BANKURA UNIVERSITY

CBCS SYLLABUS

for

M.Sc in Geo-Informatics

(Two Year Semester System)

w.e.f.

July, 2018

BANKURA UNIVERSITY

BANKURA

WEST BENGAL

PIN 722155

Syllabus for M.Sc in Geo-informatics

Division of Marks

SEM I: 250
SEM II: 300
SEM III: 350
SEM IV: 300

Structure of the syllabus (Semester I)

Sl. No.	Paper code	Name of the Paper	Marks			Credit
			Final Exam	Internal Assignment	Total	
1	GI 101T	Basics of Earth System &Remote sensing	40	10	50	4
2	GI 102T	Principle of Information Science & Computer Networking	40	10	50	4
3	GI 103P	Applied Statistics and computation	40	10	50	4
4	GI 104P	Computer Basic Programming	40	10	50	4
5	GI 105IA	Assignment (15), Seminar Presentation (25), Teacher's Assessment (10)	40	10	50	4
6	106CF	Communicative English and Personality Development				
Total			**200**	**50**	**250**	**20**

Structure of the syllabus (Semester II)

Sl. No.	Paper code	Name of the Paper	Marks			Credit
			Final Exam	Internal Assignment	Total	
1	GI 201T	Photogrammetry and Digital Image processing	40	10	50	4
2	GI 202T	Introduction to Geographical Information System & spatial modelling	40	10	50	4
3	GI 203T	Thermal, Microwave Remote Sensing and Application	40	10	50	4
4	GI 204P	Digital Image Processing	40	10	50	4
5	GI 205P	Digital Photogrammetry	40	10	50	4

6	GI 207IA	Assignment (15), Seminar Presentation (25), Teacher's Assessment (10)	40	10	50	4
7	206EF	Value Education and Human Rights				
Total			**200**	**50**	**300**	**24**

Structure of the syllabus (Semester III)

Sl. No.	Paper code	Name of the Paper	Marks			Credit
			Final Exam	Internal Assignment	Total	
1	GI 301T	Database Management System, GNNS and GPS	40	10	50	4
2	GI 302T	Research Methods and Methodology	40	10	50	4
Major Elective (any one)						
3	GI 303EA	Geo-Informatics for resource and disaster management	40	10	50	4
4	GI 303EB	Urban Development and Utility management	40	10	50	4
5	GI 303EC	Remote Sensing for forest Management	40	10	50	4
6	GI 304EAP/ GI 304EBP	Practical project on Major elective	80	20	100	8
7	GI 306P	GIS and GNNS	40	10	50	4
8	GI 307P	Surveying and Field work	40	10	50	4
Minor Elective						
8	GI 305EID A	Application of Spatial Science for Community Development	25	0	0	2
9	GI 305EID B	Remote Sensing and natural resource development	25	0	0	2
Total			**280**	**70**	**350**	**28**

Structure of the syllabus (Semester IV)

Sl. No.	Paper code	Name of the Paper	Marks			Credit
			Final Exam	Internal Assignment	Total	
1	GI 401P	Grand Viva	50	0	50	4
2	GI 402P	Internship	0	0	100	8
3	GI 403P	Research Project	100	0	100	8
5	GI 404IA	Assignment (15), Seminar Presentation (25), Teacher's Assessment (10)	40	10	50	4
Total			**180**	**10**	**300**	**24**

Semester I

Basics of Earth System & Remote sensing

Course Code: GI 101T

Unit-1 Basic of Earth System

1.1 Understanding Earth, its Bio-physical components, Energy systems, Geo-Bio-chemical systems, Earth process; energy types; transform and interactions
1.2 Different Component of Earth: Lithosphere, Hydrosphere and Atmosphere
1.3 Terminology of earth System: Size, shape, orbit, rotation and space & time component
1.4 Concept of earth coordinate, spheroid, datum and UTM projection system, topographical map

Unit-2: Principle of Remote Sensing and Aerial photograph

2.1 Process and function of RS, Fundamental law in RS (Source of energy, radiation law, Stefan-Boltzman law, Wien's law, Kirchhoff's law etc.)
2.2 Basic Concept in RS: EMR, EMS, Sensor-Resolution (Spatial, Spectral, Radiometric and Temporal), Atmospheric window, spectral signature etc.
2.3 Principle of photography (Scale, resolution, projection, flight plan, overlap)
2.4 Types of photography, elements of photography, Type of aerial camera, stereoscopic viewing

Unit-3:Sensor, Platform and satellite programme

3.1 Sensor system: Framing and Scanning system, Whiskbroom scanner, Push-broom scanner, side looking scanner, hyper spectral scanning and imaging
3.2 Types and quality of sensor: Imaging and non-imaging, active and passive
3.3 Concept of Remote Sensing Platform: Types of platform, Orbital Characteristics: Coverage, passes, pointing accuracy, Geostationary, sun synchronous, Semi-synchronous orbit and Quasi-zenith satellite orbit
3.4 Satellite programme in the world, fundamental elements (Escape velocity, orbit, data product and their types), importance of satellite programme

Reference books

1. Lilesand and Keifer (2000), Introduction to Remote sensing and Image Interpretation; John Willy & sons Ltd., New York
2. James B. Campbell (1996), Introduction to Remote Sensing; Taylor & Francis, London
3. Joseph George (2004), Fundamentals of Remote Sensing; Universities Press (India) Pvt.
4. Hayesm L. (1991), Introduction to Remote Sensing; Taylor and Fransis, London
5. Paul. J. Gibson (2000), Introductory to Remote Sensing; Taylor & Francis, London
6. Steers J.A. (1955), The Unstable Earth, Methuen & Co
7. Selby M.J. 91985), Earth's Changing Surface, Oxford
8. Sarkar Ashis (2008), Practical Geography, A Systematic Approach, Orient BlackSwan

Principle of Information Science & Computer Networking

Course Code: GI 102T

Unit-1: Preface to Computer

1.1 Exploring computers and their uses: computers for individual users, computers for organizations, parts of a computer system, role of computer users

1.2 Processing Data: difference between data and information, how computers process data, factors affecting processing speed, modem CPUs

1.3 Operating system and number representation: OS Functions and service, Windows, number system (bit & byte), binary number, octal number

1.4 Networks: networking basics, uses of a network, types of networks: LAN & WAN, hybrid networks, server-based networks, client/server networks, peer-to-peer networks, network topologies and protocols

Unit-2: Introduction to Information technology

2.1 Meaning, scope and development of Information Technology

2.2 Concept and overview of Information system

2.3 Components of Information System

2.4 Information design, analysis and management

Unit-3:OS & Number System

3.1 Work of OS

3.2 Working principle of OS

3.3 Interaction between OS and Application system

3.4 Number System

Reference books

1. John L. Hennesy and David A. Patterson (2004), Patterson Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann
2. O'Brier, J.A. (1999), Management Information Sysytem, Irwin –McGraw Hill
3. Harold Abelson et al. (1996), Structure and Interpretation of Computer Programme, MIT Press
4. Turban E. Et al (2000), Introduction to Information Technology
5. Laurini R. (2001), Information System for Urban Planning: A Hypermedia Co-Oparative Approach, Taylor Francis London and New York

Applied Statistics and Computation

Course Code: GI 103P

Unit-1: Basic of Applied Statistics

1.1 Data Collection: Primary and Secondary data, collection of data and frequency distribution. Relative and percentrelative frequencies, discrete and cumulative frequency distribution

1.2 Data type and representation: Continuous and discrete data, frequency diagrams. Graphicalrepresentation of data

1.3 Concept of Sets and Subsets, Sequences, Operations on Sets; Counting sequences, and subsets (permutations and combinations)

1.4 Algorithms and Psudocode: Induction and Recursion: Division in the integers: Matrices

Unit-2: Descriptive Statistics

2.1 Measurement of central tendency, Mean, Mode, Median, Geometric mean and Harmonic Mean

2.2 Measures of variations - Range, Quintile deviations, Mean deviation, Standard deviation and variance, Coefficient of variations

2.3 Probability concepts - Additions and multiplication laws, Basic problems on these laws

2.4 Concept of random variables and probability distribution.

Unit-3: Correlation&Regression Analysis and Sampling

1.1 Introduction to correlation: Karl Pearson's Coefficient of Correlation, Auto Correlation

1.2 Introduction to regression: Linear regression analysis; Curve fitting concept of multiple regression analysis

1.3 Theory of Sampling - Meaning of a sample, Universe, static and parameters. Sampling distribution, standard error

1.4 Different sampling techniques: scruple random sample, standard random sample, systematic, cluster and multi-storage sample

Reference books

1. Venables, W.N., Ripley, B.D (2002), Modern Applied Statistics with S (Statistics and Computing), Springer
2. Gupta S.C and V.K. Kapoor (2014), Applied Statistics and Mathematical Statistics, Sultan Chand & Son
3. Roger S. Bivand and EdzerPebesma (2013), Applied Spatial Data Analysis with R, Springer
4. Peter A Rogerson (2013), Statistical Methods for Geography: A Student's Guide, SAGE
5. Sarkar Ashis(2013), Quantitative Geography: Techniques and Presentations, Orient Blackswan

Computer Basics and Programming

Course Code: GI 104P

Unit-1: Computer Basics

1.1 Window, OS, Paint, Notepad
1.2 Microsoft Excel
1.3 Microsoft Word and Power Point
1.4 Microsoft Access

Unit-2: Programming language

2.1 Basic Concept of Programming Assemblers, Compiler, principle of programming
2.2 Programme Construction: Flowchart, algorithms, pseudo codes, data structure
2.3 Approach to programming (top-down, bottom-up and divide & Conquer) Modular programming
2.4 Programming vs. Customization

Unit-3:Hands-on Programming

3.1 Basic programming with C
3.2 Basic programming with C++
3.3 Basic programming with Python
3.4 Advanced programming concepts

Reference books

1. Balagurusamy E (2001), Programming in Basic, McGraw Hill Education
2. Xavier C. (2008), Introduction to Computers and Basic Programming, New Age
3. Thareja Reema (2016), Computer Fundamentals and Programming in C, Oxford University Press
4. Dey Pradip (2013), Computer Fundamentals and Programming in C, Oxford University Press
5. Rao R. Nageswara (2018), Core Python Programming, Dreamtech Press
6. Namdev Kamthane Ashok (2017), Programming and Problem Solving with Python, McGraw Hill Education
7. Sheetal Taneja (2017), Python Programming: A modular approach by Pearson, Pearson Education
8. Mueller John Paul (2016), Machine Learning (in Python and R) For Dummies, Wiley

Semester II

Photogrammetry and Digital Image Processing

Course Code: GI 201T

Unit-1: Basic of Photogrammetry

1.1 Types of photogrammetry, image acquisition (from aerial& satellite platform)

1.2 Image acquisition from satellite platform, geometric distortion in imagery

1.3 Principle and disciplines of photogrammetry, Geometry and scale of aerial photograph

1.4 Principles of stereoscopic vision, stereoscopic 3D viewing, lens stereoscope, mirror stereoscope

Unit-2: Pre-processing and Enhancement

2.1 Satellite data encoding and decoding, modulation, acquisition, storage and retrieval, generation of digital data formats

2.2 Image processing (Pre-processing), Image correction (radiometric, geometric correction and image enhancement)

2.3 Image Enhancement

2.4 Concept of parallax

Unit-3:Image transformation and processing

3.1 Image transformation (PCT, FT, CST, fusion, Indices)

3.2 Image classification (Supervised & Unsupervised)

3.3 Accuracy assessment (Kappa test, Contingency Matrix)

3.4 Post classification processing (Filtering and vectorization)

Reference books

1. Lilesand and Keifer (2000), Introduction to Remote sensing and Image Interpretation; John Willy & sons Ltd., New York
2. James B. Campbell (1996), Introduction to Remote Sensing; Taylor & Francis, London
3. Joseph George (2004), Fundamentals of Remote Sensing; Universities Press (India) Pvt.
4. Hayesm L. (1991), Introduction to Remote Sensing; Taylor and Fransis, London
5. Paul. J. Gibson (2000), Introductory to Remote Sensing; Taylor & Francis, London

Introduction to Geographical Information System & spatial modelling

Course Code: GI 202T

Unit-1: History and Principle of Geographical Information System

1.1 Definition, scope and subject matter of Geographical Information System (GIS), basic concept of GIS: Geographical space, spatial data and information

1.2 Components of GIS, Variables-point, lines, polygon, Functionality of GIS

1.3 Spatial data modelling (Raster and Vector), TIN, DEM, DTM, topology etc

1.4 Application and Limitation of GIS

Unit-2: Data Management in GIS

2.1 Data Capture and processing: Source of data, collection methods, topology, transformation, correction and accuracy

2.2 Data manipulation and Analysis: Basic spatial operations-vector and raster based point, line and area analysis: DEM

2.3 Proximity analysis, buffer, near and Thiessen polygon, GIS layer extraction, comparison of vector- and raster based data analysis (hillshade, viewshade, subtraction, interpolation)

2.4 Concept of Boolean algebra, introduction to overlay in GIS, topological and graphical overlay, dissolve analysis

Unit-3:GIS Modelling for decision support

3.1 Model of spatial processes: Conceptual model, mathematical model, models of physical and environmental process

3.2 Digital cartography: Concept, advantage and disadvantage, dynamic/Interactive Cartography, VRML, hyper maps, Open GIS: Implementation-generic and knowledge based mapping, Inter-operable and Entrepreneur GIS

3.3 2D and 3D Visualisation of geospatial data

3.4 Digital mapping: Cartographic design, Visual Variables, Map Lettering, Map Completions, Generalization, Map composition, Multivariate and Dynamic Mapping and Map projection

Reference books

1. BhattaBasudeb (2011), Remote Sensing and GIS, Springer
2. Kang-tsung Chang (2002), Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi.
3. C.P.Lo and Albert K.W.Yeung (2005), Concepts and Techniques of Geographic Information Systems" Prentice Hall of India,New Delhi.
4. Burrough, Peter A. and Rachael McDonnell (1998),' Principles of Geographical Information Systems, Oxford University Press, New York.
5. Magwire, D. J., Goodchild, M.F. and Rhind, D. M. Ed. (1991), Geographical Information Systems: Principles and Applications', Longman Group, U.K.

Thermal, Microwave Remote Sensing and Application

Course Code: GI 203T

Unit-1: Concept of thermal energy

1.1 Atmospheric interaction
1.2 Black body radiation and related concept (radiant Vs kinetic temperature)
1.3 Thermal remote sensing sensor
1.4 Concept of thermal imaging

Unit -2: Basic of Microwave Remote Sensing (RS)

2.1 Passive Microwave RS
2.2 Principle of active microwave RS (RADAR)
2.3 Viewing geometry, spatial resolution, RAR, SAR
2.4 Geometric and sensor properties of RADAR (polarization, speckle, layover, foreshortening, RADAR shadow, surface roughness, electric properties)

Unit-3: Processing of thermal and microwave image

3.1 Visual interpretation, temperature mapping, multispectral thermal image interpretation
3.2 Visual interpretation of RADAR Image
3.3 Calibration and processing of RADAR image
3.4 Application of thermal and microwave Remote Sensing

Reference books

1. BhattaBasudeb (2011), Remote Sensing and GIS, Springer
2. Tang Huajun and Zhao-Liang Li (2014), Quantitative Remote Sensing in Thermal Infrared (Springer Remote Sensing/Photogrammetry), Springer
3. Woodhouse H, Iain (2005), Introduction to Microwave Remote Sensing, Taylor& Francis
4. Lillesand, Kiefer &Chipman (2011), Remote Sensing and Image Interpretation, Wiley
5. George Joseph &C. Jeganathan (2018), Fundamentals of Remote Sensing, Universities Press

Digital Image Processing

Course Code: GI 204P

Unit-1: Pre-processing and Enhancement

1.1 Radiometric corrections
1.2 Geometric corrections (Image to image and image to ground)
1.3 Brightness and contrast enhancement
1.4 Image filtering techniques

Unit-2: Image transformation

2.1 Arithmetic operation (image subtraction, addition, multiplication)
2.2 Image Index (Vegetation, NDVI, SAVI, Built up, mineral exploration)
2.3 Colour space transformation (PCT, furrier transformation)
2.4 TCT (crop growth, image fusion)

Unit-3: Image Classification

3.1 Basic supervised and unsupervised classification
3.2 Index image and change image classification
3.3 Multi-temporal image classification
3.4 Accuracy Assessment, post classification, filtering and vectorization

Reference books

1. Lillesand, Kiefer &Chipman (2011), Remote Sensing and Image Interpretation, Wiley
2. George Joseph &C. Jeganathan (2018), Fundamentals of Remote Sensing, Universities Press
3. Gonzalez (2016), Digital Image Processing 3e, Pearson
4. Jayaraman S., Veerakumar T & Esakkirajan S. (2017), Digital Image Processing, Tata Mcgraw Hill Education private Limited

Digital Photogrammetry

Course Code: GI 205P

Unit-1: Digital stereo model

1.1 Non-orientation DSM
1.2 Orientation DSM
1.3 Accuracy of DSM
1.4 Handling 3D cursor with 3D mouse

Unit-2: Photogrammetric Application

2.1 3D vector collection
2.2 DEM and contour creation
2.3 Orthorectification
2.4 3D scene modelling

Unit-3: Application of UAV (Drone) in Digital Photogrammetry

3.1 Planning and execution of photographic flight and flight planning from UAV
3.2 Data transformation and mosaicking
3.3 Block triangulation and DSM
3.4 3D feature extraction and DEM creation

Reference books

1. Lillesand, Kiefer & Chipman (2011), Remote Sensing and Image Interpretation, Wiley
2. George Joseph &C. Jeganathan (2018), Fundamentals of Remote Sensing, Universities Press
3. Gonzalez (2016), Digital Image Processing 3e, Pearson
4. Jayaraman S., Veerakumar T & Esakkirajan S. (2017), Digital Image Processing, Tata Mcgraw Hill Education private Limited

Semester III

Database Management System, GNNS and GPS

Course Code: GI 301T

Unit-1: Database Management System

1.1 Introduction to DBMS, architecture, administration roles, data dictionary, DBMS users, Traditional models, three-level architecture, hierarchical model, network model and relational model, File organization, Security

1.2 Relational model – definitions and properties, keys, integrity rules, relational algebra, joins, set operations, Tuple relational calculus SQL constructs, embedded SQL

1.3 Query & Query Optimisation Techniques.ER model concepts

1.4 Database design, conceptual, logical and physical models, ER diagram and model, Functional Dependency (Armstrong's Axioms), Normal forms (1NF, 2NF, 3NF, BCNF) Indexing- Primary, Secondary, Multilevel. Distributed database, temporal database and object-oriented database

Unit-2: GNSS

2.1 Fundamentals of geodesy, Geodetic reference systems: ICRE, ITRF, Geoid and geoidal heights and undulations. Geodetic datum and datum transformation, Coordinate systems, celestial equatorial coordinate system, geographical coordinate system, shape of the earth, geoid, WGS 1984 datum, Indian geodetic datum, coordinate transformation

2.2 Navigation and positioning, points of reference, history of navigation systems, global navigation satellite system (GNSS), GPS, GLONASS, Galileo, Beidou, space segment, control segment, user segment

2.3 Working principle of GNSS, triangulation and trilateration, almanac and ephemeris, timing and ranging, GNSS signals and range determination

2.4 GNSS errors and solutions

Unit-3: GNSS and DGNSS

3.1 Positioning methods, point positioning, relative/differential positioning

3.2 Single difference, double difference, triple difference

3.3 Kinematic positioning, GNSS augmentation (EGNOS, WAAS, MSAS, CDGPS, GAGAN, DGPS)

3.4 Other navigation satellite systems (Quasi-Zenith Satellite System, Indian Regional Navigational Satellite System), GNSS receivers, receiver architecture, classification of GNSS receivers, applications of GNSS

Reference books

1. Ramakrishnan Raghu (1999), Database Management Systems (McGraw-Hill International Editions: Computer Science Series), McGraw-Hill Education
2. Saini R (2012), Database Management System, Vayu Education Of India
3. Silberschatz (2013), Database System Concepts, McGraw Hill Education

4. Ramakrishnan Raghu (2014), Database Management Systems, McGraw Hill Education
5. Gopi Satheesh (2005), Global Positioning System: Principles And Applications, McGraw-Hill Education India Pvt. Ltd
6. Dragos Catalin (2017), The Global Positioning System, LAP Lambert Academic Publishing
7. Clark Asher (2017), Global Navigation Satellite Systems and Their Applications, Larsen and Keller Education
8. Gopi Sateesh (2005), Global Positioning System: Principles And Applications, McGraw-Hill

Research Methods and Methodology

Course Code: GI 302T

Unit-1: Research Types and Research Framework

1.1 Research and its types, which method—scientific, technological, or artistic, which method—qualitative, quantitative or mixed, geoinformatics research method, scientific and critical thinking, research objective, review of literature, empiricism, rationalism, scepticism

1.2 Research framework, ontology, epistemology, research paradigm, methodology (inductive, deductive, technological)

1.3 Collection of data, factors influencing the selection of geoinformatics data, analysis of data, multi-concept of data collection and analysis, level of detail

1.4 Sampling: Sampling and Population, Techniques sampling solution, Characteristics of good sample, Sampling error and method to reduce, Reliability and validity of various tools and techniques

Unit-2: Research Design

2.1 Functions and features of research design, sampling design, observational design, analytical design, operational design

2.2 Hypothesis, Individual and Institutional

2.3 Research proposal: Format of Research Proposal and Research Question

2.4 Power/politics/ethics in research, corruptions of expert knowledge, personal and professional ethics

Unit-3: Documentation and Research

3.1 Research paper

3.2 Dissertation

3.3 Thesis

3.4 Referencing style, guidelines on writing and presentation

Reference books

1. Kothari C.R. (2019), Research Methodology : Methods And Techniques, New Age International Publishers
2. Ahuja Ram (2001), Research Methods, Rawat Pubns
3. Bryman Alan (2018), Social Research Methods 5e Xe, Oxford University Press
4. Kumar (2005), Research Methodology: A Step by Step Guide for Beginners, 2e, Pearson Education
5. Napolean D. (2014), Research Methodology: A Theoretical Approach, Laxmi Publications
6. Chitnis K.N. (2006), Research Methodology in History, Atlantic

Geo-Informatics for Resource and Disaster Management

Course Code: GI 303 EA

Unit-1: Introduction to Disaster Management

1.1 Types of disasters, importance of Geoinformatics for disaster management

1.2 Forecast, forewarning system, disaster preparedness with respect to different disaster

1.3 Geoinformatics based disaster management

1.4 Satellite surveillance for disaster mitigation

Unit-2: Disaster Management Application

2.1 Drought and Forest Fire: Drought types, causes, mitigation measures, delineation of drought vulnerable areas, drought monitoring

2.2 Forest Fire – causes, management using Geoinformatics, risk zonation mapping, forecasting system

2.3 Geoinformatics in earthquake prediction and post quake rehabilitation, Geoinformatics for earthquake disaster management, mapping tectonic lineament

2.4 Volcano: Geoinformatics of geothermal field, mapping lava flows, volcano hazard management

Unit-3:Disaster Management Application

3.1 Landslides: RS and GIS for zonation, monitoring and management; Soil erosion: RS and GIS for soil erosion and sediment estimation

3.2 Flood types- flash and river floods, snowmelt floods, Dam burst, Cloud burst, ice jams and mud flows, causes and mitigation measures, flooding potential zonation mapping, flood hazard assessment, ice cover monitoring and its role in flooding

3.3 Cyclone: cyclone monitoring using INSAT, ERS-1, NOAA and DMSP satellites, RS and GIS in hurricane mapping and mitigation, damage assessment, warning

3.4 Tsunami: types, causes, RS and GIS for warning, damage assessment and rehabilitation

Urban Development and Utility management

Course Code: GI 303 EB

Unit-1: Geoinformatics for Urban Planning and Utility Management

1.1 Urban Planning and Mapping: urban and regional planning, LU/LC mapping

1.2 Geoinformatics data modeling for urban design, urban infrastructure, urban site selection for urban development, site suitability analysis for utilities and civic amenitiesproblems of urbanization, urban sprawl and associated problems

1.3 Mapping and management of facilities: Geoinformatics applications in Automated Mapping (AM) and Facility Management (FM), necessity of utility management, types of utility sectors, evolution of geoinformatics in the utilities water and sewage related

1.4 Geoinformatics based urban water demand analysis, pipeline planning and alignment, electric and power supply related, telecom applications, radio coverage prediction, signal strength mapping.

Unit-2: Demography and urban governance and Urban ecology applications

2.1 Demography and urban governance: Population distribution map by age, gender, education, occupation, socio-economic grouping, health criteria index, crime rates and types

2.2 Urban governance: mapping administrative boundaries, city base map generation, property enumeration and property GIS, tax revenue rationalization, metropolitan information management system

2.3 Urban ecology applications: Air quality indexing and mapping, monitoring atmospheric haze, smoke, toxic gas movement and prediction of vulnerable zones, noise pollution zonation

2.4 Natural resources inventory and management, vegetation, soil, surface water and groundwater conservation, site suitability for groundwater recharging and rain water harvesting, urban area heat budgeting

Unit-3: Wastewater Business and Solid Waste Management

3.1 Wastewater Business: integration with Hydraulic/Hydrologic modeling, integration with Customer Information System, integration with Asset Management

3.2 Generation of hospital utility database; Generation of Road Network Map, Utility Map of Ambulance, Blood bank & Medical Colleges

3.3 Geographic Approach to Electric Distribution: Data Management, Planning and Analysis, Workforce Automation, Situational Awareness

3.4 Solid Waste Management: Landfills location selection, Site assessment of illegal dump sites, routing efficiency for solid waste collection, monitoring the waste pick-up performance; monitoring actual movement and real time position of garbage collection vehicle and analyze bin pick-up status

Practical Project on Major Elective

Course Code: GI 304 EAP

Case study of any one of the following Disaster and Role of Geoinformatics for the management of the said Disaster with a well written report.

1. Land Slide
2. Drought
3. Forest Fire
4. Flood

Practical Project on Major Elective

Course Code: GI 304 EBP

Case study of any one of the following urban system and Role of Geoinformatics for the urban planning and utility management with a well written report.

1. Urban Growth and Land Cover Change
2. Smart City Concept
3. Transportation Management
4. Solid waste Management

GIS and GNNS

Course Code: GI 306P

Unit-1: Point Positioning

1.1 Planning of survey
1.2 GCP collection for image georeferencing
1.3 Collection of point feature (e.g. lamp Post, tree etc.)
1.4 Georeferencing of image with surveyed GCP, plotting the point feature in GIS

Unit-2: Dynamic Survey-line Polygon

2.1 Collection of line feature with offset method
2.2 Collection of polygon feature
2.3 Mapping of line and polygon feature
2.4 Removing the overlap/gaps on common boundary

Unit-3: DGNSS

3.1 Establishing base station
3.2 Survey with rover
3.3 Post Processing of rover data
3.4 Mapping of corrected data

Reference books

1. Gopi Satheesh (2005), Global Positioning System: Principles And Applications, McGraw-Hill Education India Pvt. Ltd
2. Dragos Catalin (2017), The Global Positioning System, LAP Lambert Academic Publishing
3. Clark Asher (2017), Global Navigation Satellite Systems and Their Applications, Larsen and Keller Education
4. Gopi Sateesh (2005), Global Positioning System: Principles And Applications, McGraw-Hill

Surveying and Field work

Course Code: GI 307P

Unit-1: Surveying

1.1 Levelling of surface by Dumpy Level
1.2 Triangulation and traversing by Prismatic Compass
1.3 Height determination using Theodolite: Accessible and inaccessible bases
1.4 Survey of terrain using Total Station

Unit-2: Field Study

2.1 Need for the field study
2.2 Selection of Study Area: Objectives and Criteria
2.3 Preparation of base map and Field questionnaires
2.4 Survey and analysis of field-based information

Unit-3: Preparation of field report

Prepare a field report with the help of field study within 50 to 80 pages

Reference books

1. Arora, K.R. (2010): Surveying (Volumes I & II), Standard Book House, New Delhi
2. D. Clark, Plane and Geodetic Surveying, Vol. II, Constable Co. Ltd, London
3. Elfic, M.H., Fryer, J.G. Brinkner, R.C. and Wolf, P.R. 1994: Elementary Surveying, 8th edition, Harper Collins Publishers, London.
4. Gilbert, N. (ed.) (2005): Researching Social Life, Sage, London
5. Glodard, R.H., Field Techniques and Research Methods in Geography, Dubuque, 1982.
6. Guthrie, G. (2010): Basic Research Methods: An Entry To Social Science Research, Sage, New Delhi
7. Kanetkar, T.P. and Kulkatni, S. V. 1.988: Surveying and Levelling, Part I, Pune Vidyarthi Griha Prakashan, Pune.
8. Kulkarni, S.V. and Kanetkar, T.R. (1965): Surveying and Levelling (Volumes I & II), A.V.G. Prakashan, New Delhi
9. Hussain, S.K. and Nagaraj, M.S. 1992: Text Book of Surveying, S. Chand & Co. Ltd., New Delhi.
10. Hoggart, K., Lees, L. and Davies, A. (2002): Researching Human Geography, Arnold, London
11. Maslov A.V. Gordeev A.V.,Batrakov Yu. G. Geodetic surveying,1984, Mir Publishers, Moscow
12. Neuman, W. L. (2007): Social Research Methods: Qualitative and Quantitative Approaches, Dorling Kindersley India Pvt. Ltd., New Delhi
13. Punmia, B. C., Jain, A. K. 1990: Surveying, Laxmi Publications. New Delhi
14. Rangwala S.C. 2011. Surveying and Levelling, Charotar Publishing House Pvt. Ltd. Anand,(GJ)
15. Sarkar, A. (2008): Practical Geography: A Systematic Approach, Orient BlackSwan, Kolkata

SEMESTER IV

Grand Viva

Course Code: GI 401P

A viva will be conducted on the entire syllabus of the course.

Internship

Course Code: GI 402P

A two-month internship in the industry/Govt. Sector will be required.

Research Project

Course Code: GI 403P

Four-months research work on any selected topic on Geoinformatics. Students are free to choose institution/organization to execute their Dissertation work. One hard copy and one soft copy in PDF format of the dissertation is necessary to be submitted. Students shall present and defend their research in front of other students, PhD scholars, and subject experts in a seminar.