disputes: Cauvery and other inter-state issues, Disputes and Conflicts Related to Forest Rights and Minerals - Politics of Displacement: Issues of relief, compensation and rehabilitation: with reference to Dams and Special Economic Zones.

References:

1. Adhikari, S. (2019), Political Geography, Rawat Publication, New Delhi.
2. Agnew J. (2002), Making Political Geography, Arnold.
3. Agnew J., Mitchell K. and Toal G.(2003), A Companion to Political Geography, Blackwell.
4. Cox K. R., Low M. and Robinson J. (2008), the Sage Handbook of Political Geography, Sage Publications.
5. Sudeepth (2013), Political Geography of India –Sharda Pustak Bhawan Allahabad.
6. Mellor, R. E. H. (2015), Nation, State and Territory: A Political Geography. United Kingdom: Taylor & Francis.
7. Painter J. and Jeffrey A. (2009), Political Geography, Sage Publications.
8. Sudeepta Adhikari (2007) Political Geography –Rawat Publication New Delhi.

9. Smith, S. (2020). Political Geography: A Critical Introduction. United Kingdom: Wiley. Mathur H M and M M Cernea (eds.) Development,
10. The Structure of Political Geography. (2017). United Kingdom: Taylor & Francis.

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2. https://www.thehindu.com/news/national/karnataka/inter-state-water-disputes-act-creating-more-disputes-than-resolving-them-karnataka-cm/article38281912.ece
3. https://timesofindia.indiatimes.com/world/europe/russia-ukraine-war-nov-10-2022/liveblog/95414270.cms
4. https://www.bbc.com/news/world-europe-63578919
5. https://www.nytimes.com/news-event/ukraine-russia

Course Outcomes:

On completion of the course the student will:

1. *Understand the outline of the concern course.*
2. *Describe the modern trends and approaches of the subject.*
3. *Discuss about the internal political issues of the India*
4. *Differentiate the boundaries, frontiers and their characteristics.*
5. *Interpret the concepts of nation, state and their classes based on size, shape, and Sovereignty.*
6. *Explain the various theories and their involvement in the political powers of countries in the world.*
7. *Analyse the significance of the elections and their interrelationship with spatial arrangements.*
8. *Categorize the Electoral distortion and bias based on the different theories like gerrymandering.*
9. *Explain the governing systems and political disputes of the Indian subcontinent.*
10. *Recognize the political problems of the border states of India.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester VI	
Course Code / Title	**GC063 - GEOGRAPHY OF INDIA**	

Objectives

1. *To gain knowledge about resource distributions in India, particularly from the physical, environmental and human perspectives.*
2. *To get exposed to demographic, economic, social and cultural attributes of the country.*
3. *To develop an insight into different aspects of India's regional vitality towards unity, stability and progress.*
4. *To inculcate a tolerant mindset and attitude towards the vast socio-cultural diversity of India and showing an awareness and responsibility for the environment and India.*

Unit: 1	**Physical Landscape:** Location: Setting and situation, strategic importance, India and geopolitics of the Indian ocean, Geographical Features: Physiographic divisions, Drainage, Rainwater harvesting, National Water Grid, Interstate water disputes, International agreements for surface water resources, National Water Policy, Climate: Seasons, Koppen's, Venkatraman and Krishnan classification of climatic regions, El Nino, Indian monsoon, Drought and Flood with case studies, Natural vegetation: Floristic regions, classification of Indian forests by H.G.Champion and Seth, forest products and their utility, problems, policies, Biosphere reserves and Wildlife conservation
Unit: 2	**Soil, Agriculture- Developments and Techniques:** Soil: types, characteristics, problems, conservation, Agriculture: salient features, determinants, irrigation, major crops and their distribution, Agricultural regions, problems and remedies, Developments- Green, white, blue, red, grey, pink and purple revolution, aquaculture, sericulture, horticulture, poultry farming, dry farming and agribusiness, Techniques- Artificial Intelligence, Block Chain, Precision Agriculture, Vertical Farming, Digital Livestock farming, Soil and water sensor, Urban farming, Hydroponics, RFID, National agricultural policy, Agro tourism Agro-climatic and Agro-ecological regions.
Unit: 3	**Minerals and Industries:** Minerals: classification, 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, Industries: determinants, policies, distribution of major industries, industrial regions, problems, multinational corporations and its impact on environmental issues.
Unit: 4	**Transport, Trade and Tourism:** Transport: Road, railways, waterways and airways, Communication: postal, telecommunication, print media and Information technology, Trade: major exports and imports, trading partners, international trade policies, Tourism: types, problems, eco- tourism.
Unit: 5	**Population, Urbanization and Contemporary issues:** Population: Distribution, growth, population pyramid, impact of population growth on economy, other problems, policies, Indian Diaspora, Urbanization: Introduction, classification, city region and planning, problems, Refugees, Contemporary issues (with case studies): Natural hazards, earthquake, volcanoes, landslides, cyclone, tsunami, epidemics, human hazards – pollution and types, environmental degradation: increasing greenhouse gases, acidification, ozone depletion, disposal of waste, soil erosion, salinization, deforestation and desertification, cross border terrorism, India's role in world affairs, International boundaries of India and its disputes, contribution towards Sustainable Development Goals- 11,12 and 13.

Unit: 6 Current Contours: [Not for Examination]

Social issues, Increasing equality, Population explosion and future, Effectiveness of trade policies, Water crisis and Management, Sustainable development of resources, Technical glossary.

References:

1. Aher, A. B, Chaudhari, A. P & Chaudhari Archana, (2015). Regional Geography of India, Prashant Publication Jalgaon.
2. Anjaria, J. S., and McFarlane, C. (eds.), 2011. Urban navigations: Politics, space and the city in South Asia, Routledge.
3. Chopra J.K., (2010). Geography of India, Unique Publisher, New Delhi.
4. Douglas L. Johnson, (2009). World Regional Geography, Tenth edition, Pearson Education Inc, New Jersey.
5. Kapur, Anu. 2002. Indian Geography: Voice of Concern, Concept Publishing Co.
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1. https://journalsofindia.com/geopolitics-of-indian-ocean-ii/ (Geo-Politics of Indian Ocean)
2. http://www.thealternative.in/business/10-technological-innovations-revolutionizing-indian-agriculture/ (Modern techniques in Agriculture)
3. http://www.biologydiscussion.com/forest/loss-of-forest-cover-and-land-degradation-in-jhum-in-indias-north-east-a-case-study/1932 (Forest cover and land degradation)
4. http://link.springer.com/article/10.1007/BF00046277(Soil erosion case study)
5. https://www.niti.gov.in/verticals/sustainable-dev-goals (Sustainable Development Goals)

Course Outcomes:

On completion of the course the student will:

1. *Understand the impacts of globalization over the profile of the country.*
2. *Inculcate a tolerant mindset and attitude towards the vast socio-cultural diversity of India by analysing and discussing contemporary concepts through interpretation of natural and planning regions.*
3. *Identify the spatial variations of dimensions of vitality and fragility and to address the issues and concerns needed for planning.*
4. *Encourage the scientific mode of thinking and scientific method of enquiry in students and contextualize much of their further learnings, teaching and research on India.*
5. *Realize that the physical environment, resource endowment, human societies and local and/or global economic systems are integrated to the principles of sustainable development, of the country.*
6. *Develop a greater competence in using geographical knowledge, approaches, concepts, models, theories and geographical skills in analysing and interpreting different data sources, which will enrich their locational knowledge and spatial and environmental understanding about India.*
7. *Appreciate the unique regional dimensions of India, and its relationships with regional and global processes.*
8. *Debate the role and impact of globalization in India.*
9. *Evaluate diverse sources of knowledge, arguments and approaches pertinent in exploring environment problems in India.*
10. *Estimate the score of India in achieving the SDG.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VI	
Course Code / Title	**GC064 - MAP INTERPRETATION**	

Objectives

1. *To know about different type of toposheet and its characteristics.*
2. *To inculcate knowledge about cartographical principles and techniques in map interpretation.*
3. *To extract features from the toposheet.*
4. *To differentiate the map features in non-identical toposheet.*

Ex. I	Appreciation of SOI Toposheet
Ex. II	Appreciation of NATMO Maps
Ex. III	Appreciation of Census Atlas of India
Ex. IV	Appreciation of NBSS&LUP Maps
Ex. V	Appreciation of Resource Atlas of Tamil Nadu
Ex. VI	Appreciation of GSI Maps
Ex. VII	Appreciation of Naval Hydro graphic Charts
Ex. VIII	Interpretation of SOI 1:2, 50,000 Sheets
Ex. IX	Interpretation of SOI 1” to 1 Mile Sheets
Ex. X	Interpretation of SOI 1:50,000 Sheets
Ex. XI	Interpretation of SOI 1:25,000 Sheets
Ex. XII	Interpretation of SOI OSM Sheets
Ex. XIII	Interpretation of USGS Topographic Maps
Ex. XIV	Interpretation of Ordnance Survey Sheets

Unit: 6 Current Contours: [Not for Examination]

Open source map and economic planning-Web maps and its uses-Ground truth verification-GNSS survey.

References:

1. Aikins, E. K. (2015). Elements of Surveying, Map Reading and Map Interpretation - EBook. (n.p.): Kendall Hunt Publishing Company.
2. Gopal Singh (1998) Map Work and Practical Geography (4th Edition), Vikas Publishing House, Ahmedabad.
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4. King, C. A.M (1966) Techniques in Geomorphology, Edward Arnold, London.
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9. Singh, R.L. and Singh, R. P. B. (2009) Elements of Practical Geography, Kalyani Publishers, New Delhi.
10. Tyner, J. A. (2014). The World of Maps: Map Reading and Interpretation for the 21st Century. United Kingdom: Guilford Publications.

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2. http://www.cteresource.org/attachments/anr/forestry/lesson05.pdf
3. https://www.norfolk.gov.uk/-/media/norfolk/downloads/.../map-reading-guide.pdf
4. https://www.guilford.com/excerpts/tyner3.pdf
5. https://www.surveyofindia.gov.in/

Course Outcomes:

On completion of the course the student will:

1. *Gain knowledge about maps published by various countries.*
2. *Acquire the significance of the toposheets on research activities.*
3. *Learn appreciation of various maps.*
4. *Obtain the importance of the utilisation maps like NBSS&LUP Maps.*
5. *Identify the map features.*
6. *Segregate the map features from the different types of maps.*
7. *Differentiate the types of toposheets.*
8. *Demonstrate the different scale of toposheet.*
9. *Categorise the sources of the toposheet and other utilisation maps.*
10. *Interpret the map features.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester VI	
Course Code / Title	GS065 - SKILL BASED ELECTIVE QGIS & SagaGIS	

Objectives

1) *GIS is becoming an increasingly important tool in natural resource management and spatial analysis.*
2) *The course will aid 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.*

Ex No: I	Georeferencing
Ex No: II	Creating Geodatabase
Ex No: III	Digitizing Features
Ex No: IV	Data Import and Export
Ex No: V	Attribute Join & Attribute Queries
Ex No: VI	Data Visualization and Layout
Ex No: VII	Image Registration and Image Classification
Ex No: VIII	Geostatistical Analyses – Krigging, Spline
Ex No: IX	Terrain Analysis – Slope, Aspect, Hill Shade
Ex No: X	DEM & TIN Processing

Current Contours: Not for Examination Only for Discussion

QGIS, SagaGIS

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 Information Systems. 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. *Find the important of Open source technology in GIS and various options available in its implementation.*
2. *Understand various Concepts and protocols used in Open Source GIS.*
3. *Know Functionalities of Open Source GIS software in Desktop.*
4. *Explain Functionalities of Open Source GIS in Web based environments.*
5. *Find out the availability of various Open Source GIS software and their architecture.*
6. *Use a range of open source and cloud-based GIS software.*
7. *Able to create a spatial database.*
8. *Get knowledge about Publish a web mapping service.*
9. *Able to covert the data in spatial analysis*
10. *Understand the composition of maps*

Programme	M.SC GEOGRAPHY (FIVE-YEAR INTEGRATED PROGRAMME	Credit: 02
	Semester VI	
Course Code/Title	VAC – III – Water Quality Analysis	

Objectives:

1. *To build fundamental knowledge and skill to sampling and analysis water.*
2. *To improve working ability to handle various instruments in water quality analytical laboratory.*

Unit 1	**Sample Collection***: Groundwater - Surface water*
Unit 2	**Physical Parameter***: – Colour – Odor – Turbidity*
Unit 3	**Chemical *Parameter***: Major Cation (potassium, calcium, sodium and magnesium) - Major Anions (Bicarbonate, chloride, sulfate) pH - Electrical Conductivity - Total Dissolved Solids etc.,
Unit 4	**Analytical Instruments:** pH & TDS – EC meter - Spectro photometer - Flame photometer - Turbidity meter - Probs.
Unit 5	**Plotting of graphs**: Piper Trilinear – Wilcox - Gibb's diagram - Bivariate plot

Current Contours (For continuous internal assessment only)

ICPMS - Atomic Absorption Spectrophotometer (AAS)– WHO and BIS Standards.

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. Lyon, J.G (2003) GIS for Water Resources and Watershed Management. Taylor and Francis, New York.
4. Sensors in Water Pollutants Monitoring: Role of Material. (2019). Germany: Springer Singapore.
5. Todd, D.K. (2011). Ground water Hydrology, Wiley India Edition, New Delhi (3rd Edition).

Web sources:

1. *https://www.epa.gov/waterqualitysurveillance/online-water-quality-monitoring-resources*
2. *https://www.cdc.gov/healthywater/drinking/public/water_sources.html*
3. *http://cgwb.gov.in/wqreports.html*
4. *https://jalshakti-ddws.gov.in/*
5. *https://www.who.int/news-room/fact-sheets/detail/drinking-water*

Course Outcomes:

On the completion of the course the student will:

1. *Gain insight into key concepts of water quality, water quality and health, impairment of natural water bodies.*
2. *Comprehend components of water treatment and schemes based on source of water, select suitable unit process and unit operation at conceptual, theoretical, methodical level.*
3. *Comprehend components of wastewater treatment and schemes based on input water quality and desired water quality*
4. *Develop an integrated perspective on water resources and water quality management.*
5. *Interpret the analytical results and graphs*
6. *Gain knowledge about the guidelines of WHO and BIS standards*
7. *Learn to appreciate the drinking and irrigation water quality*
8. *Familiar to handle different types of analytical instruments*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VII	
Course Code / Title	**GC071 - GEOMORPHOLOGY**	

Objectives

1) *Students will learn about the mechanism and working principle underlying in the present earth-surface.*
2) *Students will acquire Field demonstration on process-form relationship help in concretizing ideas.*
3) *Learners will acquire knowledge on how landforms were developed and the processes involved.*

Unit: 1	**Geomorphology:** 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 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	**Applied Geomorphology:** 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. Kale, V. and Gupta, A. (2018): Introduction to Geomorphology, Orient Black Swan.
7. Singh, S., (2019): Geomorphology, Pravalika Publications
8. Strahler, A. H. and Strahler, A N., (2001): Modern Physical Geography (4/E), John Wiley and Sons,
9. Summerfield M.A., (2013): Global Geomorphology, Routledge.
10. Thornbury, W.D. (2004): Principles of Geomorphology, (Indian Reprint), John Wiley, New Delhi 20.
11. Wooldridge, S.W. and Morgan, R.S. (1991): An Outline of Geomorphology, Orient Longmans, Calcutta.
12. Bruce L. Rhoads.(2020) River Dynamics: Geomorphology to Support Management, Cambridge University Press,UK

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 the contemporary development in Geomorphology*
6. *Gain an in-depth knowledge on the influence of various types of rocks on the development and evolution of the landforms;*
7. *Discussing the erosional and depositional activities of wind, and giving examples of the resulting erosional and depositional features.*
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 remote sensing, GIS, and GPS to geomorphic processes*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VII	
Course Code / Title	GC072 - 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 and orient the students towards interdisciplinary perspectives on population issues at different geographical scales.*
4) *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. Chandna, B.C., (2012). Geography of Population, Kalyani Publishers, Ludhiana.
3. Debjani Roy., (2015). Population Geography, Books and Allied Private Limited, Kolkata.
4. Dyson, T., (2010). Population and Development: The Demographic Transition, London: Zed Books.
5. Ehrlich, P.R. and Ehrlich, A.H., (1996). Ecoscience: Population, Resources, Environment. 6th edition, W.H. Freeman and Company, San Francisco.
6. Gould, W.T.S., (2009). Population and Development, London: Routledge.
7. James, K.S., (2011). India's demographic change: opportunities and challenges. Science 333 (6042), 576-580.
8. May, J.F., (2012). World population policies: their origin, evolution, and impact, Washington DC: Springer.
9. Mohammad Izhar Hassan. (2020). Population Geography-A systematic Exposition, Routledge India Publications.
10. 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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VII	
Course Code / Title	GC073 - 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 educates some analytical procedures; include graphical presentation of data, descriptive statistics, sampling theory, and inferential statistics.*
3) *This course acquires 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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VII	
Course Code / Title	**GC074- 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

Web sources

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, graphic, 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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VII	
Course Code / Title	**GC074 - GEOHYDROLOGY**	

Objectives

1) *To understand the fundamentals concepts of groundwater concepts for its storage movement governing laws with field and laboratory estimation of hydraulic properties.*
2) *To learn flow of water porous medium its governing equations and estimation of aquifer parameters with various types of pumping tests in tube wells and open wells.*
3) *To learn various ground water management techniques such as artificial recharge, conjunctive use basin management and control of sea water intrusion.*
4) *To understand the ground water pollution, remediation and modelling 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 Modeling:** 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:

1. Alley, W.M., (1993) Regional Ground Water Quality-VNR, New York
2. Davies, S.N. & De Wiest, R.J.M., (1966), Hydrogeology-John Wiley
3. Fetter, C.W. (2005). Applied Hydrogeology, CBS Publishers & Distributors, New Delhi.
4. Freeze, R.A. & Cherry, J.A., (1979) Ground Water-Prentice Hall
5. Karanth, K.R., (1987) Groundwater Assessment-Development And Management-Tata Mcgraw Hall
6. Meinzer.O.E (1962). Hydrology, Dover Publication, New York
7. Todd, D.K. (1959). Ground water Hydrology, Wiley India Edition, New Delhi.

8. Tolman, C.F. (1937). Ground water, McGraw Hill, New York.
9. Younger, P. L. (2009). Groundwater in the Environment: An Introduction. John Wiley & Sons.
10. Hudak,Paul F,(2021) Principles of Hydrogeology, (3rd Edition).CRC Press.

Web sources:

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. *Understand 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 modelling 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. *Gain knowledge about Approaches to planning and development of groundwater resources and methods to evaluate policies and management of India.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VII	
Course Code / Title	GC075 - TECHNIQUES OF MAPPING, ANALYSIS AND IMAGE INTERPRETATION (P)	

Objectives

1) *This course studies the concept of thematic map information used in 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	Hight Measurement from Aerial Photographers using Parallax Box
Ex No: IX	Mapping from Aerial Photography: Geomorphology, Drainage, LULC and Transport
Ex No: X	Marginal Information Satellite Image
Ex No: XI	Mapping from Satellite Image: Geomorphology, Drainage, LULC, Water Resources, Forest Cover etc,
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. Dorling, D. and David Fairbairn (1997), Mapping: Map of representing the world, Addisson Wesley Longman Ltd., U.K.
3. Imagine (2009). Tour Guide Imagine, Leica Geosystem GIS & Mapping, Atlanta.
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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. *Learn various Map Appreciation and interpretation*
2. *Study various crop concentration and Crop combination.*
3. *Know how Quantitative symbolization and Digitization*
4. *Learn various between aerial photographs and satellite imaginary*
5. *Use Pocket Stereoscope measurements from Aerial Photos.*
6. *Interpret Satellite Images and Aerial photos visually and with stereoscope for delineating various landforms and landcover features.*
7. *Use scale and hight measurements from aerial photographs*
8. *Learn various satellites imaginary and produce different thematic maps.*
9. *Understand the concept of stereoscopy and its use to determine height by parallax measurement.*
10. *Learn various comparative toposheet, satellite and aerial thematic map.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VIII	
Course Code / Title	GC081 – 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 modelling the climate, covering both 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 – El-Nino and La-Nina .
Unit: 3	**Climatic Classification:** Empirical and generic climatic classification –Koppen and Thornthwaite – 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.
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7. Lal. D.S., (1998), Climatology, Chatianya Publishing House, Allahabad.
8. Oke T.R., Mills G., Christen A. and Voogy J.A., (2017) Urban Climates, Cambridge University Press, Cambridge.
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Web sources:

1. https://pressbooks.umn.edu/environmentalbiology/chapter/composition-and-structure-of-the-atmosphere/
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. *Learners 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. *Know something of the way various human activities are increasing emissions of the natural greenhouse gases.*
4. *Aware of the difficulties involved in the detection of any unusual global warming and background noise of natural variability.*
5. *Understand that although a growing scientific consensus has become established through the IPCC, for the climate.*
6. *Understand the mean global atmospheric circulations and disturbances, world climate systems, climatic variability and change.*
7. *Learn the interaction between the atmosphere and the earth's surface.*
8. *Learners associate climate with other environmental and human issues*
9. *Gain knowledge about impacts and adaptation measure of urban climatic conditions.*
10. *Establish relationship between different impacts of climate change for satellite data analysis*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VIII	
Course Code / Title	GC082 – GEOGRAPHICAL THOUGHT	

Objectives

1) *To study the history and philosophy of geography and sub-disciplines*
2) *To know the contributors and the evolution of geography through time*
3) *To understand contemporary research in human and physical geography*

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-2
4. Freeman. R (1970): Hundred year of Geography, Hutchinson. London.
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8. Harvey, David (1969): Explanation in Geography, Arnold. London:
9. Hussain. M (2015): Evolution of Geographical Thought. Rawat Publications
10. Sudeepta Adhikari (2015): Fundamentals of Geographical Thought, Orient black swan private limited
11. Wayne, Davis K.D. (1972) Conceptual Revolution in Geography, University of London press, London.
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. *Able to think critically about different schools of geographical thought.*
2. *Evaluate theoretical concepts from geography and elsewhere; and be able to demonstrate an understanding of the dynamic and contested nature of the discipline.*
3. *Learn traditions and modern trend in Geography*
4. *Analyse the Quantitative revolution*
5. *Quantitative revolution with geographical planning*
6. *Qualitative revolution views Geographical development*
7. *Applied geography role in research fields*
8. *Modern geography and innovative work.*
9. *Demonstrate geographical issues from a Third World perspective*
10. *Demonstrate the inclusive nature of 21st century geographical discourses*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VIII	
Course Code / Title	**GC083 – 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. Harrison J., Galland D., Tewdwr-Jones M. (2021) , Planning Regional Future, Routledge.
3. Hu, R., (2021), Smart Design Disruption, Crisis, and the Reshaping of Urban Spaces, 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.
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9. Sundaram, K, V (1977) Decentralised Multi level planning- Principles and Practice, Concept Publishing Company, Delhi.
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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. *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 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. *Critically assess 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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VIII	
Course Code / Title	GC083 - 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.).
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4. Blewitt, J. 2017. Understanding Sustainable Development 3rd ed, Routledge.
5. Browne, S. 2017. Sustainable Development Goals and UN Goal-Setting, Routledge.
6. Elliott, J. 2012. An Introduction to Sustainable Development, 4th ed, Routledge.
7. Robert Brinkmann., (2022). Practical Sustainability. Kindle E-Book.
8. Roling, N.G., & Wageruters, M.A.E.,(ed.) (1998). Facilitating Sustainable Agriculture, Cambridge: CambridgeUniversity Press.
9. Singh, R. B. (Ed.). (2001). Urban Sustainability in the Context of Global Change: towards promoting healthyand green cities. Science Pub Incorporated.
10. Singh, R.B., (ed.) 1990. Environmental Geography, Heritage Pub., New Delhi.

Web sources

- https://sdgs.un.org/goals
- https://www.epa.gov/sustainable-management-food
- https://www.ingwb.com/
- https://www.globalgoals.org/
- *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 that focuses 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 globalization in terms of sustainability.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester VIII	
Course Code / Title	**GC084 – 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	Scanning 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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6. Paul Gibson, and Clare H. Power, (2000). Introductory Remote Sensing: Digital Processing and Applications, Routledge Publisher, London.

7. Richards, J. A. and Jia Xiuping (2005). Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag, Berlin.
8. Schabenberger, O., Gotway, C. A. (2017). Statistical Methods for Spatial Data Analysis. United States: CRC Press.
9. Verbyla, D. L. (2002). Practical GIS Analysis. United Kingdom: Taylor & Francis.
10. Gotway, C. A., Schabenberger, O. (2017). Statistical Methods for Spatial Data Analysis. United States: CRC Press.

Web Sources:

- https://www.packtpub.com/product/practical-gis/9781787123328
- https://www.oreilly.com/library/view/practical-gis/9781787123328/
- https://www.coursera.org/specializations/gis-mapping-spatial-analysis
- *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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester VIII	
Course Code / Title	GS087 - 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.

References:

1. Creswell J., 1994: Research Design: Qualitative and Quantitative Approaches Sage Publications. Dikshit, R. D. 2003.
2. Evans M., 1988: ―Participant Observation: The Researcher as Research Tool‖ in Qualitative Methods in Human Geography, eds. J. Eyles and D. Smith, Polity.
3. Geographical Fieldwork in the 21st Century. (2021). United Kingdom: Taylor & Francis.
4. Maity, S. K. (2021). Essential Graphical Techniques in Geography. Singapore: Springer Singapore.
5. Mukherjee, Neela 2002. Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi
6. 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.
7. Rogerson, P. A. (2019). Statistical Methods for Geography: A Student's Guide. United Kingdom: SAGE Publications.
8. Stoddard R. H., 1982: Field Techniques and Research Methods in Geography, Kendall/Hunt.
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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.*
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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester VIII	
Course Code / Title	VAC- IV – OPEN-SOURCE GIS	

Objectives

1) *GIS is becoming an increasingly important tool in natural resource management and spatial analysis.*
2) *The course will aid 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 shapefiles - Digitizing and editing vector data - Adding attribute data - Joining tables - Labelling.
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.
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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,
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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. *Find the important of Open source technology in GIS and various options available in its implementation.*
2. *Understand various Concepts and protocols used in Open Source GIS.*
3. *Know Functionalities of Open Source GIS software in Desktop.*
4. *Explain Functionalities of Open Source GIS in Web based environments.*
5. *Find out the availability of various Open Source GIS software and their architecture.*
6. *Use a range of open source and cloud-based GIS software.*
7. *Able to create a spatial database.*
8. *Get knowledge about Publish a web mapping service.*
9. *Able to covert the data in spatial analysis*
10. *Understand the composition of maps*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IX	
Course Code / Title	GC091- WATERSHED STUDIES	

Objectives

1) *The students acquire knowledge about hydrologic cycle, precipitation its measurement and analysis along with its abstractions*
2) *To understand the fundamentals concepts of watershed characteristics and management strategies*
3) *To understand water resource estimation, evaluation, and modelling*
4) *To understand the 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- land use/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 Modelling:** 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. Lynn E Johnson (2009) Geographic Information systems in water resources engineering, Taylor and Francis Group, New York.
4. Lyon, J.G (2003) GIS for Water Resources and Watershed Management. Taylor and Francis, New York.
5. Misra. H.N. (Ed.) (2014, Managing Natural resources Focus on Land and water, Prentice Hall.
6. Murthy, V.V. N., (1994), Land and Water Management, Kalyani Publishers
7. Sharad K. Jain, V.P Singh (2003) Water Resources Systems Planning and Management, Elsevier B.V, Netherlands.
8. Strahler, A. H., (1991), Modern physical geography, John Wiley & Sons
9. Todd, D.K (1989) Groundwater Hydrology, John Wiley Sons, New Delhi
10. Younger, P. L. (2009). Groundwater in The Environment: An Introduction. John Wiley & Sons.
11. Hudak,Paul F,(2021) Principles of Hydrogeology, (3rd Edition).CRC Press.

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 abstractions to rainfall, infiltration, evaporation and transpiration along with their estimation and derivation of unit hydrograph from hydrograph.*
2. *Interpret hydrological and rainfall dispersion graphs and diagrams.*
3. *Gain knowledge about Approaches to planning and development of water resources and methods to evaluate surface water resources and groundwater, policies and management.*
4. *Acquire knowledge about disasters and its management, conservation of water and climate change and its impact on water resources.*
5. *Learn about different of GIS for surface water modelling, groundwater modeling, and flood plain mapping.*
6. *Identify the importance of Remote sensing and GIS in various applications like water resources, drought assessment, flood plain zoning etc*
7. *Understand the assessment of Basin and its hydrology using Geospatial technology.*
8. *Get exposure to the Groundwater and Watershed Management aspects of GIS*
9. *Realize the importance of water conservation*
10. *Get skilled by GIS methods to interlink different water projects*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IX	
Course Code / Title	**GC092 - URBAN GEOGRAPHY**	

Objectives

1) *To provide an overview and theoretical framework of urban geography*
2) *To learn the internal spatial structure and landscapes of cities*
3) *To analyze patterns of land use, racial and ethnic segregation, economic restructuring, gentrification, and new urbanism. Comparative models of internal city and structure of the cities*

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, Mann, 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 – Urban 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. A Textbook Of Urban Planning And Geography. (2020). (n.p.: PHI Learning Pvt. Ltd..
2. Barrett, H., Hall, T. (2018). Urban Geography. United Kingdom: Routledge.
3. Carter.H. (1972) the study of Urban Geography, Edward Arnold, London.
4. David Kaplan, James O. Wheeler, and Steven Holloway, (2014) Urban
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. Richa Mehta (2014) Population geography, Srishti book distributors, New Delhi.
10. 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. *Understand the functions, sizes, and spatial arrangements of urban areas*
2. *Know about differing characteristics of urban settlement in cities*
3. *Analyze the internal structure and shape of cities*
4. *Analyze the evolving forms of present-day urban area*
5. *Identify and analyze the problems of housing, slums and civic amenities*
6. *Understand the patterns and trends of urbanization in India*
7. *Understand how to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.*
8. *Realize the importance and utility of a geographic perspective.*
9. *Use computers and other electronic tools in support of learning activities in urban geography.*
10. *Understand the 5 themes of geography: location, place, region, interaction, & and movement as they relate to the internal spatial structure of cities.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IX	
Course Code / Title	GC093- 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 hoteling 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 Bombay.
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. *Understand about the industrial geography, its nature, scope, and different study methods.*
2. *Know the location of different industries and theories of industrial location.*
3. *Acquire knowledge to explain about major industrial region of the world.*
4. *Examine the transportation systems, network, measurement of accessibility, its hierarchies, hinterlands, models of network changes, gravity models.*
5. *Learn about importance of modern transport systems.*
6. *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 triad*
10. *Map and interpret data matrix measures: accessibility and shortest-path matrix, transport network and flows*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IX	
Course Code / Title	GC093 - 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. *Able to gain knowledge on Concept of spatial organization, Physical and relative space, Location and distance.*
2. *Able to gain knowledge on analysis of point entity including distribution and density, Centrography, Near neighbourhood and reflexive neighbours.*
3. *Able to gain knowledge on mapping density analysis (Isometry, Dissymmetry) and also point buffers.*
4. *Able to gain knowledge on analysis of line entity includes network topology, connectivity analysis, shortest path and total connectivity analysis.*
5. *Learn to choose the suitable type of technique based on application*
6. *Gain knowledge on detour index and allocation assignment and accessibility and buffers.*
7. *Gain knowledge on analysis of area entity / surface, Index of concentration and diversification and interpolation techniques.*
8. *Gain knowledge on trend surface analysis (TSA), gravity potential model, and spatial portioning and thiession polygon.*
9. *Gain knowledge on 3D and 4D modelling.*
10. *Enable to choose appropriate entities to represent their data in the map and are capable of choosing appropriate analysis tools for their study..*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:04
	Semester IX	
Course Code / Title	GC094 – 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.

Web Sources

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. *Able to morphometric analysis and prioritization of sub-watersheds are carried out*
10. *Able to layout use in arc gis*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	Semester IX	
Course Code / Title	GE096 – SKILL BASED ELECTIVE- SUMMER INTERNSHIP	

Objectives

1) *The study provides knowledge to the students about the various GPS survey*
2) *The students can able to understand the basic principles, problems and procedures of 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*

I. The students assigned to take a small task to do data collection and mapping around his / her village

II. He / She may visit the field during the week days or summer vacation and prepare a report of 15 pages and submit for evaluation.

III. The task may be completed with use of 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. GPS for Land Surveyors, 3rd Edition, Jan Van Sickle
3. Hofmann-Wellenhof, B., H. Lichtenegger, and J. Collins. *GPS Theory and Practice*. Springer, 1994. ISBN: 9780387824772.
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. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
7. Rampal, K.K (2011)Surveying, PragatiPrakashan, Meerut.
8. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996
9. Satheesh Gopi, rasathishkumar, N.madhu, Advanced Surveying , Total Station GPS and Remote Sensing Pearson education , 2007 isbn: 978-81317 00679.
10. Shivam Pandey (2020), Basic Concept of Remote Sensing, GPS and GIS, Sankalp Publication

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. *Understand 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. *Working principles of total station and GPS instruments*
6. *Propagation of EMR through atmosphere and corrections for its effects*
7. *The functioning various types total station and GPS equipments and their applications*
8. *Various techniques available for surveying and mapping with total station and GPS.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	Semester IX	
Course Code / Title	**VAC -V - ARTIFICIAL INTELIGENCE 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) *Artificial Intelligence A Modern Approach, Stuart Russell & Peter Norvig, 2nd Edition Perason.*
2) *Artificial Intelligence, Elaine Rich and Kelvin Knight, TMH, 2nd Edn, 1991*
3) *Artificial Intelligence, George F Luger, 4th Edition, Pearson, 2002*
4) *Artificial Intelligence,3rd edition, Henry Winston., pearson Edition*
5) *Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007*
6) *Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2002*
7) *Foundations of Artificial Intelligent and Expert Systems, V S Janaki Raman, K Sarukesi, P Gopalakrishnan, MacMillan India limited.*
8) *Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008*
9) *M.Tim jones(2008)-Artificial Intelligence: A System Approaches(computer science),Jones and Bartlett publishers Inc,; First Edition*
10) *Russell/Norvig (2022), Artifical Intelligence: A Modern Approach | Fourth Edition| By Pearson*
11) *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.,*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester X	
Course Code / Title	GC0101 - 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:** Introduction - 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 Research Methodology (2013) Second Revised Edition, New Age international (p) Ltd., Piblication. New Delhi.418 P
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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 a 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. *Strengthen their ability to write academic papers, essays and summaries using the process approach*
10. *Heighten their awareness of correct usage of English grammar in writing and speaking*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester X	
Course Code / Title	GC0102 - 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.
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6. Govt. of India (2011) Disaster Management in India. Ministry of Home Affairs, New Delhi.
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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. *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. *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. *Know about causes and an effect of Drought and Desertification, GIS based management strategies and also GIS case studies for drought and desertification.*
6. *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. *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. *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. *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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester X	
Course Code / Title	GCEIB –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. IGI Global (2019) Geospatial Intelligence: Concepts, Methodologies, Tools, and Applications. United states
5. Karl Kraus (2007) Photogrammetry – Geometry from Images and Laser Scans, Walter de Gruyter, Berlin.
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7. Olague, G. (2016). Evolutionary Computer Vision: The First Footprints. Germany: Springer Berlin Heidelberg.
8. Wilfried Linder (2003) Digital Photogrammetry: Theory and Applications, Springer – Verlag, Berlin Heidelberg.
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11. Zhilin Li, Jun Chen, Emmanuel Baltsavias (2008) Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences, CRC Press, Taylor & Francis Group, London, UK.

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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. *Acquire knowledge on the Development of Digital Photogrammetry, its Software and Hardware components.*
2. *Able to understand the concepts of Stereo image analysis includes interior orientation, exterior orientation and aerial triangulation.*
3. *Extract data from aerial photography*
4. *Able to know about DEM, DSM, DTM and Contour Extraction and edition and also Ortho Rectification.*
5. *Able to get knowledge on 2D and 3D feature extraction.*
6. *Obtain knowledge on image acquisition systems, CCD, Laser's planning and processing and its applications.*
7. *Know about 3D visualization and large-scale mapping.*
8. *Able to know about Photogrammetric Modelling.*
9. *Know about Photogrammetric Modelling applications in Infrastructure Mapping, Forensic, Archaeology and Disaster.*
10. *Deal with 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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:05
	Semester X	
Course Code / Title	GP102- Dissertation and Viva Voce	
DISSERTATION AND VIVA VOCE		

Elective Course List

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**OCEANOGRAPHY**	

Objectives

1) *To know the bottom relief features and, using the hypsometric curve, interpret relief features.*
2) *To recognize the salinity and temperature depends on the density of ocean water.*
3) *To identify the ocean currents' influence on weather conditions in the ocean.*
4) *To construct a strong curiosity about new events in oceanic research*

Unit: 1	**Oceanography:** Definition- scope-Importance of ocean – Major branches of oceanography-Development of oceanography: Satellite oceanography
Unit: 2	**Bottom morphology of ocean**: Hypsometric curve – continental shelf, continental slope, submarine canyons – Diastrophic theory- relief of Atlantic, Pacific and Indian Ocean.
Unit: 3	**Salinity and temperature:** Surface temperature- factors affecting the horizontal distribution – salinity-factors cause salinity-Distribution.
Unit: 4	**Ocean Currents and Marine deposits**: Currents of North and South Atlantic-Pacific Ocean currents – Indian Ocean currents-Classification of marine sediments – Distribution of pelagic sediments.
Unit: 5	**Coral Reef and Tides:** Distribution of coral reefs – types of coral reefs – Darwin's subsidence theory-tides – types-tide producing forces-theory of ocean tides: equilibrium theory.

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

- Monitoring Ocean Health "DNA Soup"- Deep Ocean Warming As Climate Changes Sentinel-6: International Sea Level Satellite- Hawaiian Corals, Resilience – Advanced Underwater Mapping Technology.

References:

1. Christopherson, R. W. and Birkeland, G. H., (2012) Geosystems: An Introduction to Physical Geography (8th edition), Pearson Education, New Jersey.
2. Joseph, W. S., & Parish, H. I. (1974). Introductory Oceanography, Tokyo: McGraw Hill.
3. Lal, D. S., (2019), Oceanography, PrayagPustakBhavan, Allahabad .
4. Lal, D. S., (2019), Physical Geography, PrayagPustakBhavan, Allahabad .
5. Majid Husain (Rep.2020), Fundamentals of Physical Geography.
6. Pinet, P. R. (2019). Invitation to Oceanography. Boston: Jones and Bartlett Publishers.
7. SAVINDRA SINGH, (2022), Oceanography and Climatology.
8. Stowe, K. S. (1979). Ocean Science, New York: John Wiley and Sons.
9. Strahler, A. H. and Strahler, A N., (2001) Modern Physical Geography (4/E), John Wiley and Sons, Inc., New York
10. Thurman, H. V., & Trujillo, A. P. (1997). Introductory Oceanography, New Jersey: Prentice Hall.

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2. https://www.insightsonindia.com/world-geography/physical-geography-of-the-world/oceanography/bottom-relief-features/bottom-reliefs-of-the-pacific-ocean/
3. https://www.insightsonindia.com/world-geography/physical-geography-of-the-

world/oceanography/bottom-relief-features/bottom-reliefs-of-the-indian-ocean/

4. https://www.yourarticlelibrary.com/geography/oceanography/ocean-bottom-relief-with-the-floors-of-the-three-majors-oceans-of-the-world/32197
5. https://oceanexplorer.noaa.gov/news/oceanexplorationnews/

Course Outcomes:

On completion of the course the student will:

1. *Learn the essentials of oceans and their significance.*
2. *Deliver ocean morphology and differentiate the distributions of relief features around the ocean.*
3. *Identify the salinity and temperature and their latitudinal and distributional patterns as the causes of the weather conditions.*
4. *Identify the ocean currents locations and its impact on climate change.*
5. *Categorize the marine deposits, and their distributions of ocean floors.*
6. *Differentiate between the currents and their impacts on climatic extremes like floods and droughts.*
7. *Recognize the genesis theories of coral reefs, their types, and distribution.*
8. *Distinguish the coral reef characteristics, significance and their distributions.*
9. *Appraise the theories of tides, and their applicability.*
10. *Explore the latest technologies and their usage in oceanography*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:02
	ELECTIVE	
Course Code / Title	**GEOINFORMATICS**	

Objectives

1) *The major objectives of this course are to introduce the basic concepts of Geoinformatics.*
2) *The course would discuss about components and applications of Geoinformatics.*
3) *The working principles of GIS and GNSS will be discussed in this course.*

Unit: 1	**Introduction:** The realm of Geoinformatics – Development of Geoinformatics - Emerging trends - Multidisciplinary nature – Spatial information and importance – DBMS - Applications of Geoinformatics
Unit: 2	**Basics of Remote Sensing**: Types of Remote Sensing - Interaction of EMR with the atmosphere and the earth surface - Aerial photographs and Types. Photogrammetry - Visual interpretation: Equipment's - Elements of image interpretation.
Unit: 3	**Satellite Remote Sensing:** Types of remote sensor and platforms - Types of resolution - Active and passive remote sensing - Introduction to panchromatic, multispectral and hyperspectral data - Earth observation satellites and Applications.
Unit: 4	**Geographical Information System:** Definition – Development of GIS Technology - Components of GIS – Raster and vector data structures - RDBMS - Spatial referencing - Spatial data input and editing - GIS analysis – Web GIS - Applications.
Unit: 5	**Global Navigation Satellite System:** Segments: space segment - GPS Satellite systems – New programmes – IRNSS - Control segment - Satellite tracking - User segment – Modern survey instruments – Error sources – Satellite augmented systems - DGPS - GNSS Applications.

Unit: 6 Current Contours: [Not for Examination]

Mobile mapping-location based services-Google API. GeoAI, Real-time GIS, Machine learning.

References:

1. Agarwal, N. K., (2006). Essentials of GPS, Geodesy and GPS publications, Hyderabad.
2. Anand P.H and Rajesh Kumar V, (2003) Principles of Remote Sensing and GIS Sri Venkateswara Publishers,Kumbakonam.
3. Burrough, P. A., & McDonnell, R., (2000). Principles of Geographical Information Systems, Oxford Press, London.
4. Chandra, A. M. (2017). Geoinformatics. India: New Academic Science.
5. Claudia, K., Stefan, D., 2014. Quantitative Remote Sensing in Thermal Infrared, 11, Springer.
6. Gomarasca, M. A. (2009) Basics of Geometrics, Springer Science, New York
7. Gupta, R. K. (2014). Principles Of Geoinformatics. India: Jain Brothers.
8. Lillisand T.M and R.W. Kiefer (1994) Remote Sensing and Image Interpretation. John Wiley & Sons, New York.
9. Noel Lane (2022) Geoinformatics: Methods and Applications. United States: Callisto Reference.
10. Peter Atkinson (2009) Geoinformatics - Volume I. United Kingdom: EOLSS Publications.

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1. *https://www.esri.com/en-us/what-is-gis/history-of-gis*
2. *https://photographycourse.net/types-of-aerial-photography/*
3. *https://www.mlsu.ac.in/econtents/1290_TYPES%20OF%20PLATFORMS%20AND%20SENSORS.pdf*
4. *https://www.unoosa.org/oosa/en/ourwork/psa/gnss/gnss.html*
5. *https://www.ursc.gov.in/navigation/irnss.jsp*

Course Outcomes:

At the conclusion of the course the successful student will be able to:

1. *Understand the concepts and applications of GIS and GNSS.*
2. *Acquire knowledge to collect, analyse, store, manipulate and display the spatial data.*
3. *Explain the concepts of remote sensing and image processing techniques.*
4. *Understand and able to solve the real time problems using GIS.*
5. *Enhances the knowledge on image pre-processing and image enhancement.*
6. *Familiarize with the working principles of DGPS.*
7. *Manage sustainably the natural resources with the help of Geoinformatics.*
8. *Attain the knowledge for studying present and future scenario of various natural phenomenons.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**SOIL GEOGRAPHY**	

Objectives

1. *The aim of the course is to introduce the students to soil which is one of the important elements of the earth which supports the life system.*
2. *The overuse and misuse of soil in recent years have resulted in degradation of soil.*
3. *Study of soil will help the students to appreciate the inherent limitations of soil to a particular use and managing the soil effectiveness.*

Unit: 1	**Soil Geography**: Nature, scope and significance of Soil Geography - Soil Geography relationship with Pedology - Soil forming factors: parent material, organic, climatic, topographic Spatio-temporal dimensions - Processes of soil formation and soil development: physical, biotic and chemical.
Unit: 2	**Soil Profile:** Development; Soil catena, pedogenic regimes; podzolization, laterisation, calcification and gleezation - Soil organisms, macro-animals (earthworms, sowbugs, mites, centipedes, rodents and insects), Micro-animals and plants - Nematodes, Protozoa rotifers; fungi, bacteria, algae and actinomyces.
Unit: 3	**Physical properties of soils:** morphology, texture, structure, water, air, temperature and other properties of soil - Chemical properties of soil and soil reaction - Genetic classification of soils - Taxonomic classification of soils zonal, azonal and intra-zonal soils, their characteristics and world patterns - Methods to improve the physical qualities of soils; seventh approximation - Soil erosion, degradation and conservation.
Unit: 4	**Evaluation of land and soil:** Parametric and non-parametric systems - Land capability classification, Soil survey, modern techniques - field study of soil profile and their characteristics.
Unit: 5	**Soil reclamation and management:** soil survey and landforms in environmental management - Integrated soil and water management - Sustainable development of soil resources with reference to India.

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

- Micro-pedology, micro-morphology of soils and sediments; mineralogical composition; thin sections of soil; soil functioning in different land-use systems, weathering manifestations using optical and electronic microscopy and microanalysis; technogenic catastrophes through extreme situations in soils; geo-archeological micro-pedology for the imprints of paleo- environments; biota interactions

References:

1. Bunting, B.T. (1973): The Geography of Soils, Hutchinson, London.
2. Foth H.D. and Turk, L.M. (1972): Fundamentals of Soil science, John Wiley, New York.
3. Global Soil Map - Digital Soil Mapping from Country to Globe: Proceedings of the Global Soil Map 2017
4. Kutílek, Miroslav, Nielsen, Donald R, Soil - The Skin of the Planet Earth, Springer Netherlands, VII - 239, 2015. Doi: 10.1007/978-94-017-9789-4
5. Mc. Bride, M.B(1999): Environmental Chemistry of Soils, Oxford University Press, New York .
6. Pidwirny M. (2017) Understanding Physical Geography, Our Planet Earth Publishing.
7. Rathinasamy, A et. al (2017)Fundamentals of Soil Science, Scientific Publishers,

8. Savalia S.G. (1972): Textbook of Soil Survey and Land Use Planning, Neoti Book Agency.
9. U.S. Department of Agriculture, Soil Survey Manual (2017), Create Space Independent Publishing Platform.
10. Wolfgang Zech, Peter Schad, Gerd Hintermaier-Erhard (2022), Soils of the World, Springer Nature
11. Young. A. (2000), Land Resources: Now and for the Future, Cambridge University Press. Cambridge.

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2. *http://www.eolss.net/sample-chapters/c01/e6-14-02-05.pdf*
3. *https://cdn1.byjus.com/wp-content/uploads/2020/02/Classification-of-Soil-in-India-Geography-Notes-for-UPSC1.pdf*
4. *http://www2.alterra.wur.nl/Internet/webdocs/ilri-publicaties/publicaties/Pub27/pub27-h3.pdf*
5. *https://link.springer.com/article/10.1007/s11368-018-1940-4*

Course Outcomes:

On completion of the course the student will:

1. *Understand about Importance of soil in food Production.*
2. *Study the soil forming process.*
3. *Understand Chemical and physical properties of soil.*
4. *Know soil types of India.*
5. *Understand food Security and soil quality.*
6. *Six essential nutrient elements in soil and describe how they affect soil fertility*
7. *How soil water and air are interrelated, and how they area affected by other soil physical properties*
8. *Erosion control methods (i.e. windbreaks, crop rotation, drainage, etc.)*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**GEOGRAPHY OF TAMILNADU**	

Objectives

1. *Tamil Nadu is the located in the southern part of India, with diverse physical and cultural landscape.*
2. *Tamil Nadu is one of the fastest growing states in India. It is the home of many natural resources.*
3. *The state continues to grow multidimensionality. This course will help the students to get knowledge about the physical, political, economic, social and cultural setup of Tamil Nadu state.*

Unit: 1	**Physical Landscape:** Setting and situation of Tamilnadu, strategic importance of its location and geo-politics, Physiographic divisions, Drainage: Rainwater harvesting, Interstate water disputes, 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	**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: 5	**Population, Urbanization and Contemporary issues:** Population: Distribution, growth, population pyramid, problems, policies, Settlements: classification, slums and associated problems, problems of urbanization, Refugees with case studies, Contemporary issues with case studies: Natural hazards- earthquake, landslides, cyclone, tsunami, epidemics, Human hazards – pollution and its types, Environmental degradation: increasing greenhouse gases, acidification, disposal of waste, soil erosion, salinization, deforestation and desertification, terrorism, role in world affairs, local disputes.

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*
2. *Poduval R.N (1987) Foodgrain Economy of TamilNadu 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*
5. *Ramesh and P.S. Tiwari (1983) Basic Resource Atlas of TamilNadu, University of Madras Geography 10. (n.d.). India: Ratna Sagar (P) Limited.*
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.*

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2) *www.forests.tn.gov.in/pages/view/tn-forest-types (forests)*
3) *agritech.tnau.ac.in/agriculture/agri_soilgroups.htm (soil and agriculture)*
4) *amingranites.com/ (minerals)*
5) *www.tnmine.tn.nic.in/ (mining)*
6) *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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	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. *Acquaint the students with different modes of transportation and theoretical framework relating to transport costs, hierarchies and accessibility.*
3. *Different transport network indices and matrixes would be discussed*

Unit: 1	**Introduction:** Nature, scope and recent trends of industrial and transport geography - Industrial revolution: economic changes and impact on transportation - Factors associated with the development of industries and transport system -Industrialization, transportation and regional development.
Unit: 2	**Manufacturing Industries**: Manufacturing as an economic activity - Major inputs in industry - Factors affecting location of industries - Theories and models of industrial location - Spatial pattern of major manufacturing industries - Methods of delineating manufacturing regions - Globalization in manufacturing industries -Industrial hazards.
Unit: 3	**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: 4	**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.
Unit: 5	**Urban Transport Systems and Recent Trends:** Urban mobility - Growth of urban transportation -Environmental problems - Transport policy and planning - Transport system in mega cities of India - 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.

References:

1. Alexanderson, C (1967): Geography of Manufacturing, Prentice Hall Bombay.
2. Chauhan, M L & Khandelwal, M K (2005) : Dyeing, Printing and Textile, Ritu Publication, Jaipur.
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 (1972), 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.(2018), Indian And World Geography, Rawat Publication
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/?page_id=150*
2. *https://transportgeography.org/?page_id=481*
3. *http://people.hofstra.edu/geotrans/eng/content.html*

Course Outcomes:

On completion of the course the student will:

1. *Understand study about the industrial geography, its nature, scope, and different study methods.*
2. *Study the locations of industry and their activities primary and secondary and its factors responsible for same.*
3. *Review on world distribution of some industries and selected countries.*
4. *Understand the environmental degradation, industrial hazards and occupational health, manufacturing industry, role and factors affecting on the same.*
5. *Examining the transportation network, measurement of accessibility, its hierarchies, hinterlands, models of network changes, gravity models and transport network and economic development.*
6. *Demonstrate the problems and urban transport with growth of urban transportation in developing courtiers.*
7. *Understand the trading blocks and trading pacts and international trade, its history, factors influencing, and India's foreign trade.*
8. *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.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**NATURAL RESOURCE MANAGEMENT**	

Objectives

1. *to understand concepts and approaches of natural resource management;*
2. *to examine use and misuse of various resources and to analyse future prospects,*
3. *to study various methods and approaches of conservation and management of natural resources,*
4. *to analyse natural resources' scenario through different techniques, especially remote sensing and GIS,*
5. *to understand the concept of sustainable and integrated resource management and its application.*

Unit: 1	**Introduction:** Concept, models and approaches to natural resource management; problems of resource utilization; population pressure, development and resource use; natural hazards and risk management.
Unit: 2	**Use and misuse of Resources**: Global and Indian scenario; historical background and future prospects of various resources; soil, water, minerals, forests..
Unit: 3	**Conservation and management of resources:** Meaning, principles, philosophy and approaches to conservation; resource conservation and management methods.
Unit: 4	**Resource appraisal and policy making:** appraisal of Land resources, geophysical, geochemical, geo-botanical; use of GIS and remote sensing in resource appraisal; institutional arrangements and policy models towards better management and conservation of resources.
Unit: 5	**Resource Development:** Sustainable resource management SDG concept, methods, dimension and sustainable system; integrated resource development and its application..

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

- Soil management techniques: Soil-related nonmaterial; integrated water management; Climate and weather prediction; Manipulation of the rhizosphere; remote sensing of plant physiology.

References:

1) Bunnefeld N. et at.: Decision-Making in Conservation and Natural Resource Management: Models for Interdisciplinary Approaches Volume 22 of Conservation Biology, Cambridge University Press, 2017.
2) Holechek, J.L. et al: Natural Resources: Eulogy Economics & Policy, Prentice Hall, New Jersey, 2000.
3) Kates, R.W. & Burton, I (eds): Geography, Resources and Environment, Vol I & II, University of Chicago Press, Chicago, 1986.
4) Kevin H. Deal (2020) Wildlife and Natural Resource Management 4th Edition, atithibooks, New Delhi
5) Management Association, Information Resources: Natural Resources Management: Concepts, Methodologies, Tools, and Applications: Concepts, Methodologies, Tools, and Applications, IGI Global, 2016.
6) Shivakoti G.: Redefining Diversity and Dynamics of Natural Resources Management in Asia, Volume 1: Sustainable Natural Resources Management in Dynamic Asia, Elsevier, 2016.
7) Sillitoe P.: Indigenous Knowledge: Enhancing its Contribution to Natural Resources Management, CABI, 2017.
8) Singh C.K.: Geospatial Applications for Natural Resources Management, CRC Press, 2018.

9) Thoman, Alan et. al.: Environmental Policies & NGO Influence, Routledge, London, 2001.
10) Tripathi V. K.: Integrated Natural Resource Management: The Way Forward, New Delhi Publishers, 2018.
11) Varshneya M.: Integrated Watershed Approach for Natural Resource Management, Scitus Academics LLC, 2015.

Web Sources

1) Andrews, K., & Wooten, B. (2005). Closing the gap: Helping students identify the skills employers want. National Association of Colleges and Employers Journal, 65(4), 40-43.
2) http://www.nrm.gov.au/news-and-resources/resources/natural-resource-management
3) http://www.nnrms.gov.in
4) https://www.india.gov.in/topics/environment-forest/natural-resources

Course Outcomes:

On completion of the course the student will:

1. *Learn the importance of natural resources and their effective management*
2. *Demonstrate a basic understanding of different tools used in forecasting and planning natural resource needs*
3. *Get Substantial multidisciplinary knowledge about natural resources management related to the research within the specialization*
4. *Acquire knowledge in a specific area based upon research experience from a masters project*
5. *Develop knowledge about various methodological and analytic approaches that are used within the specialization*
6. *Anticipate, analyze and evaluate natural resource issues and opportunities, explaining the ecological, economic, and social consequences of natural resource actions at various scales and over time.*
7. *Demonstrate creativity and innovation in identifying and pursuing opportunities that produce environmental, social, or economic value.*
8. *Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation. Different cultures, population densities, and income classes' value and use natural resources in very different ways.*
9. *Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**TECHNIQUES IN PHYSICAL GEOGRAPHY**	

Objectives

1. *The objective of this course is to provide students with experience and background in a variety of field methods used by physical geographers.*
2. *The course will focus on hands-on field and laboratory techniques for mapping, measurement, sample collection and data analysis in a variety of contexts.*
3. *Regular local and regional field trips will be undertaken, where data will be collected with subsequent lab classes providing instruction on how to analyse and interpret the data.*

Unit: 1	Profile – Definition, Importance and Uses; Methods Drawing of Profile; Types of Profiles – Serial, Superimposed Profile, Types of Profiles – Projected, Composited and Longitudinal Profile; Construction of Land forms through Contour features – Hill, Plateau, George, Escarpment; Construction of Land forms through Contour features – Waterfall, V and U Shaped Valley, Hanging Valley, Cliffs
Unit: 2	Morphometric Analysis (linear features); Morphometric Stream Ordering; Bifurcation Ratio and Drainage Density; Slope Analysis: Meaning, Definition; Smith's Method; Wentworth's Method; Block Diagrams – one point perspective; Block Diagrams – two point perspective; Geological Map Drawing.
Unit: 3	Data Recording, Area Measurement and Specimen Identification - Reading, Recording and Analysis of Data Obtained from Barometer, Hygrometer and Maximum-Minimum Thermometer; Determination of Soil Texture by Feel Method; Soil pH and Organic Carbon by Soil Kit; Measurement of Area by Graphical Method and Planimeter
Unit: 4	Identification of Common Minerals and Rocks with their Characteristics: Quartz, Feldspar, Mica, Haematite, Magnetite, Chalcopyrite, Galena, Calcite, Gypsum, Bauxite, Granite, Basalt, Dolerite, Pegmatite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Phyllite, Quartzite and Marble.
Unit: 5	**Resource Development:** Morphometric Analysis and Interpretation of Topographic Maps: Plateau and Plain Regions - Construction of Profiles: Superimposed, Projected and Composite; Stream Frequency and Drainage Density; Average Slope (Wentworth's method); Interpretation of Relief, Drainage and Vegetation Characteristics; Interpretation of Settlement, Transport and Communication Systems; Relationship between Physical and Cultural Elements

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

- Blockages of jet stream, Serpentinisation mantle rocks, Mantle slab movement.

References:

1. Clifford N., (2016), Key Methods in Geography, SAGE.
2. Conserva H. T (2004), Illustrated Dictionary of Physical Geography, Author House, USA.
3. Garrison E, (2016), Techniques in Archaeological Geology - Natural Science in Archaeology, Springer.
4. Harwel JD, Newson MD. (1973), Techniques in Physical Geography, Mc. Millan Edu. Ltd. London.
5. K.Siddhartha, Dr. S.Mahapatra, S.Mukherjee (2021), Basic Physical geography, Kishalaya Publications New Delhi.
6. Leng S. et al. (2016), The Geographical Sciences During 1986—2015: From the Classics To the Frontiers, Springer.
7. Mishra RP. And Ramesh A (1968) – Fundamentals of Cartography, Prasaranga, University of Mysore, Mysore.
8. Pidwirny M., (2017) Understanding Physical Geography, Our Planet Earth Publishing.
9. Small, R.J, (1985), The Study of Landforms, Mc.Graw Hill, New York,.
10. Wooldrige, S.W., (1956) The Geographer as Scientist. Thomas Nelson and Sons Ltd., London.

Web Sources

1. http://www.surveyofindia.gov.in
2. https://serc.carleton.edu/teachearth/index.html
3. https://www.journals.elsevier.com/applied-geography
4. http://www.nios.ac.in/online-course-material/sr-secondary-courses/Geography-316).aspx

Course Outcomes:

On completion of the course the student will:

1. *Provide experience with a wide range of field work skills used in physical geography and other natural sciences*
2. *Gain experience with data collection with sensors and data loggers*
3. *Extend data analysis and reporting skills and apply error analysis to data*
4. *Develop mapping and presentation approaches used for field data*
5. *Understand the introduction of GIS software's special reference of ILWIS, to examining the types of GIS software and applications, introduction of menu, tools, page layout and setting, scanning image, import of image in the software.*
6. *Study and understand the image registration and its analysis done in software.*
7. *Understand and prepare the topology of point, line and polygon and understand non spatial data analysis.*
8. *Prepare the different kinds of map using GIS software and also creates the profile of relief representation.*
9. *Understand the GPS and its functions, work, types and components for filed survey and make project report using both GPS and GIS software.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**GEOGRAPHY OF AFRICA AND AUSTRALIA**	

Objectives

1. *Understanding Africa matters a lot because of indigenous animal and plant species, vast expanses of land, huge ecosystems that are uniquely found, impact that it can have on the global climate, solar power potential and other natural resources, etc*
2. *Of the seven continents, Australia is the smallest by land mass and the second smallest by population, beaten only by Antarctica which has no permanent residents. While Australia may be small compared to other continents, it is the sixth largest country in the world by land mass.*
3. *This course will help the students to get knowledge about the physical, political, economic, social and cultural setup of these continents.*

Unit: 1	**Political Setting, Physical, Drainage:** Location and Extent, Boundaries, Countries and Capitals**,** Physical: Relief Features, Drainage Patterns, lakes in Africa..
Unit: 2	**Soil, Agriculture, Natural Vegetation and Animal Life:** Soil: Types and Distribution, Agriculture: Major Crops and Distribution, Main Producers, Natural Vegetation and Animal Life: Major Vegetation Regions and Type of Animals.
Unit: 3	**Minerals and Power Resources, Industries: Minerals and Power resources:** major Minerals and distribution, Industries: Major Industries and its distribution.
Unit: 4	**Transportation, Trade:** Transportation: Animal Transport, Roadway, Railway, Airway, Waterways, Trade: Exports and Imports.
Unit: 5	**Population, Urbanization:** Population: Cultural Regions, Distribution and Density of population, Urbanization: Level of Urbanization, Major Cities.

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

- Traditional and Modern Techniques in Agriculture. Limited Green Revolution in Africa -Land Degradation in North Africa - Deforestation in Africa - Drought in Sahel Region - Suez Canal - High Aswan Dam Multipurpose Project - Gender in equality in Sub - Saharan Africa - Ethnic Conflicts in Sudan - urbanization issues in Cairo City - Geography of AIDS - Development Strategies in Africa - Tourism in Africa
- Case studies – Australia: El Nino in Australia - The Rush for Mineral Resources - Great Barrier Reef

References:

1) Burton, R. (1991). Travel Geography. United Kingdom: Pitman.
2) Club, S. a. W. A. (2014). West African Studies An Atlas of the Sahara-Sahel: Geography, Economics and Security. France: OECD Publishing.
3) Club, S. a. W. A. (2020). West African Studies Africa's Urbanisation Dynamics 2020: Africapolis, Mapping a New Urban Geography. France: OECD Publishing.
4) Geography of Greater Britain - India - Canada - Australia - Africa - The West Indies. (2016). United States: WENTWORTH Press.
5) Majid Husain (2009) Geography of India, Tata McGraw hill Education Private Ltd, New Delhi. Douglas L .Johnson (2009) World Regional Geography, Tenth edition, Pearson Education Inc, New Jersey.
6) Majid Husain (2012 and 2015) World Geography, Fourth edition, Rawat Publications, Jaipur.
7) Ofori-Amoah, B. (2019). Africa's Geography: Dynamics of Place, Cultures, and Economies. United Kingdom: Wiley.
8) Powell, J. M., Powell, J. G. F. (1988). An historical geography of modern Australia: the restive fringe. United Kingdom: Cambridge University Press.
9) World Geography: Africa. (2020). United States: Salem Press, Incorporated.
10) World Geography: Australia, Oceania and the Antarctic. (2020). United States: Salem Press, Incorporated.

Web Sources

1) www.gifex.com
2) www.nrcs.usda.gov
3) www.premierafricanminerals.com

Course Outcomes:

On completion of the course the student will:

1. *Acquire an understanding and appreciation of the geographical location and physical features of Africa and Australia.*
2. *Learn to read, interpret, and generate maps and other geographic representations for soil, agriculture, natural vegetation and wild life of these continents.*
3. *Reasoning why the African immigrants are establishing more and more communities in America and Australia.*
4. *Analyse the available minerals, power resources and industrial activities of these continents.*
5. *Understand the varied features of transport, trade, and population status and urbanization characteristics in both the continents.*
6. *Attain knowledge about issues related to green revolution, gender inequality in Africa and Australia.*
7. *Understand characteristics of unique ecosystem and solar power potential in Africa.*
8. *Recognise, evaluate and synthesise various views, arguments and sources of knowledge pertinent to solving environmental and social problems of these continents.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**REMOTE SENSING & GIS**	

Objectives

1. *To introduce the basic concepts of Remote Sensing*
2. *To discuss the image acquisition systems, data collection and processing.*
3. *To discuss the working principles of GIS and GNSS*
4. *To familiarize the concept of spatial data*

Unit: 1	**Introduction:** Definition - Types – Components - historical development - emerging trends - multidisciplinary nature – spatial information – map and scale.
Unit: 2	**Terrestrial and Aerial Remote Sensing:** Basic principles - Elements of EMR - Energy interaction in atmosphere - Terrestrial interaction - Spectral signature – Spectral reflectance curves - Aerial photography - Types of photographs - Aerial triangulation - Photogrammetry - Visual interpretation: Equipment's - Elements of image interpretation
Unit: 3	**Satellite Remote Sensing:** Platforms - Sensors - FOV and IFOV - Pixel - Resolution: spatial - spectral - radiometric - temporal
Unit: 4	**Earth observation satellites**: Weather satellites, land and marine observation satellites - Image preprocessing - Image enhancement – Image classification - Accuracy assessment - Applications
Unit: 5	**Geographical Information System & Global Navigation Satellite System: Definition -** Components of GIS – Raster and vector data structures - RDBMS - Spatial referencing - Spatial data input and editing - GIS analysis – WebGIS

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

- Hydrological modeling - Land-surface process modeling - Environmental information system development - Ecosystem modeling - Risk and hazard modeling - Integrated Modeing - Web GIS - Mobile GIS

References:

1. Heywood, I., Comelius, S., and Carver, S., (1988). An Introduction to Geographical Information Systems, Addison Wiley Longmont, New York.
2. Hofmann W., Lichtenegger, & Wasle, (2008).Global Navigational Satellite Systems, Springer Wien, New York.
3. Jensen, J. R.,(2007). Remote Sensing of the Environment: An Earth Resource Perspective, Prentice-Hall Inc., New Jersey.
4. Konecny, G., (2014), Geoinformation: Remote Sensing, Photogrammetry, and Geographic Information Systems (2nd Edition), CRC Press.
5. Longley, P. A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W., (2005), Geographic Information System and Science (2nd Edition), John Wiley and Sons Ltd.
6. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W., (2001), Geographic Information Systems and Science, Wiley.
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. Shimada, M., (2022), Imaging from Spaceborne and Airborne SARs, Calibration, and Applications (SAR Remote Sensing), CRC Press.

Web Sources

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. *Enable the students to understand the concepts of remote sensing.*
2. *Collect, analyse, store, manipulate and display the spatial data.*
3. *Facilitate to apply the concepts of remote sensing and image processing techniques.*
4. *Enhance the knowledge on different kinds of satellites and sensors.*
5. *Gain ablity to solve the real time problems using remote sensing..*
6. *Enhance the knowledge on image pre-processing and image enhancement.*
7. *Enable the learner to choose the suitable type of remote sensing based on application*
8. *Ability to manage the natural resources sustainably with the help of Remote Sensing.*
9. *Learn the basement for studying present and future scenarios of various natural phenomenons.*
10. *Apply remote sensing techniques to existing issues.*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	TECHNIQUES IN HUMAN GEOGRAPHY	

Objectives

1. *The objectives of this course are to acquaint the students with the techniques in human geography is the first concise guide to the purposeful use of techniques.*
2. *Examining key techniques in detail – survey and qualitative, numerical, spatial and computer based – the course draws on important case studies, such as the decennial census, to illustrate applications.*

Unit: 1	**Introduction to techniques in Human Geography:** Research and project design – Methodology and research, Extensive and intensive research method, Types of error, Research design, Project design; Data generation, analysis, and presentation defining the context for the use of techniques; Handling data: An approach to the classification of data, Qualitative and quantitative data, Types of data, Evaluating data
Unit: 2	**Questionnaires:** Design frameworks and time-scales, Interviewing key individuals, Questionnaires and structured interviews – an introduction, Sampling frames and sample sizes, Designing the questions, Administering the questionnaire, Processing the results, Working in the qualitative tradition, Interviews, Focus groups, Participant observation, Other qualitative techniques, and allied techniques: getting information from people
Unit: 3	**Coming to terms with statistics:** Probability, Samples and populations, Descriptive and inferential statistics, Significance, Probability and the normal distribution, Non-parametric statistics; Statistics in action: The t test for independent samples, The t test for paired samples, The Mann-Whitney U test for independent samples, The Wilcoxon signed-rank test for paired samples, The Chi-square (X2) test for independent samples, Tests of association, Independence and autocorrelation, Statistics and the computer
Unit: 4	**Maps and mapping techniques:** The purpose of mapping, Fundamental concepts – scale, direction, projection, and co-ordinates, Do maps tell the truth?, Maps for purposes, Professional map production, The student as cartographer
Unit: 5	**Using computer applications:** An introduction to the machine, Word-processing, Spreadsheets, Presentation graphics, Computers in the field; Computer mapping: Storing and displaying spatial images, Computer atlases, Do-it-yourself computer maps, Using mapping software, Computer Aided Design and AutoCAD; Geographical Information Systems: The nature of GIS, Types and structures of GIS, The phases of a GIS project.

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

- Using the Internet: The development of the Internet, The Web, Internet of Things, Gophers and Gopherspace, Referencing the Internet, FOSS GIS.

References:

1. Gupta, S.P., (2010), Statistical Methods, Sultan Chand and Sons, Latest Edition.
2. Hammond, R. and McCullagh, P.S, (1974), Quantitative Techniques in Geography: An Introduction, Clarendan Press, Oxford.
3. Hay I., (2005), Qualitative Research Methods in Human Geography, Oxford University Press.
4. Lindsay, James M., (1997), Techniques in Human Geography, Routledge, London and New York.
5. Pergamon. Pal, S.K., (1998), Practical Manual, Oxford.
6. Robin Flowerdew and David M. Martin, (2013), Methods in Human Geography: A guide for students doing a research project, 2nd Edition, Routledge,.
7. Robinson G.M., (1998), Methods and techniques in Human Geography, J. Wiley.
8. Ron Johnston and James D. Sidaway, (2015), Geography and Geographers: Anglo-American human geography since 1945, 7th Edition - revised, Routledge.
9. Serbulo (2021), Urban Literacy, Portland State University Library
10. Statistics for Geoscientists; Techniques and Applications, (1998), Concept Publishing Company Pvt. Ltd., New Delhi.

Web Sources

1. *http://www.geog.le.ac.uk/cti/*
2. *http://www.nene.ac.uk/aps/env/gene.html*
3. *http://www.scit.wlv.ac.uk/ukinfo/uk.map.html*
4. *http://www.lib.utexas.edu: 80/Libs/PCL/Map collection/Map_collection.htm*
5. *http://www.bodley.ox.ac.uk/nnj/mapcase.htm*
6. *http://www.ordsvy.govt.uk/*
7. *http://www.geog.buffalo.edu/GIAL/netgeog.html*

Course Outcomes:

On completion of the course the student will:

1. *Understand the Microsoft Excel, work sheet and learn the basic about the preparation of graphs, maps, in software for Presentation Techniques*
2. *Evaluate and investigation the population date in Microsoft excel software.*
3. *Applied and understand the data analysis techniques for rural and urban settlement and prepare the adequate maps, various graphs.*
4. *Evaluate the Data Analysis Techniques in Agricultural Geography and Climatology*
5. *Understand the various basics statistical Techniques for analysis the geographical data.*
6. *Organize the field work and collect the authentic and appropriate data about selected village and analysed that data help with Microsoft Excel, work sheet and prepare slide and the village report for presentation.*
7. *Independently assess methodological, ethical and practical challenges in research work*
8. *Show a critical approach to relevant knowledge within human geography, including their own academic knowledge and attitudes*

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**C++ PROGRAMMING**	

Objectives

1. *To learn the fundamental programming concepts and methodologies which are essential to building good C/C++ programs*
2. *To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences. Microsoft Visual Studio is the programming environment that will used.*
3. *To design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification.*

Unit: 1	Object oriented program in c++: object oriented programming: principles, characteristics, benefits and applications, structure of c++ programme, simple c++ programme and example with class.
Unit: 2	Token keywords-data type-variable and array- operator-control statements, if-else, else if, nested if, while, do-while, go-to jump continue, for-loop, switch statement.
Unit: 3	Function-function in c-++-types of function-inline function-recursive function-array-one dimensional array-multi dimensional array-class and objects, methods (examples).
Unit: 4	Inheritance-single inheritance-multiple inheritance-multilevel-hybrid inheritance-overloading-string functions in c++.
Unit: 5	Website creating using HTML Dividing the document into 2 parts– Headers tags– Body tags– Paragraphs– Formatting– Elements of an HTML Document– Image tags– HTML Table tags– Lists– Numbered list, Non–Numbered lists, Definition lists– Anchor tag– Hyperlinks – Links with images and buttons– Marquee Behaviour–Forms related tags.

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

- Marquee Behaviour from (left to right, top to bottom), how application linked with Scripting (eg FaceBook, Google search), Computer Graphics code, Geo server.

References:

1. Alexandrescu (2001). Modern C++ Design: Generic Programming and Design Patterns Applied, Pearson Education.
2. Andrew Koenig (2000). Accelerated C++: Practical Programming by Example, Addison-Wesley.
3. Balagurusamy E. (2008). C++ Programming, Tata McGraw–Hill Education.
4. Bjarne Stroustrup (2004). The C++ Programming Language, Pearson Education, New Delhi.
5. Bjarne Stroustrup (2014). Programming Principles and Practice Using C++, Pearson Education.
6. Ira Pohl (2003). Object–Oriented Programming Using C++, Pearson Education, New Delhi.
7. Marc Gregoire, (2021). Professional C++, Wiley, U.S.A
8. Scott Meyers (2014). Effective Modern C++, O'Reilly Media.
9. Stanley B. Lippman and Josee Lajoie (2003). C++ Primer, Pearson Education, New Delhi.
10. Venugopal, K. R., Rajkumar Buyya, and Ravishankar, T. (2003). Mastering C++, TMH, New Delhi.

Web Sources

1. *people.sc.fsu.edu/~jburkardt/cpp_src/cpp/cpp.html*
2. *https://www.w3resource.com/cpp-exercises/basic/index.php*
3. *https://www.guru99.com/cpp-tutorial.html*
4. *https://www.gurobi.com/documentation/8.0/examples/cpp_examples.html*

Course Outcomes:

On completion of the course the student will:

1. Generate an application based upon the concepts of C++& Object oriented Programming.
2. Create and communicate between client and server using Java and create a good, effective and dynamic website
3. Understand, analyze and apply the role languages like HTML, CSS, XML, JavaScript and protocols in the workings of web and web applications
4. To implement the object-oriented modelling and design patterns to provide solutions to the real-world software design problems.
5. Use Unix commands to manage files and develop programs, including multi-module programs
6. Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
7. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
8. Apply the concepts and principles of the programming language to the real-world problems and solve the problems through project-based learning.

Programme	M.SC. GEOGRAPHY (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	DIGITAL IMAGE PROCESSING	

Objectives

1. *To provide more comprehensive instruction in remote sensing, focusing primarily on the analysis and interpretation of satellite imagery to study the environment*
2. *To introduce fundamental technologies for digital image, compression, analysis, and processing. Students will gain understanding of analytical tools and practical implementations of various digital image applications*

Unit: 1	**Introduction to Digital Image Processing:** Remote Sensing Process - Analog to Digital data – Digital image data formats - Image processing system characteristics - Initial statistical extraction: histograms, univariate and multivariate statistics – Scientific visualization – Image Pre-processing: calculating radiance from DNs - atmospheric, radiometric and geometric correction.
Unit: 2	**Image Enhancement:** Contrast enhancement: linear, non-linear and level slicing – Spatial feature enhancement: spatial filtering, edge enhancement and fourier and wavelet transform – Multi-image enhancement – band ratioing, principal component analysis, vegetation indices, IHS and texture transformations and image fusion.
Unit: 3	**Image Classification: Supervised classification:** classification algorithm and training site selection - Unsupervised classification – Hybrid classification – Classification of mixed pixels: spectral mixture analysis and fuzzy classification – Post classification smoothing – Ancillary data - Classification accuracy assessment - Artificial Neural Networks – Contextual Classification - Object-Oriented Classification.
Unit: 4	**Digital Change detection:** LULC system – resolution considerations – environmental characteristics - change detection algorithms –data merging – GIS integration – cartographic modelling.
Unit: 5	**Hyperspectral Image Analysis:** Imaging Spectroscopy - Spectral Libraries – Data Processing techniques: n-Dimensional, scatter plots, spectral angle mapping, and spectral mixture analysis - Wavelet Analysis for Hyperspectral Imagery.

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

- Image Fusion, Filters for SAR processing, Spatial classification: Texture, Context, Segment/Object-based classifications. ANN classification.

References:

1. Campbell, J. B. and Wynne, R.H., (2011). Introduction to Remote Sensing, 5th Edition, The Guilford Press, New York.
2. Domenico Solimini, 2016. Understanding Earth Observation, Springer; 1st Ed.
3. Gibson, P. and Power, C. H., (2000). Introductory Remote Sensing: Digital Image Processing and Applications, Routledge Publisher, London.
4. Gonzalez, R. C. and Woods, R. E., (2007). Digital Image Processing, 3rd Edition, Prentice-Hall Inc. Upper Saddle River, New Jersey..
5. Introduction, 4th Edition, Springer –Verlag, Berlin.
6. Jensen, J. R., (2006). Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc., New Jersey.
7. Jude Hemant (2020). Artificial Intelligence Techniques for Satellite Image Analysis Remote Sensing and Digital Image Processing, Springer, India.
8. Lillisand, T.M., and Kiefer, P.W., (2007). Remote Sensing and Image Interpretation,6th Edition, John Wiley & Sons, New York.
9. Ravi Shankar Dwivedi, 2017, Remote Sensing of Soils, Springer 1st Ed.

Web Sources

1. *http://www.nrcan.gc.ca*
2. *https://www.e-education.psu.edu*
3. *https://swayam.gov.in/course/3723-digital-image-processing-of-remote-sensing-data*
4. *https://www.ncl.ac.uk*
5. *https://www.landcareresearch.co.nz/resources/maps-satellites/remote-sensing-and-image-processing/digital-image-processing*

Course Outcomes:

On completion of the course the student will:

1. *Analyse temporal, spectral and spatial differences of satellite data using image processing software*
2. *Perform image pre-processing and post-processing techniques on a given satellite data*
3. *Classify given satellite data for thematic mapping process*
4. *Acquire skills to carry out the Lab Exercises independently on various Visual and digital Image processing techniques.*
5. *Classify the types and formats of digital satellite data*
6. *Process digital satellite images for retrieving features*
7. *Classify the processed remote sensing data*
8. *Evaluate the accuracy of image classification*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**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	**Mapping Diseases -** 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. 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

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 (FIVE-YEAR INTEGRATED) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**URBAN GIS**	

Objectives

1. *To introduce geographic information systems to students in urban studies*
2. *To learn how GIS is useful for urban analysis, land use analysis, flooding, coastal zone management, urban renewal, transportation planning, and disaster management among others.*
3. *To impart and enhance their analytical skills using GIS analytical tools for presentation, communication and decision making which forms the bedrock of Urban GIS as a profession.*

Unit: 1	Fundamentals -Relevance of Geoinformatics for Urban Planning - Scope and Limitations - Resolution - Characteristics of Settlements - Interpretation from Aerial and Satellite images - Digital Image Processing Techniques - Texture based analysis - Automated Feature extraction.
Unit: 2	Urban Mapping - Urban Area - Physical Structure and Composition - Delimitation of Urban Agglomeration - Urban Pattern Characterisation – Urban Morphology - Land Cover Classification - Urban Head Island - Housing Typology - Use of High-resolution, Hyperspectral Remote Sensing – Radar Remote Sensing for Urban Areas.
Unit: 3	Urban Planning - Classification of Plans - Master and Detailed Development - Objectives and Contents – Census Estimation - Water Demand Analysis - Use of remote sensing and GIS in plan preparation - Urban Information System- and data base management - Urban Solid Waste Management Planning - Utility Planning - case studies.
Unit: 4	Urban Analysis - Urban Growth and Sprawl - Physical Patterns and Forms - Causes and Consequences - Monitoring Urban Growth through Remote Sensing - Analysis of Urban Growth - Geodemographic Analysis – Property Market Analysis Urban Renewal - Land Suitability Analysis - case studies.
Unit: 5	Urban Modeling - Urban Growth Modeling - Planning Support Systems - Urban Environmental Monitoring and Modeling - 3D city Modeling – Case Studies.

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

- Urban Hazard & Risk Assessment - Urban geomorphology for hazard identification; Urban hazards and risk assessment; Multi-hazard risk assessment; Damage assessment due to earthquake, fire and explosion.

References:

1. Geospatial Technology and Smart Cities: ICT, Geoscience Modeling, GIS and Remote Sensing. (2021). Switzerland: Springer International Publishing.
2. Lillesand, T.M. and Kiefer, R.W. (2009): Remote Sensing and Image Interpretation, John Wiley andSons, New York.
3. Maantay, J., Ziegler, J. (2006). GIS for the urban environment. Ireland: ESRI Press.
4. Rangwala (2010). Town Planning, Charotar Publishing House Pvt. Ltd., Anand, India.
5. Rashed Tarek, and Jurgens, Carsten (Eds.) (2010): Remote Sensing of Urban and Sub-urban Areas. Springer.
6. Roy, P.S., Dewivedi, R.S, and Vijayan, D. (2010) (ed.). Remote Sensing Applications. National Remote Sensing Centre, Department of Space, Government of India, Hyderabad, India, 2010.
7. Sameer Sharma (2020) A Textbook of Urban Planning and Geography, PHI Learning Pvt. Ltd, Rimjhim House, 111, Patparganj Industrial Estate, Delhi - 110 092, India.
8. Sliuzas, R.V.(2004). Managing Informal Settlements: A Study using Geo-information, ITC Publications Series No. 112, The Netherlands.
9. Subudhi, A.P., Sokhi, B. S. and Roy, P. S. (2001). Remote Sensing and GIS Applications in Urban and Regional Studies, Human Settlement Analysis Division, Indian Institute of Remote Sensing, DehraDun.
10. UNCHS (1982). Survey of Slums and Squatter Settlements. Development Studies Series, Vol.1, Tycooly International, Dublin.

Web Sources

1. *www.itpi.org*
2. *www.casa.ncl.ac.uk*
3. *www.GISdevelopment.net*
4. *www.gim-international.com*
5. *www.unhabitat.org*

Course Outcomes:

On completion of the course the student will:

1. *Basics of urban mapping and Plan preparation.*
2. *Familiar with application of remote sensing in urban mapping.*
3. *The role of remote sensing in preparation of urban plans.*
4. *The modelling techniques for modelling and prediction of future land use scenarios.*
5. *Gain knowledge of urban and regional planning concepts,*
6. *Familiar with use of Geomatics technology in planning and management in urban areas and regions.*
7. *Familiarize with case studies, inputs from Remote Sensing and GIS.*
8. *Get exposure in modelling in urban land use and its forecasting using GIS software*

Programme	M.SC. GEOGRAPHY (TWO YEAR) PROGRAMME	Credits:03
	ELECTIVE	
Course Code / Title	**BASICS OF PYTHON PROGRAMMING**	

Objectives

1) *To develop Python programs with conditionals, loops and functions.*
2) *To use Python data structures – lists, tuples, dictionaries.*
3) *To do input/output with files in Python*
4) *To use modules, packages and frameworks in python*
5) *To define a class with attributes and methods in python*

Unit: 1	**Basics of Python –** Introduction to Python: Python Introduction, History of Python, Python features , Python interpreter, Overview of programming in Python, Basic data types. Global and local variables - Basic Operators: Arithmetic Operators, Comparison Operators, Logical (or Relational) Operators, Assignment Operators, Conditional (or ternary) Operators.
Unit 2:	**Data Types in Python** -Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your Own Module – The Python Standard Libraries.
Unit 3:	**Conditional Statements**-Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement-Continue statement – Function Call and Returning Values – Parameter Passing
Unit 4:	**File Handling and Exception Handling** :Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position –Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions
Unit 5:	**Object Oriented Programming in Python** - Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

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.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, (2002)."How to Think Like a Computer Scientist - Learning with Python", Green Tea Press.
3. Reema Thareja, (2017) "Python Programming using Problem Solving Approach", Oxford University Press, First edition.
4. Guido van Rossum, Fred L. Drake Jr., (2011) "An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition.
5. John V Guttag, (2013) "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press.
6. Charles Dierbach, (2016) "Introduction to Computer Science using Python", Wiley India Edition, First Edition.
7. Joel murach, Michael urban, (2017) "Murach's python programming", SPD.
8. John V Guttag, (2013) "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press.
9. Pinde Fu (2020). Getting to Know Web GIS, Taylor and Francies, ESRI, U.S.A
10. Reema Thareja, (2017). Python Programming - Oxford University Press, UK.

Web sources

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. *Develop algorithmic solutions to simple computational problems*
2. *Represent compound data using Python lists, tuples and dictionaries.*
3. *Read and write data from/to files in Python Programs*
4. *Structure simple Python programs using libraries, modules etc.*
5. *Structure a program by bundling related properties and behaviours into individual objects.*
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. *Know the usage of modules and packages in Python*
9. *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
	ELECTIVE	
Course Code / Title	ADVANCED PYTHON FOR GIS ANALYSIS	

Objectives

6) *To introduce the fundamentals of Python Programming.*
7) *To teach about the concept of Functions in Python.*
8) *To impart the knowledge of conditional statement, looping and functions.*
9) *To learn about testing and files in python.*
10) *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:

11. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second Edition, Shroff, O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/
12. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist - Learning with Python”, Green Tea Press, 2002.
13. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist - Learning with Python”, Green Tea Press, 2002
14. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley India Edition, First Edition, 2013
15. Fundamentals of Python Programming, Lambert – Cengage Publications, 2017
16. Guido van Rossum, Fred L. Drake Jr., “An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition, 2011
17. 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, 2017
18. John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and Expanded Edition, MIT Press, 2013
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20. Problem Solving using Python – E. Balagurusamy, Mc Graw Hill Education Ltd., 2017
21. Python Programming - Reema Thareja, Oxford University Press, 2017.

Web sources

6. *www.spoken-tutorial.org*
7. *https://bugs.python.org/file47781/Tutorial_EDIT.pdf*
8. *https://www.tnstate.edu/faculty/fyao/COMP3050/Py-tutorial.pdf*
9. *https://www.javatpoint.com/python-tutorial*
10. *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. *Know the usage of modules and packages in Python*
9. *Familiarize with file concepts in Python*
10. *Read and write data from/to files in Python Programs*