CENTRAL UNIVERSITY OF PUNJAB, BATHINDA

Master of Science in Geography

Academic Session 2020-22

Department of Geography

Programme Learning Outcome

The M.Sc. Geography Programme will enable the students to:

1. Understand various concepts and theories in the field of geographical enquiry.
2. Explore real world issues through various research tools of geographical research.
3. Train to become a geospatial analyst using GIS and Remote sensing tools that would enable them to assume different positions in industry, government and world agencies.
4. Equip the student for different National and International level competitive examination for different scientific, professionals and other posts related to civil and administration, etc.
5. Transform the student into a research professional with integrity and ethics and pursue higher research in geography and related field of human sciences.

Course Structure and Syllabus for M.Sc. Geography, 2020-2022

Course Code	Course Title	Course type	Credit Hours			
			L	T	P	C
Semester-I						
CST.502	Computer Applications (Practical)	CF	-	-	4	2
GEO.513	Basic Geo-statistics	CF	2	-	-	2
GEO.506	Geomorphology	Co	4	-	-	4
GEO.507	Climatology	Co	4	-	-	4
GEO.508	Oceanography	Co	4	-	-	4
GEO.509	Cartography (Practical)	Co	-	-	4	2
GEO.541	Seminar	SB	-	-	-	1
Compulsory Paper for M.Sc. Geography						
GEO.510	Introduction to Earth's material	Co	-	-	4	2
IDC						
IDC.	Interdisciplinary course from other discipline	IDC	2	-	-	2
	Total		**16**	**-**	**12**	
GEO.511	Food Security	IDC	2	**-**	**-**	**2**
GEO.512	Introduction to Climate Change	IDC	2	**-**	**-**	**2**
Semester-II						
GEO.551	Remote Sensing	Co	4	-	-	4
GEO.552	Remote Sensing (Practical)	Co	-	-	4	2
GEO.571	Geography of India	Co	4	-	-	4
GEO.524	Biogeography	Co	4	-	-	4
GEO.542	Seminar	SB	-	-	-	1
IDC						
IDC.	Interdisciplinary course from other discipline	IDC	2	-	-	2
Compulsory course for M.Sc. Geography						
GEO.535	Soil Pollution and Management	Co	4	-	-	4
GEO.536	Soil Pollution and Management (Practical)	Co	-	-	4	2
	Total		**18**	**-**	**8**	
Semester-III						
GEO.521	Geographic Information System & GNSS	Co	4	-	-	4
GEO.522	Geographic Information System & GNSS (Practical)	Co	-	-	4	2

GEO.553	Survey and Field visit	SB	-	-	-	2
GEO.562	Research Methodology	CF	4	-	-	4
VAC	Course Offered by Other Department	VAC	1	-	-	1
GEO.599	Project work	SB	-	-	12	6
VAC	Course offered by Department					
GEO.503	Map Reading	VAC	1	-	-	1
Select any one elective course and its respective practical course from the followings:						
Elective courses I:						
GEO.554	Natural Hazard and Disaster	D. El	4	-	-	4
GEO.556	Social and Demography Geography	D. El	4	-	-	4
GEO.558	Gender, Health and Development	D. El	4	-	-	4
GEO.560	Geography of Forest	D. El	4	-	-	4
GEO.575	Urban System and Planning	D. El	4	-	-	4
Elective courses I (Practical):						
GEO.555	Natural Hazard and Disaster (Practical)	D. El	-	-	4	2
GEO.557	Social and Demography Geography (Practical)	D. El	-	-	4	2
GEO.559	Gender, Health and Development (Practical)	D. El	-	-	4	2
GEO.561	Geography of Forest (Practical)	D. El	-	-	4	2
GEO.576	Urban system and Planning (Practical)	D. El	4	-	-	2
	Total		**12**	**3**	**20**	
Semester-IV						
GEO.523	Geographical Thoughts	Co	4	-	-	4
GEO.572	Population & Settlement Geography	Co	4	-	-	4
GEO.573	Practice in Geography - I	DEC	2	-	-	2
GEO.574	Practice in Geography - II	DEC	2	-	-	2
VAC	Course offered by other Discipline	VAC	1	-	-	1
GEO.599	Project work	SB	-	-	12	6
VAC	Course offered by Department					
GEO.504	Introduction to GNSS	VAC	1	-	-	1
Select any one elective course and its respective practical course from the followings: (students can also opt for MOOC courses instead of the following)						
Elective courses: II						
GEO.577	Photogrammetry	D. El	4	-	-	4
GEO.579	Digital Image Processing & Information Extraction	D. El	4	-	-	4

GEO.581	Watershed management	D. El	4	-	-	4
GEO.583	Advanced Urban and Regional Planning	D. El	4	-	-	4
Elective courses II (Practical):						
GEO.578	Photogrammetry (Practical)	D. El	-	-	4	2
GEO.580	Digital Image Processing & Information Extraction (Practical)	D. El	-	-	4	2
GEO.582	Watershed management (Practical)	D. El	-	-	4	2
GEO.584	Advanced Urban and Regional Planning	D. El	4	-	-	4
	Total		**12**	**5**	**16**	
	Grand total	**CBCS**	**L**	**T**	**P**	
			58	**10**	**56**	

** Course will be offered by the Department of Computer Science andTechnology, Department of Mathematics and Statistics or Computational Science / Students can also choose suitable MOOC course instead of CST.502, STA.504.

Evaluation Criteria for Theory Courses	Abbreviations
A. Continuous Assessment: [25 Marks] i. Surprise Test (minimum three) - Based on Objective Type Tests (10 Marks) ii. Term paper (10 Marks) iii. Assignment(s) (5 Marks) B. Mid Semester Test-1: Based on Subjective Type Test [25 Marks] C. Mid Semester Test-2: Based on Subjective Type Test [25Marks] D. End-Term Exam: Based on Objective Type Tests [25 Marks]	**CBCS:** Choice Based Credit System **Co:** Core Course **CF:**Compulsory Foundation **SB:** Seminar Base **D. El:**Discipline Elective Course **VAC:** Value Added Course **DEC:** Discipline Enrichment Course **L:** Lectures **T:** Tutorial **P:** Practical

Semester-I

Course Title: Computer Application (Practical)   **L**   **T**   **P**   **Cr**
Course Code: CST.502   -   -   4   2
Total Hour: 60 Hours
Course Objective:
To nature the student's knowledge in computer skill for carrying out research in various discipline.
Learning Outcome:
Upon successful completion of this course, the student will be able to:
- Use different operating system and their tools easily.
- Use word processing software, presentation software, spreadsheet software and latex.
- Understand networking and internet concepts.
- Use computers in every field like teaching, industry and research.

Various lab assignments will be given based on theory subject CST.501. Assignments will be based on Computer Fundamentals, Computer Network, Word Processing, Presentation Tool, Spread Sheet, Use of Computers in Education and Research.

Evaluation Parameters	Marks
Practical File	5/10
Implementation	15/30
Viva-voce	30/60
Total	**50/100**

Mode of Transaction: Lab exercises

References:
1. Sinha, P.K. Computer Fundamentals. BPB Publications.
2. Goel, A., Ray, S. K. 2012. Computers: Basics and Applications. Pearson Education India.
3. Microsoft Office Professional 2013 Step by Step
   https://ptgmedia.pearsoncmg.com/images/9780735669413/samplepages/ 97807356694 13.pdf

Course Title: Basic Geostatistics   **L**   **T**   **P**   **Cr**
Course Code: 2   -   -   2
Total Hour: 30 Hours 40 hours
Course objective: To provide the understanding and use of Statistical techniques for students of other departments.
Learning Outcome: The student would be able to analyse data and apply various skill in research works.
Unit I: Descriptive Geostatistics
- Introduction of Geostatistics: population, statistics, data and variables, scales measurement
- General Geostatistics : count, frequency, curve, ogives, graphs, histogram
- Measures of central tendency : mean, median, mode, skewness and kurtosis
- Measures of variability: range, standard deviation, variance, co-variance and z-score

Unit II: Inferential geostatistics   **(Lectures 10)**
- Sampling: probabilistic and non-probabilistic
- Regression analysis: simple, multiple and logistic regression
- Correlation analysis: simple and multiple correlation
- Probability distribution: normal, binomial and Bayesian probability distribution
- Hypothesis testing: student's t-test, Chi-square test, F-test

Unit III: Graphing and mapping geostatistics   **(Lectures 10)**
- Diagram and charts: bar, pie, boxplot, line graph, dots
- General maps : choropleth map, isopleth map, dot map, bar and pie map
- Inferential maps: Interpolated maps (IWD, Kriging, thin plate spline), pattern mapping (hotspot and cold spot map)
- Symbols and colours: sign, shades, pattern and legend

Unit IV: Introduction to geostatistical software   **(Lectures 10)**
- Introduction to open source software
- Introduction to open source programming language
- Introduction to GIS software
- Introduction to SPSS, R and Python

Mode of Transaction: Classroom lecture and solving problem exercise.
Suggested readings:
1. P. L. Meyer, Introductory Probability and Statistical Applications, Oxford & IBH Pub, 1975.
2. R. V. Hogg, J. Mckean and A. Craig, Introduction to Mathematical Statistics, Macmillan Pub. Co. Inc., 1978.
3. F. E. Croxton and D. J. Cowden, Applied General Statistics, 1975.
4. P. G. Hoel, Introduction to Mathematical Statistics, 1997.

Course Title: Geomorphology	L	T	P	Cr
Course Code: GEO.506	4	-	-	4

Total Hour: 60 Hours

Course objective: It introduces the basic concepts of geomorphology. It covers various geomorphic processes that would help in understanding different landforms on the earths' surface.

Learning outcome: The students would be able to understand the concept of landform building processes and it would help the students to get insight about research in geomorphology.

Unit I: Fundamental Concepts in Geomorphology: (14 Lectures)
- Concept & fundamentals of geomorphology;
- Concept of relief – mountains, plateaus, hills, foothills, valleys, plains and Floodplains.
- Doctrine of Isostasy - Views of Airy and Pratt.
- Mountain Building Theories – concepts of Kober, Daly and Holmes.

Unit II: Earth Movements and Interior of the Earth   (14 Lectures)
- Plate Tectonics and Continental drift theory.
- Earthquake and volcanism
- Evolution of the earth and Earth's internal structure; composition and characteristics.

Unit III: Geomorphic Processes and landforms   (14 Lectures)
- Gradational and Aggradational processes: Concept of slope, erosion and mass wasting.
- Cycle of Erosion - concepts of Davis and Penck
- Geomorphic landform: fluvial, glacial, Aeolian, coastal and karst.

Unit IV: Geology and Pedology   (14 Lectures)
- Weathering: Physical and chemical Process
- Rocks: types, formation and characteristics
- Soil: types, formation and characteristics

Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Group discussion. Tools used: PPT, video, animation movie, whatsapp.

Suggested readings:
1. Huggett, Richard John (2011), Fundamentals of geomorphology, 3rd edition, Routlegde Taylor & francis group.
2. Harvey, Adrian (2012), Introducing geomorphology: A guide landforms and processes, Edinburgh, Dunedin academic press.
3. Gregory, Kenneth J. (Ed.) (2014), The SAGE handbook of geomorphology, New Delhi, Sage publications India Private Limited.
4. Singh, Savindra (1998). Geomorphology, Allahabad: Prayag Pustak Bhawan.
5. Strahler, A.N. (1992) Physical Geography, New York: John Wiley and Sons.

Course Title: Climatology	**L**	**T**	**P**	**Cr**
Course Code: GEO.507	4	-	-	4

Total Hour: 60 Hours

Course objective and Learning outcome: This course aims to provide an overview of the climate system including its components like temperature, precipitation and wind; their interactions; and the processes that drive the general global as well as regional circulation.Students will learn the fundamentals of atmospheric dynamics, method of interpretation of weather symbols, and the contemporary climatic issues. They will also study the oscillations in the climate system such as: ENSO and Monsoon, the North Atlantic oscillation, the Arctic and Antarctic oscillation. Students will also be able to relate dynamics of climatic system with urban environment.

Unit I: (14 Lectures)
- Fundamentals of climatology and meteorology.
- Earth's Atmosphere: Evolution, Structure and Composition.
- Solar radiation and Terrestrial radiation; Variation, distribution and effect on atmosphere.
- Greenhouse effect and global heat budget
- Temperature: Concept, measurement, scales, daily and annual cycles of temperature; vertical distribution; world distribution.

Unit II: (14 Lectures)
- Stability and instability in atmosphere.
- Cloud: Type and formation.
- Atmospheric moisture and precipitation: Concept and measurement of atmospheric moisture;
- Condensation - forms of condensation; adiabatic temperature changes,
- Formation and types of precipitation; global distribution of precipitation.

Unit III: (14 Lectures)
- Wind circulation Models of general circulation of the atmosphere: Jet stream, Air masses and fronts, characteristics, movements, frontogenesis.
- Tropical cyclones; mechanism and characteristics
- Genesis of Indian Monsoon and the causes of its variability.
- Oscillations: ENSO

Unit IV: (14 Lectures)
- Classification of climates: Empirical and generic,
- Climatic classification with special reference to Koppen or Thornthwaite (any one).
- Urban Microclimate with special reference to cities.
- Indian Meteorological Department and All India Weather Forecast.

Transaction mode: The course will be taught with a combination of lectures, discussion, and presentations. Case study (recent weather phenomena) will also be discussed. Students will be assigned the task to Read and interpret all India Weather Forecast report generated by IMD available at http://www.imd.gov.in/pages/allindiawxfcbulletin.php

Suggested readings:
1. Strahaler, A.H., 2013 (6th edition). Introducing Physical Geography. Wiley Pub.
2. Savindra Singh (2005). 'Climatology', Prayag Pustak Bhavan, Allahabad.
3. Lal, D.S. (1998). 'Climatology', Chaitanya Publishing House, Allahabad.

Suggested website:
- IMD: http://www.imd.gov.in/pages/main.php
  NASA Earth Observatory:
  https://earthobservatory.nasa.gov/?eocn=topnav&eoci=logo

Course Title: Oceanography	**L**	**T**	**P**	**Cr**
Course Code: GEO.508	4	-	-	4

Total Hour: 60 Hours

Course objective:
The objectives of this course are to provide the details of bottom relief of major oceans, major features of ocean basins, circulation patterns in the oceans, temperature and salinity distribution etc.

Learning outcomes

After completion of this course students will be able to explain the basic concepts of oceanography and the differences between the various relief features of oceans. They will be able to understand the marine resources and the impacts of human activities on marine environment.

Unit I:(14 Lectures)
- Nature and Scope of Oceanography;
- Major features of Ocean basins and ocean deposits
- Bottom relief of Indian, Atlantic and Pacific Oceans.

Unit II: (14 Lectures)
- Physical and chemical properties of sea water, sources and factors affecting the distribution of temperature and salinity.
- Circulation patterns in the ocean – ocean currents, water masses, waves, tides and tsunamis, their types and theories of origin.

Unit III: (14 Lectures)
- Marine biological environment, bio zones – Plankton, Nekton and Benthos
- Coral reef; types, characteristics and theories of origin.

Unit IV: (14 Lectures)
- Ocean resource and their influence on human activity
- Impacts of Humans on the Marine Environment – Laws of the sea, marine resources, pollution, EEZ (exclusive Economic Zone).

Mode of Transaction: Lecture, class discussion, presentation methods would be used for teaching. Tools such as whatsapp, ppt., and video will be use. Case studies related to human impact on ocean resources will also be discuss in the class.

Suggested readings:

1. Garrison, T. (2001). Oceanography – An Introduction to Marine Science, Books/Cole, Pacific Grove, USA.
2. Gross M.Grant (1987). Oceanography – A view of the Earth, Prentice Hall Inc. New Jersey.
3. Singh Savindra (2001). Oceanography, Allahabad.

Course Title: Cartography (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.509	-	-	4	2

Total Hour: 60 Hours

Course objective:

It introduces the basic concepts of geomorphology. It covers various geomorphic processes that would help in understanding different landforms on the earths' surface.

Learning Outcome: The students would be able to prepare maps and interpret. This will enhance research work in analysing data for graphical representation of map.

Unit I

- Introduction to Map; Concepts, types and scale.
- Reading and Analysis of Topographical Maps of 1:50,000 scale, Contour profiling
- Preparation of Thematic Map/and Generation of Data from the topographical maps (land use map and area under different land-use categories)
- Construction of Transect Chart showing the relationship among Relief, Drainage, Vegetation, Settlements, Agriculture and Transport Network
- Map projection: Types and Preparation.

Unit II:

- Choropleth mapping (Density of population/Land Use/Cropping pattern)
- Nearest Neighbour Analysis
- Pie-graph for representation of land use, cropping pattern, rural-urban composition, etc.
- Cartographic representation of data: Age-sex pyramid, line graph, bar graph

Mode of Transaction: Hand on exercise in cartography lab.

Suggested readings:

1. Misra, R.P. and Ramesh, A. (1989). Fundamental of Cartography, Concept Publishing Company, New Delhi.
2. Singh, R.L. Elements of Practical Geography,
3. Robinson, A.H. et al. (1992). Elements of Cartography, John Willy & Sons, New York, 6th edition.

Evaluation criteria for Practical Examination

Examination	Practical copy	Viva	Total
50	30	20	100

Course Title	Seminar		L	T	P	Cr
Course Code	GEO.541		-	-	-	1
Evaluation Criteria						
Continuous evaluation (out of 50)	**End semester presentation** (out of 50)					Total (out of 100)
	Literature Strength (out of 10)	Organization of content (out of 10)	Presentation (out of 20)	Discussion (out of 10)		

Course Title: Introduction to Earth's Material - Practical

Course Code: GEO.510

L	T	P	Cr
-	-	4	2

Total Hour: 60 Hours

Course objective and outcome: The student will benefit in understanding the characteristics of rocks and minerals. Identification of minerals and rocks. Uses of tools that would help in carrying out further research.

Unit I
- Definitions of rock and minerals, Classification of rocks.
- Identification of minerals
- Identification of Igneous, sedimentary and metamorphic rocks,

Unit II:
- Nature and use of various natural construction material – grain size analysis using sieve test; strength of the natural materials
- Water quality test
- Identification of hazardous earth material for human health

Suggested readings:
1. Minerals and Rocks-Exercises in Crystallography, Mineralogy and Hand Specimen Petrology by Cornelius Klein, 2007, Wiley publisher.
2. Earth Materials: Introduction to mineralogy and petrology by Cornelius Klein and Anthony Phillpotts, 2013, Cambridge University press, Cambridge.

Evaluation criteria for Practical Examination			
Examination	**Practical copy**	**Viva**	**Total**
50	30	20	100

Semester II

	L	T	P	Cr
Course Title: Remote Sensing				
Course Code: GEO.551	4	-	-	4

Total Hour: 60 Hours

Course objective and learning outcome:

It introduces the students to the basic concepts and the skills necessary to acquire remote sensing data and extract geo-information from them. The objective of this course is to give understanding of fundamentals of remote sensing. The students will learn the interaction of electromagnetic radiation with terrestrial features; will get to know about satellite imaging sensor systems; and apply the underlying principles of interpreting image data.

Unit I: Fundamental Concepts of Remote Sensing: (12 Lectures)
- History of Remote Sensing
- Spectrum, Spectral Quantities
- Theories of EMR
- Laws of Radiation
- Concept of Blackbody radiation
- Electromagnetic Spectrum.

Unit II: Energy-Atmosphere Interaction   (12 Lectures)
- Scattering, Absorption, Refraction, Path Radiance Reflection, Transmission, Absorption.
- Energy-Earth Interaction
- Atmospheric Windows
- Spectral Signatures of Surface Features

Unit III Remote Sensing platforms, sensors and satellite series:
(14 Lectures)
- RS Satellites- Polar sun-synchronous, geo-stationary
- Platforms: Types and their orbital characteristics
- Sensors types: active and passive
- Sensors systems: whiskbroom and push broom; Principles and geometry of scanners and CCD arrays
- Satellite RS data products or series: LANDSAT, SPOT, IRS, IKONOS, Quick bird and world view

Unit IV Image Processing and Interpretation: (14 Lectures)
- Image: Meaning and Types (Analogue and Digital) and Characteristics
- Resolution: Spatial, Spectral, Radiometric and Temporal
- Basics of Image Processing
- Elements of Image Interpretation
- Visual Interpretation
- Ground Truth Collection

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as whatsapp, ppt., and video will also be used.

Suggested readings:
1. Rees, W.G., Physical Principles Of Remote Sensing, Cambridge University

Press, 2001.
2. Sabins F., Remote Sensing : Principles And Interpretation, New York 1997
3. Lillesand T.M., And Kiefer R.M., Remote Sensing And Image Interpretation,Fourth Edition, Wiley, 1999.
4. Jensen J.R., Remote Sensing Of Environment: An Earth Resource Perspective,Prentice Hall,2000.

	L	T	P	Cr
Course Title: Remote Sensing (Practical)				
Course Code: GEO.552	-	-	4	2

Total Hour: 60 Hours

Course objective and learning outcome: The practical course gives operational skills necessary to acquire remote sensing data and extract geo-information from them. The students will critically examine the trade-offs between spatial, spectral, radiometric and temporal resolution of remotely sensed data; Perform basic operations associated with digital image processing; and evaluate applications of remotely sensed data for monitoring and managing natural resources. The students can use their knowledge in their project report.

Remote sensing, image interpretation and image processing:

• Familiarisation with different types of satellite images and Annotation strip.

• Reading metadata and basic characteristics of images.

• Visual Interpretation of Landsat; IRS- LISS, IRS- PAN Images.

• Detection of defined objects/features in single bands;

• Interpretation, classification, delineation and mapping of land use/land cover from False Colour Composite (FCC);

• Transfer of information from imagery to base map; Preparation of maps (at least one for each type).

• Image Processing System : Image Registration : Image to map and Image to Image;

• Digital Image classification of Landsat; IRS- LISS, IRS- PAN images: selection of training sets, supervised and unsupervised classification.

• Image Enhancement Techniques: Histogram Equalization. Contrast stretching, filtering and band rationing.

Evaluation criteria for Remote Sensing Practical

Examination	Practical copy	Viva	Total
50	30	20	100

	L	T	P	Cr
Course Title: Geography of India				
Course Code: GEO.571	4	-	-	4

Total Hour: 60 Hours

Course Objectives andOutcome: India is a vast country with diversity physically as well as ethnically. The course would help in understanding India

and its geographical entity for students.

Unit I:(14 Lectures)
- Geological history of India
- Relief feature: Physiographic divisions and its formation
- Drainage systems; watershed and basin

Unit II: **(14 Lectures)**
- Climate of India: types and Mechanism of monsoon
- Indian forest: types and characteristics
- Mineral resources: types and belt

Unit III:(14 Lectures)
- Agriculture: Salient features of agriculture, agricultural regions, major crops,
- Agricultural revolution: green revolution, white, blue and yellow revolutions.
- Industry: Industrial belt of India: Locational factors of cotton, jute, textile, iron and steel, aluminium, fertilizer, paper, chemical and pharmaceutical, automobile, cottage and agro-based industries;
- New industrial policies; Multinationals and liberalization; Special Economic Zones; Exclusive Economic Zone

Unit IV:(14 Lectures)
- Social and environmental challenges in India: Regional disparities in the levels of economic development, distribution of population growth and policies
- Flood and drought problem; spatial distribution and management

Mode of Transaction: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Group discussion. Tools used: PPT, video, animation movie, whatsapp.

Suggested readings:
1. Husain, Majid (2005), General geography and geography of India, Delhi, Aquarian books.
2. Khullar D.R. (2005). India-A comprehensive geography, Kalyani Publishers, Ludhiana.

Course Title: Bio-Geography	L	T	P	Cr
Course Code: GEO. 524	4	-	-	4

Total Hour: 60 Hours
Objectives:
To familiarise the students with the geographical and historical background of the field of biogeography. It helps the students to understand the ecological factors that shape the distribution of plants and animals and their changes over time.
Learning Outcomes:
By the end of this course students will be able to understand the historical development of biogeography during different time periods. They will be able to

explain the spatio-temporal variations of plant and animal regions and the factors affecting these variations. Students will also understand the biogeographical consequences of global change like climate change.

Unit I:(14 Lectures)
- Nature, scope, significances, approaches and history of Biogeography
- Spatial dimension in biogeography; pattern of plant and animal distributions,
- Bio-geographical regions and realms.

Unit II: (14 Lectures)
- Ecology and Ecosystem; significance in biogeography;
- Basic ecological principles; Geo-biochemical cycles: carbon, nitrogen, oxygen and phosphorus cycles;
- Biome and biomass; ecosystem integrity

Unit III: (14 Lectures)
- Biogeography of the seas; island biogeography.
- Habitat fragmentation; biogeography of linear landscape features.
- Biodiversity: depletion and conservation.

Unit IV: (14 Lectures)
- Biogeographical information, collection, retrieval and application.
- Projecting into the future: Climate change and biodiversity; biogeographical consequences of global change; changing communities and biomes
- National forest, water resource and wildlife policy of India

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as whatsapp, ppt., and video will also be used.

Suggested readings:
1. Brown, J. H., & A. C. Gibson, Biogeography, St. Louis, Mosby, 1983.
2. Brown, J.H. and Lomolino, M.V., Biogeography, Second Edition, Sinauer Associates, Inc. Sunderland, Massachusetts, 1998.
3. Cox, C.B., Moore, P.D., Biogeography, An Ecological and Evolutionary Approach, 5th ed., Blackwell Science, Cambridge, 1993.
4. MacDonald, Glen, Biogeography: Introduction to Space, Time and Life, John Wiley, New York, 2002.
5. Robinson, H., Biogeography, The English Language Book Society and Macdonald and Evans, London, 1982.

Course Title	Seminar	**L**	**T**	**P**	**Cr**
Course Code	GEO.541	-	-	-	1
Evaluation Criteria					
Continuous evaluation (out of 50)	**End semester presentation** (out of 50)				Total (out of 100)
	Literature Strength (out of 10)	Organization of content (out of 10)	Presentation (out of 20)	Discussion (out of 10)	

Course Title: Soil Pollution and Management   **L   T   P   Cr**
Course Code: GEO.535   4   -   -   4
Total Hour: 60 Hours
Objectives and Learning Outcome:
The student will be introduce to various issue related to soil and water problem, component and characteristics.

Unit I: **(14 Lectures)**
Soil formation: Definition, rocks, minerals, soil forming factors, soil weathering- types and processes, soil formation, soil horizon, soil profiles, composition of soil, soil biota and their function in soil, humus, Soil microbes in nutrient cycling, Soil types in India. Physico-chemical and biological properties of soil, sampling and analysis of soil quality.

Unit II: **(14 Lectures)**
Soil pollution: Definition, sources- point and non- point, soil pollutants – types and characteristics, routes. Soil pollutants – Types, pesticides – classification, formulation; residual toxicity, synthetic fertilizers, heavy metals, Industrial waste effluents and interaction with soil components. Effects and impacts of soil pollution, bio-magnification. Thermal pollution – sources and impacts.

Unit III: **(14 Lectures)**
Soil erosion: Salt affected soil – Saline soils, Sodic soil, Usar, Kallar, Types of erosion – water and wind erosion, causes, soil loss equation. Land degradation – causes and impacts, types of waste lands in India, desertification and its Control.

Unit IV: **(14 Lectures)**
Soil management: Methodologies for soil conservation, conservation of arable land, techniques of reclamation and restoration of soil, wasteland reclamation, soil salinity management, remedial measures for soil pollution, bioremediation- in situ, ex situ, phytoremediation and biodegradation. Principles of weed management, Legal measures for land conservation at national and international level.

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as whatsapp, ppt., and video will also be used.

Suggested readings:
1. Botkin, Daniel B. and Keller, Edward A. Environmental Science: Earth as a Living Planet. 6th ed. John Wiley & Sons, USA. 2007.
2. Cunningham, W. P. and Cunningham, M. A. Principles of Environment Science. Enquiry and Applications. 2nd ed. Tata McGraw Hill, New Delhi. 2004.
3. Cutler, S.L, Environment Risks and Hazard. Prentice Hall of India, Delhi. 1999.
4. De, A.K., Environmental Chemistry. New Age International (P) Ltd.

Publishers, New Delhi. 2000.
5. Hillel, D., Introduction to Soil Physics, Academic Press, New York. 1982.

Course Title: Soil Pollution and Management - Practical	**L**	**T**	**P**	**Cr**
Course Code: GEO. 536	-	-	4	2

Total Hour: 60 Hours
Course Objective and Learning Outcome:
The student will benefit in understanding on how to carry out soil and water analysis that will give them immense knowledge for further research.
Unit I:
* Determination of pH of water/soil sample.
* Determination of conductivity/TDS of the water sample.
* Determination of salinity of the soil sample.
* Determination of Total Organic Content.
* Determination of Total Kjehldahl Nitrogen (TKN), ammonical nitrogen etc. in soil samples.
Unit II:
* Determination of fluoride content in soil.
* Determination of bacterial population in soil samples by serial dilution and spread plate methods.
* Soil sieve analysis
* Standardization and use of Flame Photometer.
* Detection of heavy metal elements using Atomic absorption spectrophotometer.

Evaluation criteria for Practical Examination			
Examination	**Practical copy**	**Viva**	**Total**
50	30	20	100

Semester III

Course Title: Geographical Information System	**L**	**T**	**P**	**Cr**
Course Code: GEO. 521	4	-	-	4

Total Hour: 60 Hours
Course Objective:
The course introduces students to the fundamentals of GIS, GPS, data models, data sources, databases and Global Positioning Systems (GPS) and geospatial metadata. It prepares the candidate for the geospatial analysis.
Learning Outcome:
The students would get immense knowledge in extraction, generation, and analysing of maps. This would benefit students for various geographical research works. This course would give students theoretical framework in geographical information system.

Unit I: **(14 Lectures)**
- Concept and definition of GIS, History and development of GIS technology, Applications of GIS in various sectors:
- Geographic information System database: data types (map, attributes, image data) and structure; Spatial and non-spatial data;

Unit II: **(14 Lectures)**
- Geo-referencing;
- Data entry and preparations (inputs, editing and attributing);
- Spatial analysis: overlay, buffer and proximity, network analysis;
- Contours and spot heights; Determination of slope and hill shading; Data interpolation: point and line data; Output generation and layouts.

Unit III: **(13 Lectures)**
- Introduction to GNSS; Concepts, types and application.
- Sources of Errors and resolving of errors.
- Introduction to DGPS, wide area augmentation system (WAAS);

Unit IV: **(13 Lectures)**
- Introduction to GPS; Concepts, types and application.
- Segments of GPS; Collection of GCPs.

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as whatsapp, ppt., video will be used.

Suggested readings:
1. Liu, Jian Guo & Mason, Philippa J. (2016), Image processing and GIS for remote sensing, Techniques and applications, 2nd editionPublication, United Kingdom, Wiley Blackwell.
2. Kennedy, Michael (2013), Introducing geographic information systems with arcgis: A workbook approach to learing gis, 3rd edition, New jersy, A john wiley & sons publications.
3. Bhatta, Basudeb (2011), Remote sensing and Gis, 2nd edition, New Delhi, oxford university press.
4. Harvey, Francis (2016), A primer of GIS: Fundamental geographic and cartographic concepts, 2nd edition, New York, The Guilford press.
5. Holfmann-wellenhof, B. ; Lichtenegger, H. ; Collins, J. ; Hofmann-wellenhof, B. (2013), GPS global positioning system: Theory and practice 5th edition, New Delhi, Springer (india) private limited.
6. Van Sickle, Jan (2008), GPS for land surveyors, 3rd edition, London, Crc press.

Course Title: Geographical Information System - (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO. 522	-	-	4	2

Total Hour: 60 Hours
Course Objective:
The course provides a firm understanding of the conceptual and technical

issues that affects the use of GIS and GPS. Through hands on exercise students will know about beauty of geographic/spatial data management.

Learning Outcome:
The students would get immense knowledge in extraction, generation, and analysing of maps. This would benefit students for various geographical research works. This course would give students theoretical framework in geographical information system.

Unit I:
- Geo-referencing Maps/Images, Digitization of Raster Map: Point, Line and Polygon Features,
- Preparation of Attribute Tables, Editing and Joining Tables, Analyzing Attribute Data: Calculating Area, Perimeter, and Length.

Unit II:
- Spatial Representation: Symbolizing and Map Layouts, Basic Analysis in GIS: Buffering, Overlay and Query Building.
- GPS Applications.Collection of ground control points using hand held GPS receiver; transferring data from GPS receiver to PC.

Mode of Transaction: Lab exercise through open source softwares.

Evaluation criteria for Practical Examination

Examination	Practical copy	Viva	Total
50	30	20	100

	L	T	P	Cr
Course Title: Survey and Field visit	-	2	-	2
Course Code: GEO.553				

Total Hour: 20 Hours

Course objective and Learning Outcome:
This course will help the student to interact with people in studying their socio-economic study. A survey schedule will be organised in selected areas (village/town, etc.). This will help the student understand and interact with people more closely that would be beneficial for carrying out research in future.

Unit I
Procure a topographic map of 1:50,000 to 1:25,000 scale to study the Settlements selected in its regional setting. Prepare a site map of the survey area; settlement, road, water body, agricultural field etc.
Collection of socio-economic profile data of the survey site and create a demographic profile from the secondary date; Data procure from census office, economic and statistics office. Assessment of the secondary data by using statistical tools and techniques.

Unit II:
Based on results of the land-use and socio-economic enquiry of the households, prepare a critical field-survey report. Photographs and sketches, in addition to maps and diagrams, may supplement the report.

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching and Field visit will be conducted.

Evaluation Criteria for Field survey

Active participation in field work	Report writing	Presentation	Total (100)

Course Title: Research Methodology	**L**	**T**	**P**	**Cr**
Course Code: GEO.562	4	-	-	4

Total Hour: 60 Hours

Course Objectives:
The course will make the students aware about types, approaches and methods of research in geography and orient the students to design and prepare geographic research proposal, with emphasis on problem identification, methodology design and literature review.

Outcome:
After completion of this course students will have better understanding of various approaches, research methods and tools of data collection and analysis. Students will be able to write the synopsis and project report.

Unit I:(12 Lectures)
- Introduction to research in Geography: Concept and significance of research in geography; Philosophy and methods; Naturalism and anti-naturalism; realism and idealism, Critical thinking.

Unit II: **(12 Lectures)**
- Research and Academic Integrity: Copyright issues, Conduct of ethical research, Belmont report and Plagiarism in research.
- Scientific Research; Inductive and deductive approaches; Research design; Formulation of research problem; Development and testing of hypothesis; Techniques of data collection; Sampling and field survey.

Unit III:(16 Lectures)
- Data Analysis, interpretation and report writing: Data classification and tabulation; Data analysis and interpretation; reference writing; APA, MLA, Chicago.

Unit IV:(16 Lectures)
- Writing thesis, project report and research paper; Synopsis writing: procedure, content, methods, literature review.

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as whatsapp, ppt., and video will also be used.

Suggested readings:
1.   Blackburn, J. and Holland, J. (eds.) (1998): Who Changes? Institutionalising Participation in   Development. IT Publications, London.
2.   Blaxter, L.; Hughes, C. and Tight, M. (1996): How to Research. Open University Press, Buckingham.
3.   Dikshit, R. D. (2003): The Art and Science of Geography: Integrated Readings. Prentice-Hall of India, New Delhi.
4.   Dorling, D. and Simpson, L. (eds.) (1999): Statistics in Society. Edward Arnold, London.

5.   Fisher, P. and Unwin, D., (eds.) (2002): Virtual Reality in Geography. Taylor and Francis, London.
6.   Flowerdew, R. and Martin, D. (eds.) (1997): Methods in Human Geography. A Guide for Students Doing a Research Project. Longman, Harlow.
7.   Hay, I. (ed.) (2000): Qualitative Research Methods in Human Geography. Oxford University Press, New York.
8.   Kitchin, R. and Tate, N., (2001): Conducting Research into Human Geography. Theory, Methodology and Practice. Prentice-Hall, London.
9.   Limb, M. (2001): Qualitative Methodologies for Geographers. Issue and Debates. Edward Arnold, London.

Course title	Map Reading (VAC)	L	T	P	Cr
Course code	GEO.503	1	-	-	1

Total Hour: 15 Hours

Learning outcome: The practice of theoretical knowledge will help the students in applying at ground observation in field and to learn essential observational and practical skills. This paper will help the student to formulate their knowledge in field trip and will be able to identify different land features in toposheets for adaptation in field work environment in certain professional and scientific organizations.

Unit I:
Introduction to map: Concept, history and applications;
Scale in map and its usage.

Unit II:
Introduction to Topographical maps: Compositions and conventional symbols:
Reading of Toposheets at scale of 1:50,000

Unit III:
Preparation of Thematic Map/and Generation of Data from the topographical maps (land use map and area under different land-use categories)

Unit IV:
Interpretation of Toposheets: Representation of features in classroom exercises.

Mode of Transaction: Classroom Lectures Using PPTs and videos. Hand on exercise with toposheets and lab exercises.

Suggested Reading:
1. Misra, R.P. and Ramesh, A. (1989). Fundamental of Cartography, Concept Publishing Company, New Delhi.
2. Singh, R.L. Elements of Practical Geography,
3. Robinson, A.H. et al. (1992). Elements of Cartography, John Willy & Sons, New York, 6th edition.

Evaluation Criteria:
Examination (50), Practical files (30), Viva (20)

Course Title	Project	L	T	P	Cr

Course Code	GEO.599		-	-	-	6
Evaluation Criteria						
Continuous evaluation (out of 50)	**End semester presentation** (out of 50)					Total (out of 100)
	Literature Strength (out of 10)	Organization of content (out of 10)	Presentation (out of 20)	Discussion (out of 10)		

Elective courses II: Select any one elective course and its respective practical course from the followings:

Course Title: Natural Hazard andDisaster   **L   T   P   Cr**
Course Code: GEO.554   4   -   -   4
Total Hour: 60 Hours
Course Objectives:
The course in Geography, as a science of human-environment interactions, offers key analytical tools for understanding the complex causes and uneven impacts of disaster and hazards around the world. It explores various types and impacts of disasters.
Learning Outcome:
The student would gain knowledge about disaster concepts and phenomena. It would give theoritical understanding
Unit I:(14 Lectures)
- Introduction to Disaster: Concept of Hazard and Catastrophe; Geographical analysis of Disaster study.
- Concept of vulnerability and risk
- Impacts of Disasters:Social, Economic, political, environmental, health, psychological; Differential impacts: Caste, class, gender, age, location, disability.
Unit II: (14 Lectures)
- Classification of Disasters: Natural and man made disaster;
- Natural Disaster study (Causes, Assessment and Management):Cyclones, droughts, forest fires, earthquakes, volcanoes, landslides.
Unit III:(14 Lectures)
- Man-made disaster study: Fire, Terrorism, Food poisoning, stampedes.
Unit IV:(14 Lectures)
- Mitigation, prevention, preparedness, response and recovery;
- Applications of GIS and Remote sensing in disaster studies.
Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as whatsapp, ppt., and video will also be used.
Suggested readings:
1. Vaidyanathan, S. (2011), An introduction to disaster management: Natural disasters and manmade hazards, Delhi, Ikon books.

2. Singh, S.R. (2016), Disaster management, New Delhi, Aph Publishing Corporation.
3. Juneja, Satish (2009), Human made disaster management, Delhi, Commonwealth publishers.
4. Jain, A.K. (2008), A practical guide to disaster management, Delhi, Pragun publication, 2008.

Course Title: Natural Hazard andDisaster (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.555	-	-	4	2

Total Hour: 60 Hours

Course objective:
The course place emphasis on analytical geographical tools to study disasters. Students will learn to do mapping and prepare hazard zones using remote sensing and GIS techniques

Outcome:

Unit I
Risk and vulnerability assessment hazard zonation, Use of remote sensing and GIS in hazard studies.

Unit II:
Hazards zonation/ mapping: meteorological –cyclones, typhoons, hurricanes and droughts, forest fires, causes, assessment, effects and control measures. Natural hazards – Geological – earthquakes, volcanoes, causes, effects and control measures; Natural hazards – Geomorphic – landslides, soil erosion and gullying, coastal erosion causes, assessment, effects and control measures.

Mode of Transaction: GIS lab exercise using open softwares.

Evaluation criteria for Geography of Disaster - Practical

Examination	Practical copy	Viva	Total
50	30	20	100

Course Title: Social and Demography Geography	**L**	**T**	**P**	**Cr**
Course Code: GEO.556	4	-	-	4

Total Hour: 60 Hours

Course Objectives:
The paper reflects various social issues in relation to demographic feature. The student would be introduce to various concepts of social as well as demography that would inculcate in structuring thoughts in the minds of student.

Outcome: On completion of this course students will have better understanding of various social and cultural aspects of geography. They will be able to explain the historical growth and distribution of population and various theories of population growth. An understanding of demographic dynamics will also be enhanced through this course.

Unit I:(14 Lectures)
- Social Welfare and Well-being: Concept and Components – Healthcare,

Housing and Education.
- Social Geographies of Inclusion and Exclusion, Slums, Gated Communities, Communal Conflicts and Crime.

Unit II: (13 Lectures)
- Population ageing and dependency ratios
- Concept of Space: Social space, Material space

Unit III: (13 Lectures)
- Introduction to Demography. History of Population Growth. Geographic Distribution of World Population and Global Variations in Population Size and Growth.
- Theories of Population Growth: Malthus and Marx
- The Concepts of Age and Sex. Impact of Mortality rate

Unit IV: (14 Lectures)
- Demographic evaluation of Family Planning Programme
- Demography Dynamics: Fertility, Mortality and Migration – Measures, Determinants and Implications

Mode of Transaction: Lecture, class discussion, presentation
Suggested Reading:
1. Ahmed A., 1999: Social Geography, Rawat Publications.
2. Casino V. J. D., Jr., 2009) Social Geography: A Critical Introduction, Wiley Blackwell.
3. Cater J. and Jones T., 2000: Social Geography: An Introduction to Contemporary Issues, Hodder Arnold.
5. Panelli R., 2004: Social Geographies: From Difference to Action, Sage.
6. Rachel P., Burke M., Fuller D., Gough J., Macfarlane R. and Mowl G., 2001: Introducing Social Geographies, Oxford University Press.
7. Smith D. M., 1977: Human geography: A Welfare Approach, Edward Arnold, London.
8. Smith D. M., 1994: Geography and Social Justice, Blackwell, Oxford.
9. Smith S. J., Pain R., Marston S. A., Jones J. P., 2009: The SAGE Handbook of Social Geographies, Sage Publications.
11. Valentine G., 2001: Social Geographies: Space and Society, Prentice Hall

Course Title: Social and Demography Geography (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.557	-	-	4	2

Total Hour: 60 Hours
Course objective and Outcome: This paper is intended to help the student giving geographical thoughts in carrying out research related to demographic issue. After completion of this course students will be able to use the cartographic and statistical techniques on primary and secondary data.
Unit I
- Procedures of data collection: primary and secondary
- Sampling techniques : random, stratified random and purposive
- Preparation of choropleth map, histogram, etc.

Unit II:
- Measures of dispersion: mean deviation, quartile deviation, standard deviation and Co-efficient of variation.
- Bivariate scatter diagram and regression trend line
- Coefficient of correlation after Karl Pearson

Mode of Transaction: Lecture, class discussion, presentation

Evaluation criteria for Social and Demography Geography - Practical

Examination	Practical copy	Viva	Total
50	30	20	100

	L	T	P	Cr
Course Title: Gender, Health and Development	4	-	-	4
Course Code: GEO.558				

Total Hour: 60 Hours

Course Objectives:
The student will benefit in understanding the relationship of gender and health.

Outcome: After completion of this course students will be able to understand the concepts of gender and health. They will be able to explain the variations in social structures, health infrastructure. An understanding of MDGs will also be improved through this course

Unit I:(14 Lectures)
- **The Concept of gender**, Evolution of gender in historical perspective; Patriarchy, Kinship Structure and gender roles, Feminist theories, Gender stratification in traditional and modern societies, Gender Analysis Tools, Gender Sensitive Indicators;
- **Concept of health**, Evolution of the concept of Reproductive Health, life cycle approach to RH and recommendations from ICPD; Changing concept of development, Indicators of development, gender adjusted HDI.

Unit II: (14 Lectures)
- Major morbidity and mortality burden in the developing world with major focus on India- sex ratio of births, major health problems experienced by women and men, reproductive health of women and men in developing world, differentials in use of male and female methods of contraception; **Health infra-structure** and health care providers; Nutritional status, susceptibility to infections;
- **Major risk factors of men's health:** masculinity, alcoholism, tobacco and drug consumption, accident; **Gender and Sexuality:** Sexual health of men and women, gender dimension of HIV /AIDS; Gender and Infertility.

Unit III:(14 Lectures)
- **Gender and Development:** Understanding social structures- role of caste, class, ethnicity and religion and gender in health inequalities and health outcomes; Gender dimension of social development, status and role of men and women in household and community, culture, marriage

customs, dowry and bride price practices, age at marriage; Gender differentials in household headship and role in decision making; Gender differences in access to knowledge-, education, exposure to media and freedom of movements; Gender based violence- Domestic and community violence and gender, Legal aspects of domestic violence and rape.

Unit IV:(14 Lectures)
- **The concept of Gender Mainstreaming:** Historic overview of Gender Mainstreaming- Women in development (WID)-concept and criticism by feminist; shift to Gender and Development (GAD), Gender Mainstreaming and the Millennium Development Goals (MDGs); The rights approach to Health, sexual and reproductive rights, violence, human rights and health

Mode of Transaction: Lecture, class discussion, presentation
Suggested readings:
1. Basu, Alaka M., (1992): Culture, The Status of Women and Demographic Behaviour, Oxford University, New York.
2. Bhasin K. (1993). What is patriarchy?, Kali for Women Publishers, New Delhi.
3. Bhasin K. (2000). Understanding Gender, Kali for Women Publishers, New Delhi.
4. Dyson, Tim and Mick Moore, (1983). "On Kinship structure, female autonomy, and demographic behaviour in India", Population and Development Review vol. 9(1).

Course Title: Gender, Health and Development (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.559	-	-	4	2

Total Hour: 60 Hours
Course objective:
The student will benefit in understanding the relationship of gender and health.
Outcome: On completion of this course students will be able to use SPSS and STATA softwares for data tabulation and analysis.
Unit I
- Introduction to SPSS- facilities, creating database structure, data entry, specifying scales, validation of data entry, importing and exporting data. Data Manipulation–recoding creating new variable, sorting, filtering and selection of specific data, generating simple frequencies, use of syntax editor. Correlation and regression analysis– interpretation and regression diagnostic test.

Unit II:
- Introduction to STATA, generating, variables, commands and do file editor. Survey analysis – estimation of mean, proportion, design. Multivariate analysis–concepts and interpretation of results of multiple

regressions, logistic regression, ANOVA, with and without interaction. Survival analysis – Kaplan Meier, Cox regression -test of proportionality and heterogeneity.Introduction to GIS and illustration.

Evaluation criteria for Social and Demography Geography - Practical

Examination	Practical copy	Viva	Total
50	30	20	100

	L	T	P	Cr
Course Title: Geography of Forest				
Course Code: GEO.560	4	-	-	4

Total Hour: 60 Hours

Course Objectives:
The paper underlines the geography of forest and the spatial distribution of forest in India. Forest being an important resource the paper reflects policies in relation to conservation and management.

Outcome: After completion of this course students will have understanding of forests, its types and characteristics. They will be able to use recent applications of Remote Sensing and GIS in forest study.

Unit I:(14 Lectures)
- Concept of forest and forestry. Identification in types of forest and its characteristics, distribution of forest in India in relation to soil and climatic variation.
- Importance of forest resource; forest cover in India, Forest based industry, NTFP.

Unit II: (14 Lectures)
- Forest eco-system; Characteristic, feature and structures
- Concept of forest carbon index; contribution and policies

Unit III:(14 Lectures)
- Forest conservation and management policies in India; community forestry
- Incidence of forest fire and forest disturbances in India.

Unit IV:(14 Lectures)
- Application of Remote sensing and GIS in the forest study.
- Role of modern techniques in forest study and policy implementation.

Mode of Transaction: Lecture, class discussion, presentation

Suggested readings:
- Kumar, H.D. (2001), Forest resources: Conservation and management, New Delhi, Affiliated east-west press pvt ltd.
- Robinson, H. (1982), Biogeography, The English Language Book Society and Macdonald and Evans, London.

	L	T	P	Cr
Course Title: Geography of Forest (Practical)				
Course Code: GEO.561	-	-	4	2

Total Hour: 60 Hours
Course objective:
Forest management would be best understood in various techniques related to remote sensing and GIS. Thus the paper reflects various tools in identification and mapping changes in relation to forest.
Outcome: Students will be able to use satellite data and GIS techniques for mapping the various types of forests.
Unit I
- Application of Remote sensing and GIS in the forest study. Mapping of forest types through satellite data.

Unit II:
- Exercise in topographical measuring (transects, orientation, etc.) and in special survey and measure techniques concerning the terrain structure and the vegetation structure.

Evaluation criteria for Geography of forest - Practical

Examination	Practical copy	Viva	Total
50	30	20	100

Course Title: Urban System and Planning	L	T	P	Cr
Course Code: GEO.575	4	-	-	4

Total Hour: 60 Hours
Course Objectives and Expected Learning Outcomes:
The objective of the course are to develop an understanding of multiple theoretical perspectives on the city and to define, in multiple ways, the processes that constitute the city, its production. The students will also study various contemporary issues of urban areas from planning perspective. They will also understand the impact that urban policy of India has on cities.

Unit I:Nature and scope(14 Lectures)
- Theoretical perspective of urban geography;
- Urbanisation in India and world
- Characteristics of cities in different historical periods (both industrial and pre-industrial); Indian cities during British

Unit II: Urban Morphology and theory   (14 Lectures)
- Urban land use and functional morphology: functional areas and Peri-urban areas; Urban land use planning;
- Theories of urban structure (Burgess, Hoyt, Harris and Ullman, Mann, White).
- Concept of garden city; Neighbourhood unit

Unit III:Urban Issues and planning(14 Lectures)
- Urban problems: environmental, poverty, slums, transportation, housing, crime.
- Smart cities; Planned cities: Chandigarh and Jaipur
- Master Plans approach: A case study of Chandigarh.

Unit IV:Policies for urban planning(14 Lectures)
- Urban transportation: Evaluation of Urban Structure Transportation systems
- Management of Transportation system
- Transport policies
- National Urban Development Policy;
- Remote Sensing and GIS in urban planning.
- Urban Information system.

Mode of Transaction: The course will be taught with a combination of lectures, discussion, and presentations.

Suggested readings:
1. Bridge, B. and Watson, S. (eds.) (2000): A Companion to the City. Blackwell, Oxford.
2. Carter, H. (1995): The Study of Urban Geography. 4th ed. Reprinted in 2002 by Rawat Publications, Jaipur and New Delhi.
3. Dubey, K.K. (1976): Use and Misuse of Land in KAVAL Towns. National Geographical Society of India, Varanasi.
4. Dubey, K.K. and Singh, A.K. (1983): Urban Environment in India. Deep and Deep, New Delhi.
5. Dutt, A. Allen, K, Noble, G., Venugopal G. and Subbiah S. (eds.) (2003): Challenges to Asian Urbanisation in the 21st Century. Kluwer Academic Publishers, Dordrecht and London.

Additional readings:
1. Hall, P. (1992): Urban and Regional Planning. Routledge, London.
2. Hall, T. (2001): Urban Geography. 2nd edition. Routledge, London.
3. Haughton, G and Hunter, C. (1994): Sustainable Cities. Jessica Kingsley, London.
4. Jacquemin, A. (1999): Urban Development and New Towns in the Third World – A Lesson from the New Bombay Experience. Ashgate, Aldershot, UK.
5. Johnson, J.H. (1981): Urban Geography, Pergaman Press, Oxford.
6. Mayer, H. and Cohn, C. F. (1959): Readings in Urban Geography, University of Chicago Press, Chicago.
7. Paddison, R. (ed.) (2001): Handbook of Urban Studies. Sage, London.
8. Pacione, M. (2005): Urban Geography: A Global Perspective, Routledge, London and New York.
9. Ramachandran, R., (1991): Urbanisation and Urban Systems in India. Oxford University Press, Delhi.
10. Rao, B. P. and Sharma, N. (2007): Nagariya Bhoogol, Vasundhara Prakashan, Gorakhpur.
11. Singh. H. H. (1972): Kanpur: A Study in Urban Geography, Indrasini Publications, Varanasi
12. Singh, K. and Stainberg, F. (eds.) (1998): Urban India in Crisis. New Age International, New Delhi.
13. Singh, O. P. (1987): Nagariya Bhoogol, Tara Book Agency, Varanasi

14.   Singh, R.L. (1955): Banaras. A Study in Urban Geography. Nand Kishore and Brothers, Banaras.

15.   Singh, R.L. and Singh, Rana P.B., (eds.) (1979): Place of Small Towns in India. National Geographical Society of India, Varanasi,

16.   Singh, Rana P.B. and Rana, P.S. (2002): Banaras Region. Indica Books, Varanasi.

17.   Singh, S. B. (ed.) (1996): New Perspectives in Urban Geography. M.D. Publications, New Delhi.

Course Title: Urban System and Planning (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.576	-	-	4	2

Total Hour: 60 Hours

Unit I

- Base map preparation and elementary data analysis using GIS techniques.
- (Example: preparation of Base map of Bathinda city using 1:50,000 topographical sheet).
- Contents of base maps at various scales, notations – basic disciplines of maps: measurement of areas etc. Data requirement for urban and regional planning and various types of plans: sources of primary and secondary data, measurement scale and their application.
- Techniques of conducting surveys for land use, building use, density, structural condition of buildings, height of building.
- Basic principal and methods of image interpretation and techniques of data collection through satellite data.
- Preparation of urban land use classes for any one urban area; Techniques of graphical presentation of spatial data.
- Understanding and documenting Urban component such market place, organic and planned, residential districts, station areas, mill lands, urban villages, transport hubs etc

Evaluation criteria for Geography of Urban System and Planning Practical

Examination	Practical copy	Viva	Total
50	30	20	100

Semester IV

Course Title: Geographical Thoughts	**L**	**T**	**P**	**Cr**
Course Code: GEO. 523	4	-	-	4

Total Hour: 60 Hours

Course Objectives and Expected Learning Outcomes:

Aim of the course is to develop understanding of origins of geographic thoughts and their evolution, with emphasis on the philosophical and methodological standpoints of leading geographers from different countries. As a geographersit

is important to have an understanding of the theoretical traditions and contemporary lines of thought of the discipline. The students will learn about the different ways in which geography has been defined over time. Students will get clear understanding of the entire journey of Geography as a discipline from the past to present (and also how the nature of the discipline has been contested over time). Key issues that will play an important role in its future development will also be learnt.

Unit I: (14 Lectures)
- The field of Geography, its place in the classification of Sciences;
- Epistemology of geography;
- Evolution of Geographic Thought: Changing paradigms – Environmentalism, Possibilism, areal differentiation, spatial organisation.

Unit II: (14 Lectures)
- The Emergence of Modern Geography: Varenius, Kant, Humboldt and Ritter
- Concept of region, place and space;
- Critical assessment and debates on Spatial science, quantitative, qualitative revolution;

Unit III: (14 Lectures)
- Exceptionalism and the Schaefer-Hartshorne debate.
- Critical understanding of positivism,
- Behaviourism,
- Humanistic Geographies;

Unit IV: (14 Lectures)
- Feminist Geographies;
- Postmodernism and beyond,
- Changing methodologies of geography in a Globalising World.
- Progress and Contributions in Indian Geography;

Mode of Transaction:
The course is designed to engage the students in classroom and outdoor discussion activities and group work. The course will be taught using a combination of lectures, discussion, and presentations. Paper reading will also be done by the students.

Suggested readings:
1. Cresswell, Tim (2013) Geographic Thought: A Critical Introduction. Malden, MA: Wiley Blackwell
2. Dikshit, R. D. (2004): Geographical Thought. A Critical History of Ideas. Prentice-Hall of India, New Delhi.
3. Adams, P., Steven, H. and Karel, T. (eds.) (2001): Texture of Place. Exploring Humanistic Geographies. University of Minnesota Press, Minneapolis.
4. Anderson, K., Domosh, M., Pile, S. and Thrift, N. (eds.) (2003): Handbook of Cultural Geography. Sage Publications, London.
5. Barnes, T. and Gregory, D. (eds.) (1997): Readings in Human Geography:

The Poetics and Politics of Inquiry. Arnold, London.

6. Daniels, P., Bradshaw, M., Shaw, D. and Sidaway, J. (2000): An Introduction to Human Geography. Issues for the 21st Century. Prentice Hall, London.
7. Dear, M. J. and Flusty, S. (2002): The Spaces of Postmodernity: Readings in Human Geography. Blackwell Publishers, Oxford.
8. Doel, M. (1999): Poststructuralist Geographies. The Diabolical Art of Spatial Science. Edinburgh University Press, Edinburgh
9. Gaile, G. and Wilmott, C. (eds.) (2003): Geography in America at the Dawn of the 21st Century. Oxford University Press, Oxford and New York.

Course Title: Population & Settlement Geography	**L**	**T**	**P**	**Cr**
Course Code: GEO.572	4	-	-	4

Total Hour: 60 Hours

Course Objectives:
The course introduces population concepts and their importance. It explains how human population is distribute over earth surface and interacts with developmental process.

Outcome: After completion of this course students will be able to explain the concepts of population and settlement geography. They will have better understanding of theories of migration. An understanding of rural and urban settlement types will also be improved through this subject.

Unit I:(13 Lectures)
*   Population geography: Concepts, scope and methodology; Data sources;
*   Population dynamics: fertility and mortality
*   Concepts of ageing: young, stationary and stable population.

Unit II: **(14 Lectures)**
*   Migration: Concepts and pattern; types of migration and theories
*   Concept of mobility and migration, sources and quality of data, census definition of migrants and its limitations;
*   Millennium development goals and achievements with special reference to India.

Unit III:(14 Lectures)
*   Settlement Geography: Nature, scope and significance, concept of Site and situation.
*   Types of settlement: Clustered and dispersed.

Unit IV:(14 Lectures)
*   Rural Settlements: Definition and characteristics; Types and materials of farm fencing; Folk housing and folk architecture; Traditional building materials.
*   Urban Settlements: Definition and characteristics; Theory of Christaller; Functional classification of urban centres; Harris and Nelson; Morphological characteristics of urban settlements; Theories explaining

internal structure of cities: Sector, concentric zone and multiple-nuclei.

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching.

Suggested readings:
1. Ahmad, E. 1979. Social and Geographical Aspects of Geography of Human Settlements. New Delhi: Classical Publications.
2. Ambrose, P. 1970. Concepts in Geography; Settlement Patterns. London: Longmans.
3. Census of India, 1961. House Types and Settlement Patterns of Villages in India. New Delhi.
4. Chisholm, M. 1969. Rural Settlements and Land Use. London: Hutchinson.
5. Christaller, C. W. 1966. Central Places in Southern Germany. Englewood Cliffs N. J: Prentice Hall.
6. Clout, H. D. 1972. Rural Geography: Introductory Survey. Oxford: Pergamon.
7. Chisholm, M. (1962). Rural Settlements and Landuse, Hutchinson, London.
8. Ehrlich, P.R. and Ehrlich, A.H. (1996). Ecoscience: Population, Resources, Environment. 6th ed. W.H. Freeman and Company, San Francisco.

Course Title: DEC–Practice in Geography - I	**L**	**T**	**P**	**Cr**
Course Code: GEO. 573	2	-	-	2

Total Hour: 30 Hours

Course objective: The main aim of this course is to prepare students for the UGC-exam and other competitive exams.

Learning outcome: After completion of this course student will be able to solve subject specific problems/competitive exam questions in a better way.

Unit I
- Geomorphology
- Climatology
- Geographical Techniques

Unit II
- Geography of India
- Cultural, Social and Political Geography

Transaction mode: Discussion method and MCQs practice test (UGC previous years papers/other subject specific competitive exam papers will be used for this course.

Suggested readings:
- Singh, Surender (2009), Geography - For UPSC Civil Services Preliminary Examination Paperback, Tata mcgraw hill education.
- Siddhartha, K. (2017), Geography through maps, Kitab Mahal.

- Hussain, Majid (2016), Models in Geography, Rawat Publishers, Jaipur.

Course Title: DEC–Practice in Geography - II   **L**   **T**   **P**   **Cr**
Course Code: GEO. 574   2   -   -   2
Total Hour: 30 Hours
Course objective: The main aim of this course is to prepare students for the UGC-exam and other competitive exams.
Learning outcome: After completion of this course student will be able to solve subject specific problems/competitive exam questions in a better way.

Unit I
- Geography of Environment
- Oceanography
- Geographic Thought

Unit II
- Population and Settlement Geography
- Geography of Economic Activities and Regional Development

Transaction mode: Discussion method and MCQs practice test (UGC previous years papers/other subject specific competitive exam papers will be used for this course.

Suggested readings:
- Singh, Surender (2009), Geography - For UPSC Civil Services Preliminary Examination Paperback.
- Siddhartha, K. (2017), Geography through maps, Kitab Mahal.
- Hussain, Majid (2016), Models in Geography, Rawat Publishers, Jaipur.

Course title   Introduction to GNSS (VAC)   **L**   **T**   **P**   **Cr**
Course code   GEO.504   **1**   -   -   **1**
Total Hour: 15 Hours
Learning Outcome: The student will opt for courses that are provide at university level.

Unit I
Introduction to GNSS (Global Navigation Satellite System): Basic Concepts, Background, types and Application in various field.

Unit II
Introduction to GPS (Global Positioning System): Background, Component and uses in various field.

Unit III
Collections of GCPs (Ground Control Points): Hands on exercise using point, line and polygon.

Unit IV
Transfer of GCPs in system.

Mode of transaction: Lecture and hands on exercises. PPTs and materials provided to students.

Suggested Reading:
- Holfmann-wellenhof, B. ; Lichtenegger, H. ; Collins, J. ; Hofmann-wellenhof, B. (2013), GPS global positioning system: Theory and practice 5th edition, New Delhi, Springer (india) private limited.
- Van Sickle, Jan (2008), GPS for land surveyors, 3rd edition, London, Crc press.

Evaluation Criteria: Full Marks – 100

Course Title	Project		L	T	P	Cr
Course Code	GEO.599		-	-	-	**6**
Evaluation Criteria						
Continuous evaluation (out of 50)	**End semester presentation** (out of 50)					Total (out of 100)
	Literature Strength (out of 10)	Organization of content (out of 10)	Presentation (out of 20)		Discussion (out of 10)	

Elective courses III: Select any one elective course and its respective practical course from the followings:

Course Title: Photogrammetry   L   T   P   Cr
Course Code: GEO.577   4   -   -   4
Total Hour: 60 Hours
Course Objectives and outcome:
This course introduces photogrammetry as a data acquisition tool, and provides a general overview of its theory and working principles. Students will gain the ability to extract data from aerial photography.

Unit I:(14 Lectures)
- Photogrammetry: Definition and Categories ii. Historical Background: Early Developments in Aerial
- Surveying and Mapping; Problems of Aerial Photogrammetry; Application of Photogrammetry.

Unit II: **(14 Lectures)**
- Aerial photos: types, scale, resolution; Geometric properties of aerial photos; Stereoscopy; Stereoscopic parallax; Relief displacement. Calculation of Height of Objects on Vertical Aerial Photograph.

Unit III:(14 Lectures)
- Interpretation keys and their types; Aerial mosaics; Multi-spectral aerial photographs; Ground control for mapping from aerial photos; Rectification methods in aerial photos.

Unit IV:(14 Lectures)

- Aerial photo interpretation in general resource evaluation; Geomorphic studies and mapping. Land use/Land cover mapping; Ortho-photos and Contour Extraction; Applications and limitation of Aerial Photography.

Mode of Transaction: The course will be taught with a combination of lectures, discussion, and presentations.

Suggested readings:

1. Cracknell, A. and Ladson, H (1990): Remote Sensing Year Book. Taylor and Francis, London.
2. Curran, P.J. (1988): Principles of Remote Sensing. ELBS Longman, Essex, U.K.
3. Deekshatulu, B.L. and Rajan, Y.S. (ed.) (1984): Remote Sensing. Indian Academy of Science, Bangalore.
4. Floyd, F. S. Jr. (1997): Remote Sensing: Principles and Interpretation. W.H. Freeman, New York.
5. Hallert, B. (1960): Photogrammetry. McGraw Hill Book Company. Inc. New York
6. Leuder, D.R. (1959): Aerial Photographic Interpretation: Principles and Application, McGraw Hill, New York.
7. Jensen, John R. Remote sensing of the Environment – An Earth Resource Perspective, Pearson Education, 2000.
8. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. 4th ed. John Wiley and Sons, New York.
9. Pratt W.K. Digital Image Processing, Wiley, New York, 1978.

Course Title: Photogrammetry (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.578	-	-	4	2

Total Hour: 60 Hours

Course objective and outcome:
The course will develop understanding of image interpretation and information extraction from Arial photographs and determination of height of objects.

Unit I
- Stereoscopy; Stereoscopic parallax; Relief displacement. Calculation of Height of Objects on Vertical Aerial Photograph; Identification of objects and features; Determination of height of objects from single photographs.

Unit II:
- Preparation of thematic maps on lithology and structure, Land use/ Land cover, Hydrogeomorphic mapping.

Mode of Transaction:

Evaluation criteria for Photogrammetry

Examination	Practical copy	Viva	Total
50	30	20	100

Course Title: Digital Image Processing & Information Extraction	**L**	**T**	**P**	**Cr**
Course Code: GEO.579	4	-	-	4

Total Hour: 60 Hours

Course Objectives and outcome:

This course will introduce fundamental technologies for digital image processing, information extraction, information analysis, and processing. Students will gain understanding of analytical tools, and implementations of various digital image applications.

Unit I:(13 Lectures)
- Introduction to Digital Image Processing & Information Extraction
- Digital Data Formats; Image Rectification–I
- (Radiometric and Atmospheric Correction Techniques)
  Image Rectification–I
- (Geometric Correction Techniques)

Unit II: **(13 Lectures)**
- Image enhancement techniques–I
- (Linear and non-liner contrast stretching)
  Image enhancement techniques - II
- (Image filtering–Low pass, high pass, edge enhancement & detection
- filters)

Unit III:(13 Lectures)
- Image Transformation
- (Spectral rationing, density slicing, Principal Component analysis etc.)

Unit IV:(13 Lectures)
- Information Extraction–I
- (Unsupervised/Supervised and Hybrid classification techniques)
   Information Extraction–I
- (Accuracy Assessment and integration with GIS)

Mode of Transaction: The course will be taught with a combination of lectures, discussion, and presentations.

Suggested Readings:

1. Black, P.E. (1991): Watershed Hydrology, Prentice Hall, London
2. Michael, A.M. (1992): Irrigation Engineering, Vikas Publishing House
3. Murty, J.V.S. (1998): Watershed Management, New Age International, New Delhi
4. Murthy, J.V.S. (1994): Watershed Management in India, Wiley Eastern, New Delhi
5. Purandare, A.P. and Jaiswal, A.K. (1995): Waterhed Development in India, National Institute of Rural Development, Hyderabad
6. Vir Singh, R. (2000): Watershed Planning and Management, Yash Publishing House, Bikaner

Course Title: Digital Image Processing & Information Extraction (Practical)	**L**	**T**	**P**	**Cr**
Course Code: GEO.580	-	-	4	2

Total Hour: 60 Hours

Course objective and outcome:

Through this course students will gain knowledge and practical experience in digital image processing.

Unit I
- Image Rectification, Image enhancement and Image transformation

Unit II:
- Information Extraction–I
- (Unsupervised/Supervised and Hybrid classification techniques) Information Extraction–I
- (Accuracy Assessment and integration with GIS)

Evaluation criteria for Digital Image Processing & Information Extraction Practical

Examination	Practical copy	Viva	Total
50	30	20	100

Course Title: Watershed Management	**L**	**T**	**P**	**Cr**
Course Code: GEO.581	4	-	-	4

Course Objectives and outcome: This course helps the students to understand the fundamental concepts of watershed management. After completion of this course students will be able to explain the concepts of watershed management. They will understand various approaches of watershed management and application of tools for the management.

Unit I: Fundamental of Watershed management   (14 Lectures)
- **Fundamentals of Watershed Management**
- Introduction and Basic Concepts of watershed and watershed management, Watershed management policies and decision making
- Sustainable Watershed Approach and Practices: natural resources management, agricultural practices, integrated farming, Soil erosion and conservation; conjunctive use of water resources, rainwater harvesting; roof catchment system, Watershed Management Practices in Arid and Semiarid Regions

Unit II: Managing Water Resources(14 Lectures)
- Management of Water Quality: Water quality and pollution, types and sources of pollution, water quality modelling, environmental guidelines for water quality
- Drought Management: Drought assessment and classification, drought analysis techniques, drought mitigation planning
- Water Conservation and Recycling: Perspective on recycle and reuse, Waste water reclamation

Unit III: Social approach in watershed Management(14 Lectures)
- Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy,

Integrated development, Water legislation and implementations, Case studies

Unit IV: Application of tools   (14 Lectures)
- Use of modern techniques in watershed management: Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching.

Suggested readings:
1. Harry, C.A. (ed.) (1987): Digital Image Processing. IEEE Computer Society, California.
2. Hord, R.M. (1982): Digital Image Processing of Remotely Sensed Data. Academic Press, New York.
3. Jensen, J.R. (1986): Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice-Hall, Englewood Cliffs, New Jersey.
4. Jensen, J.R. (2004): Remote Sensing of the Environment: An Earth Resource Perspective. Prentice-Hall, Englewood Cliffs, New Jersey. Indian reprint available.
5. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
6. Nag, P. (ed.) (2000): Thematic Cartography and Remote Sensing. Concept Publishing. Company, New Delhi.

Course Title: Watershed Management (Practical)	L	T	P	Cr
Course Code: GEO.582	-	-	4	2

Total Hour: 60 Hours

Unit I
- Use of modern techniques in watershed management: Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.

Unit II:
- Demarcation of watershed boundary and Morphometric analysis.

Evaluation criteria for watershed management Practical

Examination	Practical copy	Viva	Total
50	30	20	100

Course title: Advanced urban and regional planning   L   T   P   Cr
(Theory)

Course code: GEO.583   4   -   -   4
Total hour: 60
Course objective: to introduce concept, theory, models and to explore the role of remote sensing and GIS for urban and regional planning. To develop student as urban and regional planning professionals for competitive global job opportunities.
Learning outcome:
- Student will be proficient to comprehend concept, theory, models of urban and regional planning.
- Competent to investigate the use of geoinformation science for urban and regional planning
  at national to global context.
- Student will be professional to carry out independent research on contemporary urban and regional planning challenges.

Unit I: Introduction to Urban Planning
(15 lectures)
- Urban planning concept, theory and scope
- Urban planning instruments
- Urban planning metaphors
- Urban planning policy, institutions and governance
- Contemporary urban planning challenges: Indian and beyond

Unit II: Introduction to advanced urban planning
(15 lectures)
- Spatial planning
- Smart city planning
- Transportation planning
- Integrated land use and transportation planning
- Disaster and climate resilient city planning

Unit III: Introduction to Regional Planning
(15 lectures)
- Concept, definition, types and methods of delineation of region
- Regional planning theory, methods and models
- Types of planning region and its delineation methods
- Regional planning policy, institutions and governance
- Contemporary regional planning challenges: Indian and beyond

Unit IV: Introduction to geoinformation science for urban and regional
planning   (15 lectures)
- Introduction to data sources in urban and regional planning
- Introduction to remote sensing and machine learning in urban and regional planning
- Introduction to GIS and Spatial Decision Support System in urban and regional planning
- Introduction to open source software and programming languages in urban and regional planning

- Introduction to database management system and GIS models in urban and regional planning

Mode of Transaction: methods of transaction are lecture, audio-video, discussion which will be followed in teaching using ppt, social media etc.

Mode of evaluation:

Total marks: 100, **Theory examination:** 70, **Assignment and presentation:** 30 (20+10)

Suggested readings:

Mishra, R.P. (2002).*Regional Planning.* New Delhi, Concept Publishing Co.

Chandna R.C.(2016). *Regional Planning and Development(6th eds).* Ludhiana, Kalyani Publishers.

Boyko, T. C., & Cooper, R.(2011).Clarifying and re-conceptualising density, *Progress in Planning* 76, 1–61.

Singh et al.(2014).Measuring transit oriented development: a spatial multi criteria assessment approach for the City Region Arnhem and Nijmegen, *Journal of Transport Geography, 35,* 130-143.https://doi.org/10.1016 /j.jtrangeo.2014.01.014

Jabareen, Y. R.,(2006). Sustainable Urban Forms : Their Typologies, Models, and Concepts, *Journal of Planning Education and Research,* 26: 38-52.

Cheng, J.& Masser, I., (2003).Urban growth pattern modeling: a case study of Wuhan city, PR China*, Landscape and Urban Planning,* 62, 199–217.

Course title: Advanced urban and regional planning (practical)   L   T   P   Cr

Course code: GEO.584   -   -   4   2

Total hour: 60

Course objective: to introduce concept, theory, models and to explore the role of remote sensing and GIS for urban and regional planning. To develop student as urban and regional planning professionals for competitive global job opportunities.

Learning outcome:
- Student will be proficient to comprehend concept, theory, models of urban and regional planning.
- Competent to investigate the use of geoinformation science for urban and regional planning
  at national to global context.
- Student will be professional to carry out independent research on contemporary urban and regional planning challenges.

Unit I: Data mining in urban and regional planning
(15 lectures)
- Satellite and ancillary data mining for urban and regional planning
- Mapping land use/cover and others base layers using GIS and machine learning
- Uncertainty analysis in mapping of land use/cover and others base layers

Unit II: Advanced urban planning

(15 lectures)
- Urban land use/cover change modelling and analysis
- Mapping and analysis of urban morphology, green infrastructure and deprived area
- GIS-based network analysis for transportation planning
- Risk-based urban land use planning

Unit III: Advanced regional planning
(15 lectures)
- Delineation of formal and functional region
- Delineation of growth pole/centre based on central place model
- Spatial interaction modelling based on gravity and potential model
- Planning and management of urban and rural watershed

Unit IV: Case Study
(15 lectures)
- Project assignment
- Seminar

Mode of Transaction: methods of transaction are lecture, audio-video, discussion which will be followed in teaching using ppt, social media etc.

Mode of evaluation:
Total marks: 100, **Theory examination:** 70, **Assignment and presentation:** 30 (20+10)

Suggested readings:

Mishra, R.P. (2002).*Regional Planning.* New Delhi, Concept Publishing Co.

Chandna R.C.(2016). *Regional Planning and Development(6th eds).* Ludhiana, Kalyani Publishers.

Jones, B.(2014).Assessment of a gravity-based approach to constructing future spatial population scenarios, Journal of Population Research, 31, 71–95. DOI 10.1007/s12546-013-9122-0.

Boyko, T. C., & Cooper, R.(2011).Clarifying and re-conceptualising density, *Progress in Planning* 76, 1–61.

Singh et al.(2014).Measuring transit oriented development: a spatial multi criteria assessment approach for the City Region Arnhem and Nijmegen, *Journal of Transport Geography, 35,* 130-143.https://doi.org/10.1016 /j.jtrangeo.2014.01.014

Jabareen, Y. R.,(2006). Sustainable Urban Forms : Their Typologies, Models, and Concepts, *Journal of Planning Education and Research,* 26: 38-52.

Cheng, J.& Masser, I., (2003).Urban growth pattern modeling: a case study of Wuhan city, PR China*, Landscape and Urban Planning,* 62, 199–217.

	L	**T**	**P**	**Cr**
Course Title: IDC- Food Security	2	-	-	2
Course Code: GEO.511				
Total Hour: 30 Hours				

Course objective: The main aim of this course is to provide students the basic understanding of food security concept and its various dimensions.

Learning outcome: After completion of this course students will be able to explain the basic concepts of food security, its dimensions and methods of measurements. They will have a better understanding of world patterns of food security; the inter-relationship with sustainable agriculture and climate change.

Unit I
- Food security: Definitions, Dimensions and Historical Development
- Approaches – Household and Livelihood
- Methods of Measurement – FAO food balance sheet, Household income and expenditure surveys.

Unit II
- Concept of Poverty, Hunger and Malnutrition
- World pattern of food security

Unit III
- Sustainable Agriculture and Food Security
- Climate Change and Food Security

Unit IV
- Millennium and Sustainable Development Goals
- Food Security Policy in India with special focus on Public Distribution System and Food Security Act, 2013.

Transaction mode: Lectures, discussion and presentation methods will be used for teaching.

Suggested readings:
1. Asian Development Bank Agricultural, Food Security and Rural Development, Oxford University Press, New Delhi, 2010
2. Clay, E. (2002): Food Security: Concepts and Measurements", Paper for FAO Export Consultation on Trade and Food Security, Rome.
3. Food Insecurity Atlas of Rural India (2001) MS Swaminathan Research Foundation and World Food Programme.
4. FAO, WFP and IFAD. 2017. The State of Food Insecurity in the World 2017. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition, Rome, FAO.
5. Von Braun , J. Agriculture, food security, nutrition and the Millennium Development Goals (Annual Report Essay) . Washington, D.C: Washington, D.C, 2004. 88 p.

Suggested websites:
Food and Agriculture Organisation (http://www.fao.org)
World Food Programme (http://www.wfp.org)
World Bank (http://www.worldbank.org/)
MS Research Foundation, India (https://www.mssrf.org/)

Course Title: IDC- Introduction to Climate Change   L   T   P   Cr

Course Code: GEO.512   2   -   -   2

Total Hour: 30 Hours

Course objective: The course aims to help anybody to understand climate change and what it means for them and the world.

Learning outcome: After completing the course, student will be able to:
- Explain what climate change is.
- Identify the main drivers of climate change.
- Describe how they plan to adapt to the negative (or positive) impacts of climate change.
- Identify ways to plan climate actions.
- Explain how climate negotiations work.
- Formulate a climate project or policy.

Unit I: Introduction to Climate Change Science(6 Lectures)
- Introduction to Climate Change Science
- Fundamental feedbacks in the Climate System
- Natural & Anthropogenic Drivers of Climate Change

Unit II: Climate Change Impacts at Global Scale   (8 Lectures)
- Observed (in past & present) evidence & projected trends of Climate Change
- Carbon cycle feedbacks&Changes in atmospheric greenhouse gases
- Extreme weather&Modern surface temperature trends
- Introduction to live case studies from global agency datasets (e.g. NASA/ EGU/UN/WHO/IPCC/ISRO/JAXA)

Unit III: Climate Change Impacts at National to Local Level (8 Lectures)
- Ecosystems and biodiversity
- Glacier melting, impacts on regional water balance and food resources
- Sea level rise and coastal impacts
- Human health impacts
- Introduction to live case studies from national to local level agency datasets (ISRO/PRL/IITM/IMD/NCOSS etc.)

Unit III: What Is Our Path Forward?   (8 Lectures)
- Millennium and Sustainable Development Goals
- Geoengineering: A scientist's perspective
- Emissions reductions and scenarios, stabilizing CO2 concentrations
- Solution at local to global scale, its approaches & policies: A path of hope

Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Local field visit discussion. Tools used: PPT, video, animation movie, whatsapp and Expert's Video Conferencing lectures from various national & international organizations

International to National to Local reachability: The course will have wider reachability from local to international level to understand the today's most dreadful problem of the world and our contribution to curb this at our maxima potential.

Suggested Readings:

- IPCC, (2013): Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.
- Kininmonth, William. (2004). Climate Change: A Natural Hazard. Brentwood: Multi-Science Pub. Co.
- Letcher, T. M. (Trevor M.). Climate Change: Observed Impacts on Planet Earth.
- Lovejoy, Thomas E., and Lee Hannah (2019). Biodiversity and Climate Change: Transforming the Biosphere. Biodiversity and Climate Change: Transforming the Biosphere. Yale University Press.
- Maslin, Mark (2014). Climate Change: A Very Short Introduction. Climate Change: A Very Short Introduction. Oxford University Press. doi:10.1093/actrade/9780198719045.001.0001.