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	Internal Assignment	Assignment (15), Seminar Presentation (25), Teacher's Assessment (10)	40	10	50	4
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	Internal Assignment	Assignment (15), Seminar Presentation (25), Teacher's Assessment (10)	40	10	50	4
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 303EP	Practical project on Major elective	80	20	100	8
7	**GI 304P**	**GIS and GNNS**	**40**	**10**	**50**	**4**
8	**GI 305P**	**Surveying and Field work**	**40**	**10**	**50**	**4**
Minor Elective						
8	GI 306MEA	Application of Spatial Science for Community Development	25	0	0	2
9	GI 306MEB	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	Internal Assignment	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 **Credit 4**

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 **Credit 4**

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 **Credit 4**

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

Computer Basics and Programming

Course Code: GI 104P **Credit 4**

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 Basic programming

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

Semester II

Photogrammetry and Digital Image Processing

Course Code: GI 201T **Credit 4**

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)

Introduction to Geographical Information System & spatial modeling

Course Code: GI 202T **Credit 4**

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

Thermal, Microwave Remote Sensing and Application

Course Code: GI 203T **Credit 4**

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

Digital Image Processing

Course Code: GI 204P **Credit 4**

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

Digital Photogrammetry

Course Code: GI 205P **Credit 4**

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