BIRLA INSTITUTE OF TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS) CURRICULUM

(Effective from Academic Session: Monsoon 2022)

M.Sc. Geoinformatics

Department of Remote Sensing

INSTITUTE VISION

To become a Globally Recognised Academic Institution in consonance with the social, economic and ecological environment, striving continuously for excellence in education, research, and technological service to the National needs.

INSTITUTE MISSION

- To educate students at Undergraduate, Post Graduate, Doctoral, and Post-Doctoral levels to perform challenging engineering and managerial jobs in industry.
- To provide excellent research and development facilities to take up Ph.D. programmes and research projects.
- To develop effective teaching learning skills and state of art research potential of the faculty.
- To build national capabilities in technology, education, and research in emerging areas.
- To provide excellent technological services to satisfy the requirements of the industry and overall academic needs of society.

DEPARTMENT VISION:

Be a centre of excellence in the field of Geospatial Technology education and research in the areas of Earth Resources, Environment & Climate to meet the needs of ever increasing requirement of human resources in these fields and to cater to the larger interest of the Society and Nation.

DEPARTMENT MISSION

- Impart quality education and equip the students with strong foundation that could make them capable of handling challenges of the ever advancing geo-spatial technologies.
- Maintain state-of-the-art in research and outreach facilities in phase with the premier institutions for sustained improvement in the quality of education and research.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To prepare the students in identifying, analysing and solving geospatial problems.
2. To train the students in developing practical and executable solutions to the challenges of growing field of Remote Sensing and GIS.
3. To impart the students with strong base of knowledge that makes them suitable both for industries as well as for teaching and research.
4. To inculcate the students with the sensitivity towards ethics, public policies and their responsibilities towards the society.

PROGRAMME OUTCOMES (POs)

PO1: An ability to independently carry out investigation and development work to solve real life geospatial problems.

PO2: An ability to write and present a substantial technical report/document/international level research articles.

PO3: Students should be able to demonstrate a degree of mastery over the areas of Geoinformatics.

PO4: An ability to share theoretical and practical knowledge in both teaching and research as well as in industries.

PO5: An ability to apply professional ethics, accountability and equity.

PROGRAMME COURSE STRUCTURE (ALL SEMESTERS)

SEMESTER - I

	Course Category	Course Code	Subjects	Mode of Delivery L – Lecture; T – Tutorial; P - Practical			Credits
				L	T	P	
SEMESTER- I	PC	GI 501	Principles of Remote Sensing	3	0	0	3
		GI 502	Geographic Information System	3	0	0	3
		GI 503	Digital Cartography and GPS	3	0	0	3
		GI 504R1	Advanced Image Acquisition and Interpretation for Environmental Mapping	3	0	0	3
		GI 505	Remote Sensing Laboratory	0	0	4	2
		GI 506	Geographic Information System Laboratory	0	0	4	2
		GI 507	Digital Cartography and GPS Laboratory	0	0	4	2
		GI 508	Advanced Image Acquisition and Interpretation for Environmental Mapping Laboratory	0	0	4	2
		MT132	Communication Skills-I	0	0	3	1.5
	OE	**OPEN ELECTIVE**		3	0	0	3
	Total Credits (1st Semester) (Theory + Labs)						**24.5**

SEMESTER – II

	Course Category	Course Code	Subjects	L	T	P	Credits
SEMESTER- II	PC	GI 509R1	Digital Satellite Image Processing	3	0	0	3
		GI 510R1	Research Methods and Statistics in Geoinformatics	3	0	0	3
		GI 511	Digital Satellite Image Processing Laboratory	0	0	4	2
		GI 512R1	Programming and Customisation in Geospatial domain Laboratory	0	0	4	2
		GI 513	Field Study Laboratory	0	0	4	2
		GI 518	Spatial data handling through programming	3	0	0	3
		MT133	**Communication Skills-II**	0	0	3	1.5

	PE	GI*	ELECTIVE – I	3	0	0	3
		GI*	ELECTIVE - I Laboratory	0	0	4	2
	OE	**OPEN ELECTIVE**		3	0	0	3
	Total Credits (2nd Semester)						**24.5**

SEMESTER – III

	Course Category	**Course Code**	**Subjects**	**L**	**T**	**P**	**Credits**
SEMESTER- III	**PC**	GI 601	Project (Part - I)				4
		GI 602	Advanced Geospatial Modelling and Decision Support System	3	1	0	4
		GI 603	Aerial, Satellite, UAV based Photogrammetry & Application	3	1	0	4
		GI 604	Advanced Geospatial Modelling & DSS Laboratory	0	0	4	2
		GI 605	Aerial, Satellite, UAV based Photogrammetry &Application Laboratory	0	0	4	2
	PE	GI*	ELECTIVE – II	3	1	0	4
		GI*	ELECTIVE - II Laboratory	0	0	4	2
	OE	**OPEN ELECTIVE**		3	0	0	3
	Total Credits (3rd Semester)						**25**

SEMESTER – IV

	Course Category	**Course Code**	**Subjects**	**L**	**T**	**P**	**Credits**
SEMESTER- IV	**PC**	GI 611	Project (Part – II)				8
	Total Credits (4th Semester)						**8**

Grand TOTAL =82 credits

*ELECTIVES

Course No.	Course Title

ELECTIVE-I (Spring Session)

GI 514 R1	Geoinformatics for Climate Change and Environmental Impact Assessment
GI 515 R1	Geoinformatics for Hydrology & Water Resources
GI 516	Geoinformatics for Climate Change and Environmental Impact Assessment Laboratory
GI 517	Geoinformatics for Hydrology & Water Resources Laboratory

ELECTIVE-II (Monsoon Session)

GI 606	Geoinformatics for Natural Resource Management
GI 607	Geoinformatics for Disaster Management
GI 608	Geoinformatics for Natural Resource Management Laboratory
GI 609	Geoinformatics for Disaster Management Laboratory

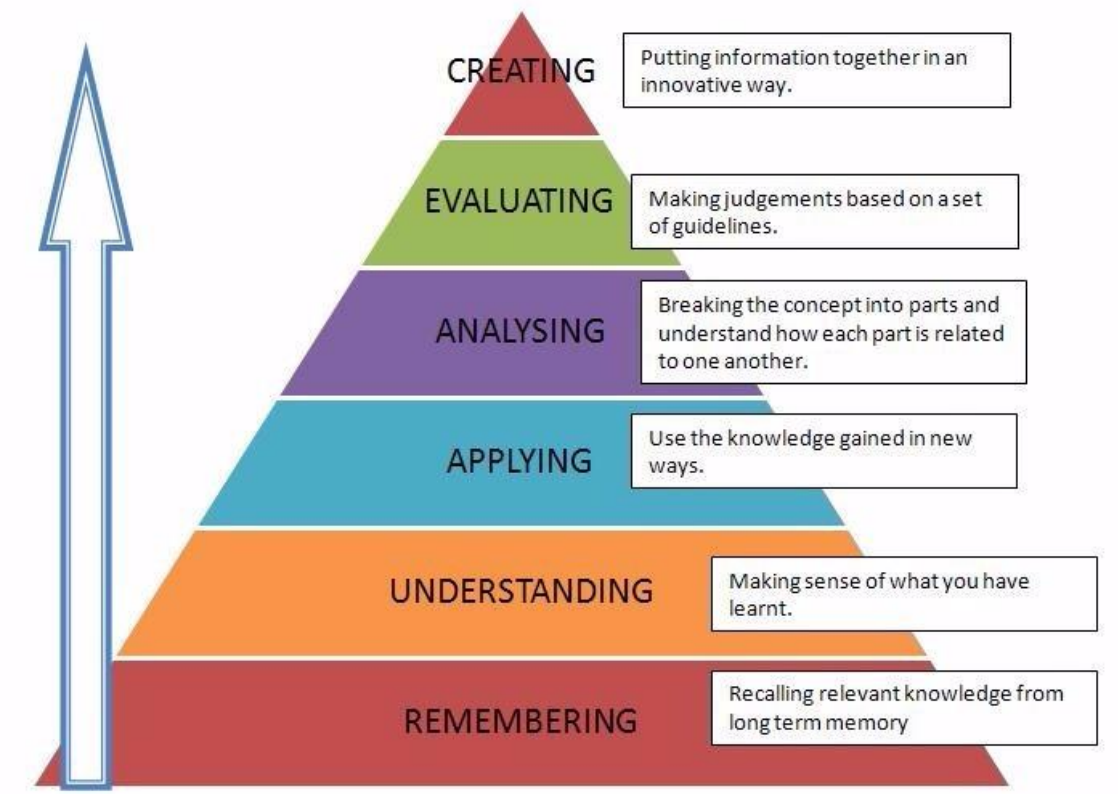
Project (Part – I) – Focus on Problem definition, Literature Review, Data Collection, Objectives and Research Questions Formulation and Detailed Work Plan, and partial fulfillment of initial objectives.

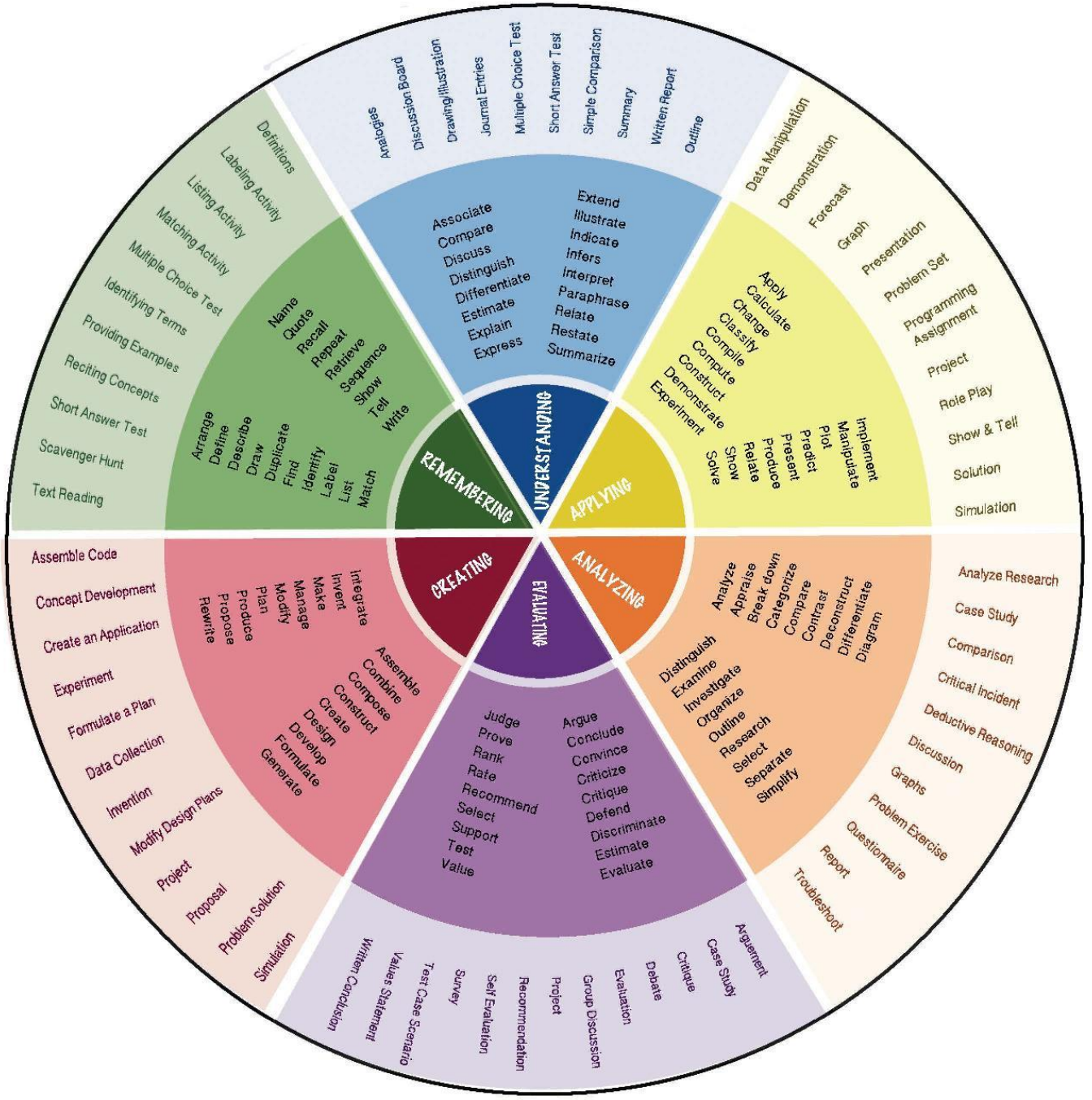
Project (Part – II) – Focus on systematic execution of work plan, data processing, analysis, interpretation, inferences and fulfillment of objectives and research questions, and report preparation, and finally leading to a research publication.

BLOOM'S TAXONOMY FOR CURRICULUM DESIGN AND ASSESSMENT:

Preamble

The design of curriculum and assessment is based on Bloom's Taxonomy. A comprehensive guideline for using Bloom's Taxonomy is given below for reference.




REMEMBERING
UNDERSTANDING
APPLYING
ANALYZING
EVALUATING
CREATING
Definitions
Labeling Activity
Listing Activity
Matching Activity
Multiple Choice Test
Identifying Terms
Providing Examples
Reciting Concepts
Short Answer Test
Scavenger Hunt
Text Reading
Name
Quote
Recall
Repeat
Retrieve
Sequence
Show
Tell
Write
Arrange
Define
Describe
Draw
Duplicate
Find
Identify
Label
List
Match
Analogies
Discussion Board
Drawing/Illustration
Journal Entries
Multiple Choice Test
Short Answer Test
Simple Comparison
Summary
Written Report
Outline
Associate
Compare
Discuss
Distinguish
Differentiate
Estimate
Explain
Express
Extend
Illustrate
Indicate
Infers
Interpret
Paraphrase
Relate
Restate
Summarize
Data Manipulation
Demonstration
Forecast
Graph
Presentation
Problem Set
Programming Assignment
Project
Role Play
Show & Tell
Solution
Simulation
Apply
Calculate
Change
Classify
Compile
Compute
Construct
Demonstrate
Experiment
Implement
Manipulate
Plot
Predict
Present
Produce
Relate
Show
Solve
Analyze Research
Case Study
Comparison
Critical Incident
Deductive Reasoning
Discussion
Graphs
Problem Exercise
Questionnaire
Report
Troubleshoot
Analyze
Appraise
Break down
Categorize
Compare
Contrast
Deconstruct
Differentiate
Diagram
Distinguish
Examine
Investigate
Organize
Outline
Research
Select
Separate
Simplify
Argument
Case Study
Critique
Debate
Evaluation
Group Discussion
Project
Recommendation
Self Evaluation
Survey
Test Case Scenario
Values Statement
Written Conclusion
Argue
Conclude
Convince
Criticize
Critique
Defend
Discriminate
Estimate
Evaluate
Judge
Prove
Rank
Rate
Recommend
Select
Support
Test
Value
Assemble Code
Concept Development
Create an Application
Experiment
Formulate a Plan
Data Collection
Invention
Modify Design Plans
Project
Proposal
Problem Solution
Simulation
Integrate
Invent
Make
Manage
Modify
Plan
Produce
Propose
Rewrite
Assemble
Combine
Compose
Construct
Create
Design
Develop
Formulate
Generate

COURSE INFORMATION SHEET

SEMESTER III

Course code: GI 601
Course title: Project (Part - I)

Pre-requisite(s): Completion of all Labs of 1st and 2nd semester
Co- requisite(s):

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**		**4**

Class schedule per week: 4
Class: M. Sc.
Semester / Level: 03&04/06
Branch: Geoinformatics

Course Objectives: This course aims to make the student with following abilities:

A.	Carry out independent research project addressing real life Geospatial problems with sound scientific framework.
B.	Prepare spatial maps from satellite data and other sources utilising various Geoinformatics techniques and produce research report with acceptable quality and ethics, and communicate results to stakeholders.

Course Outcomes (CO): On completion of this course, students should be able to:

CO1	Collect and summarise relevant existing literatures related to the problem in hand.
CO2	Identify Research Gaps, Develop appropriate research questions and Objectives in relation to their domain of research.
CO3	Design Research Methodology and Create coherent geospatial database and other relevant data for each objective.
CO4	Apply Geoinformatics tools and techniques to evaluate the appropriateness of results in relation to objectives and research questions.
CO5	Integrate and synthesis all results and write a scientifically sound academic report with appropriate referencing, and communicate research findings to stakeholders.

Mapping Course Outcome with Programme Outcome

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	1	2	2	3	3
CO2	2	3	2	2	3
CO3	3	2	2	3	3
CO4	3	3	3	2	1
CO5	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course code: GI 602
Course title: ADVANCED GEOSPATIAL MODELLING AND DECISION SUPPORT SYSTEM
Pre-requisite(s): Basic concept of GIS
Co- requisite(s): Knowledge of programming

Credits:	L:	T:	P:	C:
	3	1	0	4

Class schedule per week: 4
Class: M.Sc.
Semester / Level: 03/06 (Monsoon)
Branch: Geoinformatics

Course Objectives

This course aims to:

1.	Introduce students towards vector and raster based geo-spatial and geo-statistical analytical techniques.
2.	Impart knowledge about Spatial and Non-spatial Decision Making Process, techniques and Decision Support Systems.

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Differentiate two types of spatial analysis techniques: Vector & Raster
CO2	Make use of GIS tools and geostatistical analysis techniques to solve real world spatial problems
CO3	Understand the basic architecture of DSS and SDSS
CO4	Understand and make use of spatial and non-spatial MCDM techniques

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
Module – I INTRODUCTION TO SPATIAL ANALYSIS AND MODELING Spatial Analysis: Definition, Processes & Steps, Classification of Spatial analysis techniques, Raster–Based Techniques: Overlay Analysis, Slope and Aspects, Cost-Distance Calculation, Vector-Based Techniques: Overlay Analysis, Network Analysis : Linear referencing, Optimal Routes, Location and Service Area Problems, Digital Terrain Analyses and Modeling: TIN and DEM, Surface Representation & Analysis, Architecture of Geodatabase Model, Advantages of using Geodatabase over shapefile and coverage.	**10**
Module – II GEOSTATISTICAL ANALYSIS TECHNIQUES Spatial Interpolation: Introduction, Control Points, Global Methods: Trend Surface Analysis, Regression Models, Local Methods: Thiessen Polygons, Density Estimation, Inverse Distance Weighted Interpolation, Kriging: Ordinary Kriging, Universal Kriging.	**8**
Module – III INTRODUCTION TO DSS Introduction to decision making process and decision support systems, Introduction of a frame work for planning and decision making, Different types of DSS, Components of DSS, GIS and Spatial Decision Making, Difference between DSS & SDSS.	**8**
Module – IV MULTICRITERIA ANALYSIS AND DECISION MAKING Principles and elements of multiple-criteria decision making, Classification of Multiple-criteria Decision Problem: Multi-objective Vs Multi-attribute, Decision Alternatives and constraints, Criterion weighting, Decision rules, Multiple-criteria decision making in spatial data analysis.	**8**
Module–V ANALYTICAL HIERARCHY PROCESS(AHP) Introduction to AHP, Basic Principles of AHP, Effect Table, Pair Wise comparison, Consistency, Weightage, performance score, Case studies involving AHP.	**6**

TEXT BOOKS

1. Bonczek, R.H., C.W. Holsapple, and A.B. Whinston, (1981). Foundations of Decision Support Systems, Academic Press, New York. Basic text on DSS
2. Geoffrion, A.M., (1983). "Can OR/MS evolve fast enough? Interfaces 13:10. Source for six essential characteristics of DSS.
3. House, W.C. (1983). Decision Support Systems, Petrocelli, New York. Basic DSS text
4. Sprague, R.H., (1997). A framework for the development of decision support systems, Management Information Sciences Quarterly 4:1-26. Source for DSS development model.
5. Sprague, R.H., and Carlson, E.D., (1982). Building Effective Decision Support Systems, Prentice-Hall, Englewood Cliffs NJ. Basic DSS text
6. Burrough, Peter A. and Rachael McDonnell (1998). Principles of Geographical Information Systems. Oxford University Press, New York.
7. Laurini, Robert and Derek Thompson (1992). Fundamentals of Spatial Information Systems. Academic Pr., London.

REFERENCE BOOKS

1. Kluwer Fotheringham A S, O'Kelly M E. (1998).Spatial Interaction Models: Formulations and Applications.
2. Paul Longley, Michael Goodchild, David Maguire and David Rhind (2005). Geographical Information Systems. Principles, Techniques, Applications and Management. John Wiley & Sons.

Burt James E., Barber Gerald M., Rigby David L. (2009). **Elementary statistics for Geographers**.3rd ed., New York: Guilford Press.

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Indirect Assessment –

1. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	1		2	1	1
CO2	2	1	1	2	2
CO3	2		3	3	
CO4	2	1	3	3	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods
CD1	Lecture by use of Boards/LCD Projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Mini Projects/Projects
CD5	Laboratory Experiments/Teaching Aids
CD6	Industrial/Guest Lectures
CD7	Industrial Visits/In-plant Training
CD8	Self- learning such as use of NPTEL Materials and Internets
CD9	Simulation

Course Outcome	Course Delivery Method Used
CO1	CD1,CD2,CD3,CD8
CO2	CD1,CD2,CD3,CD5,CD8
CO3	CD1, CD2, CD3, CD8
CO4	CD1,CD2, CD3,CD5, CD6,CD8

Course code: GI 603
Course title: AERIAL, SATELLITE, UAV BASED PHOTOGRAMMETRY & APPLICATIONS

Pre-requisite(s): Basic concept of remote sensing, GNSS
Co- requisite(s):

Credits:	L:	T:	P:	C:
	3	1	0	4

Class schedule per week: 4
Class: M.Sc.
Semester / Level: 03/06 (Spring)
Branch: Geoinformatics

Course Objectives
This course aims to make the students:

1.	Learn fundamental aspects of Aerial Photogrammetry, and its applications in various thematic domains.
2.	Learn analogue and digital based approaches in photogrammetry.
3.	Understand the recent developments and role of satellite and UAV in terrain modelling and mapping.

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Understand the historic developments in the field of Photogrammetry
CO2	Make planimetric measurements (both manually and digitally) from a given Aerial, Satellite and UAV derived High Resolution Images
CO3	Handle Stereoscopes, anaglyph glasses and digital workstations for Photogrammetric purposes.
CO4	Discuss flight planning requirements, Advantages and limitations so as to get desired scale and accuracy for a given situation where natural resources or thematic mapping requirement to be fulfilled

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
Module – I INTRODUCTION Need for Photogrammetry, Historical developments in Photogrammetry, Fundamental concepts and Importance of flight planning, End Lap, Side Lap, Scale, Ground Coverage, Weather Conditions, Purpose, Flying Height, Fundamentals and elements of visual photo interpretation, Mapping terrain elements: land use land cover, drainage and physiographical features.	**7**
Module – II GEOMETRY OF AERIAL PHOTOGRAPHS Projection, Tilt, Swing, Scale, Image Displacement due to relief, due to lens distortion, due to tilt, Parallax, stereoscopic depth perception, overlaps in stereo pairs, principles of floating marks, Parallax bar and types, measurement of absolute and differential parallax, Parallax height measurement, correction to measure parallaxes – contouring from stereometric heights. Types of photographs, Vertical and Tilted photographs.	**8**
Module – III ANALYTICAL PHOTOGRAMMETRY Co-ordinate system, air base components, degree of freedom, Elements of interior and exterior orientation of an aerial photographs, Numerical Derivations for Height based on relief displacement, coordinates, parallax, Orientation Procedures, Coordinate Transformation concepts, Epi-polar Geometry, Photo-triangularion: Pass-points for Aerotriangulation, semi-analytical aero-triangulation, analyticalaerotriangulation, bundle adjustment with GNSS, Aero-triangulation with Satellite images, strategies for aero-triangulation.	**10**
Module – IV DIGITAL PHOTOGRAMMETRY Analogue to Digital conversion, Image measurements, colour balancing, Image matching, Feature extraction- points, lines and regions, Planimetric Measurements, GCPs and Ortho-Rectification, Ortho-photographs, Digital Terrain Model derivation from Satellite images, Limitations, quality checks and interactive control.	**8**
Module–V TERRAIN MODELING WITH UAV Digital Photogrammetric Images from UAV and associated concepts, UAV flight planning, coverage types, processing methods. Recent trends in its application, automated aerial triangulation: concepts, solutions, analysis, Photogrammetry work-stations, review of available software.	**7**

TEXT BOOKS

1. Wolf, P.R. (2000). Elements of Photogrammetry with Applications in GIS, McGraw Hill Ins, Singapore.
2. Rampal, K.K. (2004). Textbook of Photogrammetry, John-Wiley & Sons.
3. Moffit, F.M. (1980). Photogrammetry, International Text Book Co.
4. McGlone J.C. (editor) (2013). Manual of Photogrammetry. 6th edition. American Society for Photogrammetry and Remote Sensing.
5. Drury, S.A. (2004). "Image Interpretation in Geology, Publisher: - Chapman and Hall, London, UK.

REFERENCE BOOKS

1.Panday, S. N. (1987). Principles and Application of Photogeology, Parentice Hall Inc.
2.Ray, R. (2012). An Introduction to photogrammetry, MITRAM publications, Kolkata.ISBN:978-93-80036-41-0.
3.Beginners Guide to UAV: https://www.digitaltrends.com/opinion/start-serious-drone-habit/

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Indirect Assessment –

1. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	1	2	3	2	
CO2	2		3	3	
CO3	2	2	3	3	
CO4	2	2	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods
CD1	Lecture by use of Boards/LCD Projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Mini Projects/Projects
CD5	Laboratory Experiments/Teaching Aids
CD6	Industrial/Guest Lectures
CD7	Industrial Visits/In-plant Training
CD8	Self- learning such as use of NPTEL Materials and Internets
CD9	Simulation

Course Outcome	Course Delivery Method Used
CO1	CD1,CD2,CD3,CD8
CO2	CD1,CD2,CD3,CD8
CO3	CD1, CD2, CD3, CD5, CD8
CO4	CD1,CD2, CD3,CD6,CD8

ELECTIVES

Course code: GI 606
Course title: GEOINFORMATICSFOR NATURAL RESOURCE MANAGEMENT

Pre-requisite(s): Knowledge of natural resources
Co- requisite(s): Knowledge of RS & GIS

Credits:	L:	T:	P:	C:
	3	1	0	4

Class schedule per week: 4
Class: M.Sc.
Semester / Level: 03/06 (Monsoon)
Branch: GEOINFORMATICS

Course Objectives

This course aims to:

1.	Introduce students about ecological, economical and social dimension of natural resource and importance of its sustainable management.
2.	Make them understand about various policies, ethics and geo-spatial techniques involved in natural resources management.

Course Outcomes (COs)

On completion of this course, students should be able to:

CO1	Explain concepts related to different types of natural resources
CO2	Understand the policies, and ethics regarding conservation practices
CO3	Make use of the scientific method of sustainable resources management
CO4	Apply Geospatial Techniques for better management of natural resources

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
Module – I INTRODUCTION Fundamentals of Natural resources, Classification of Natural resources: Abiotic and biotic resources, Ecological, social and economic dimension of resource management, Sustainable utilization of the natural resources	**6**
Module – II NATURAL RESOURCES PLANNING & MANAGEMENT Approaches in Resource Management**:** Ecological approach; economic approach; ethnological approach; Geoinformatics approach, Ecological principles, policies, and ethics regarding conservation practices, The Scientific Method and Adaptive Management, Management of Common International Resources	**8**
Module – III LAND AND WETLAND MANAGEMENT Land use: Classification, planning and desertification, Wetland: A brief Introduction, Classification of Wetland, Over-utilization of surface and ground water, drought, conflicts over water, dams-benefits and problems. Water ecology and management, Impact of climate change on land and wetland, Fish and other marine resources: Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, Solid waste Management, Waste water management.	**10**
Module – IV FOREST MANAGEMENT AND WILDLIFE CONSERVATION Forest: Present status, distribution and its contribution as natural resource, Over-exploitation: deforestation and its societal impact, Forest products. Developing and developed world strategies for forestry, Environmental Impact Assessment.	**8**
Module–V MANAGEMENT OF OIL & MINERAL RESOURCES Petroleum Product and minerals: A brief introduction, Renewable Energy Sources, Use and exploitation, Environmental effects of extracting and using mineral resources, Case studies.	**8**

TEXT BOOKS:

1.Michael J. Conroy, James T. Peterson,(2013).Decision Making in Natural Resource Management**:** A Structured, Adaptive Approach. John Wiley & Sons.
2.Moulton, M.P. and J. Sanderson(1999). Wildlife issues in a changing world. Lewis Publishers, Boca Raton, Florida, 500 pp.
3.Francois Ramade (1984)**.** Ecology of Natural Resources. John Wiley & Sons Ltd.

REFERENCE BOOKS:

1.P. K. Joshi(2009).Geoinformatics for Natural Resource Management .Nova Science Publishers
2.Mann, K.H. (2000). Coastal Ecology & Management, Ecology of Coastal Waters with Implications for Management (2nd Edition).Chap. 2-5, pp.18-78 & Chap. 16, pp.280-303.
3.Harikesh N. Mishra(2014). Managing Natural Resources- Focus on Land and Water. PHI Lerning Publication.
4.Vitousek, P.M.(1994). Global Change and Natural Resource Management, Beyond global warming: Ecology and global change. Ecology 75, 1861-1876.

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Indirect Assessment –

1. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	2		3	2	
CO2	2	2	1	1	3
CO3	2		3	3	1
CO4	2	1	3	2	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods
CD1	Lecture by use of Boards/LCD Projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Mini Projects/Projects
CD5	Laboratory Experiments/Teaching Aids
CD6	Industrial/Guest Lectures
CD7	Industrial Visits/In-plant Training
CD8	Self- learning such as use of NPTEL Materials and Internets
CD9	Simulation

Course Outcome	Course Delivery Method Used
CO1	CD1,CD2,CD3,CD8
CO2	CD1,CD2,CD3,CD8
CO3	CD1, CD2, CD3, CD8
CO4	CD1,CD2, CD3,CD5,CD6,CD8

Course code: GI 607
Course title: GEOINFORMATICS IN DISASTER MANAGEMENT
Pre-requisite(s): Knowledge of natural disasters
Co- requisite(s): Knowledge of RS & GIS

Credits:	L:	T:	P:	C:
	3	1	0	4

Class schedule per week: 4
Class: M.Sc.
Semester / Level: 03/06 (Monsoon)
Branch: Geoinformatics

Course Objectives

This course aims to:

1.	Impart basic concepts of disaster, its causes and its historial background
2.	Enhance student's knowledge about disaster management planning
3.	Make the students learn Geoinformatics approaches to deal with disaster risk reduction and management.

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Explain various types of disasters and responsible factors.
CO2	Interpret and discriminate different stages of disaster management planning and utility of geoinformaticstools in every stage.
CO3	Understand administrative structure of disaster management in India.
CO4	Understand the ethical values and humanitarian values.
CO5	Apply integrated geospatial techniques in disaster management and disaster risk reduction.

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
Module – I INTRODUCTION Fundamental concepts of hazards and disasters, their types, and characterization, Zonation of hazards, natural and human induced disasters, Disaster and National losses, historical perspective of disasters in India.	**8**
Module – II DISASTER MANAGEMENT Fundamental concept of Disaster Management, Government, NGOs and peoples participation disaster management, Existing organizational structure for managing disasters in India, Geoinformatics in disaster mitigation.	**8**
Module – III GEOLOGICAL HAZARDS: Landslide, Earthquake, Mining hazards (Land subsidence, Mine flooding etc.), Volcanic hazards, Groundwater hazards, Glacial hazards, Geoinformatics in Geological Hazards.	**8**
Module – IV HYDRO METEOROLOGICAL AND ENVIRONMENTAL HAZARDS Flash floods, River floods, Dam burst, Cloud burst, Cyclones, Coastal hazards and Drought, Forest hazards (Deforestation, Degradation and Forest fire), Land & soil degradation, Desertification, Pollution (Water, air and soil), Geoinformatics in Hydro Meteorological and Environmental Hazards	**10**
Module–V CASE STUDIES Earthquakes in India, Floods in Indo Gangetic plains, Landslides in Himalayan region, Drought in Indian plateau regions	**6**

TEXT BOOKS

1. Roy, P.S. (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS).
2. Skidmore A. (2002) Environmental Modeling with GIS & Remote Sensing, Taylor & Francis.

REFERENCE BOOKS

1. Anji Reddy, M. (2004). Geoinformatics for environmental Management. B. S. Publication.
2. Parag Diwan(2010). A MANUAL ON DISASTER MANAGEMENT. Pentagon Press ISBN: 10: 8182744385 / 13: 978-8182744387
3. Joshi, P. K.(2009). Geoinformatics for Natural Resource Management Nova Science Publishers

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Indirect Assessment –

1. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	2	1	3	2	
CO2	2	1	3	2	
CO3	2	2	3	2	1
CO4	1	1	1	1	3
CO5	3	2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods
CD1	Lecture by use of Boards/LCD Projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Mini Projects/Projects
CD5	Laboratory Experiments/Teaching Aids
CD6	Industrial/Guest Lectures
CD7	Industrial Visits/In-plant Training
CD8	Self- learning such as use of NPTEL Materials and Internets
CD9	Simulation

Course Outcome	Course Delivery Method Used
CO1	CD1,CD2,CD3,CD8
CO2	CD1,CD2,CD3,CD5,CD8
CO3	CD1, CD2, CD3, CD8
CO4	CD1,CD2, CD3,CD6,CD8
CO5	CD1,CD2,CD3,CD5,CD6,CD8

Laboratory related subjects

Course code: GI 604

Course title: ADVANCED GEOSPATIAL MODELLING AND DECISION SUPPORT SYSTEM LABORATORY

Pre-requisite(s): Basic theoretical knowledge of RS, GIS, GPS and associated sotware
Co- requisite(s):

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 03/06 (Monsoon)

Branch: GEOINFORMATICS

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Perform spatial analysis using vector and raster analysis techniques
CO2	Make use of GIS tools and geostatistical analysis techniques to solve real world spatial problems
CO3	Solve multi-criteria using spatial and non-spatial MCDM techniques

List of Laboratories

Sl.No.	**Name of the Laboratories**
Lab1	Creating a Geodatabase and importing feature datasets to it
Lab2	Topology creation of feature dataset of Geodatabase
Lab3	Editing of feature dataset and error correction
Lab4	Overview of vector analysis tools and solving a spatial problem using vector analysis functions
Lab5	Making a model involving vector analysis functions for solving a spatial problem using Model Builder
Lab6	Overview of raster analysis tools and solving a spatial problem using raster analysis functions.
Lab7	Making a model for involving raster analysis functions for solving a spatial problem using Model Builder
Lab8	Surface generation using different interpolation techniques
Lab9	Surface generation using Geostatistical techniques
Lab10	Customization of ArcGIS
Lab11	Mapping accident locations using Linear Referencing technique
Lab12	Preparation of raster layers for Multicriteria Analysis
Lab13	Solving a spatial problem using Multicriteria Analysis(Spatial AHP)

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
2 Quizzes	20 % (2 × 10%)
Day to Day Performance & Lab File	30%
Viva	20%
Final Exam	30%

Indirect Assessment –

1. Student Feedback on Faculty

Course Delivery Methods

CD1	Laboratory experiments

Mapping Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CO1	1	2	3	3	1
CO2	2	2	3	3	1
CO3	3	2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course code: GI 605

Course title: AERIAL, SATELLITE, UAV BASED PHOTOGRAMMETRY & APPLICATION LABORATORIES

Pre-requisite(s): Basic theoretical knowledge of RS, GPS and associated sotware
Co- requisite(s):

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M.Sc.

Semester / Level: 03/06 (Spring)

Branch: GEOINFORMATICS

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Use Pocket Stereoscope and make planimetric measurements from Aerial Photos.
CO2	Interpret Aerial photos with stereoscopic vision for delineating various landforms and landcover features.
CO3	Use photogrammetric techniques and tools under Digital Environment so as to create digital surface models, and extract point, line and polygon features and their position, height, area and volume.

List of Laboratories

Sl.No.	**Name of the Laboratory**
Lab 1	Depth perception (3D view) using pocket stereoscope
Lab 2	Depth perception (3D view) using mirror stereoscope
Lab 3	Use of parallax bar and measurement of distance and height
Lab 4	Stereoscopic vision and photo interpretation of B/W aerial photograph
Lab 5	Stereoscopic vision and photo interpretation of colour aerial photograph
Lab 6	Differential parallax measurement and contouring by parallax bar method
Lab 7	Digital Stereoscopic Model - Non-Oriented Approach
Lab 8	Digital Stereoscopic Model - Interior & Exterior Orientation
Lab 9	Digital Stereoscopic Model - 3D based Planimetric Measurements
Lab 10	Digital Ortho-Rectification - Relief Displacement Correction
Lab 11	Point, Line & Polygon Feature Extraction using Stereopair from HighSpatial Resolution Aerial & satellite images
Lab 12	Understanding and Experimenting with UAV based image acquisition
Lab 13	Creation of Point, Line, Polygon and Land Cover Features from Images acquired from satellite and UAV.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
2 Quizzes	20 % (2 × 10%)
Day to Day Performance & Lab File	30%
Viva	20%
Final Exam	30%

Indirect Assessment –

1. Student Feedback on Faculty

Course Delivery Methods

CD1	Laboratory experiments

Mapping Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CO1			3	3	
CO2	1	1	3	3	1
CO3		2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course Code: GI 608
Course title: GEOINFORMATICS FOR NATURAL RESOURCE MANAGEMENT LABORATORY

Pre-requisite(s): Basic theoretical knowledge of RS, GIS, GPS and associated sotware
Co- requisite(s):

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 03/06 (Spring)

Branch: GEOINFORMATICS

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Visually and Digitally differentiate various agriculture and forestry features from satellite data.
CO2	Use various remote sensing and GIS tools for extracting land cover, land capability, degradation, waterlogging, and model acreage, lifezones and fire risk.
CO3	Execute spatial models related to landscape metrics, biodiversity, wild life habitat suitability, and environmental problems.

List of Laboratories

Sl.No.	**Name of the Laboratory**
Lab 1	Image Interpretation of Standard FCC on screen and on photograph
Lab 2	Classification of Satellite Images- Revision
Lab 3	Use of INDICES
Lab 4	Extraction of Land Surface Temperature from satellite data
Lab 5	Site Suitability for Forest Fire Zones
Lab 6	Extraction of Water Bodies
Lab 7	Extraction of Forested area
Lab 8	Site suitable for Fishing Zones
Lab 9	Site Suitability for Solid waste and Waste water for an upcoming urbanization
Lab 10	Identification of forest cover types in a satellite image
Lab11	Creation of Solar atlas for a given area
Lab 12	Removal of Haze from industrial townships in satellite imagery
Lab13	Site suitability analysis of wind mills

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
2 Quizzes	20 % (2 × 10%)
Day to Day Performance & Lab File	30%
Viva	20%
Final Exam	30%

Indirect Assessment –

1. Student Feedback on Faculty

Course Delivery Methods

CD1	Laboratory experiments

Mapping Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CO1	1		3	3	
CO2	2	1	3	3	1
CO3		2	3	3	

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course Code: GI 609
Course title: GEOINFORMATICS FOR DISASTER MANAGEMENT LABORATORY

Pre-requisite(s): Basic theoretical knowledge of RS, GIS, GPS and associated sotware
Co- requisite(s):

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 03/06 (Spring)

Branch: GEOINFORMATICS

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Take help from Bhuvan Disaster services and other online web portal for data collection related to disasters and environmental/man-made factors associated with disaster.
CO2	Prepare map of different natural and man-made disaster-prone areas.
CO3	Apply integrated geospatial techniques in disaster management and disaster risk reduction.

List of Sessionals

Sl.No.	**Name of the Laboratory**
Lab 1	Overview of "Bhuvan" Geoportal of ISRO for disaster services
Lab 2	Estimation of flood inundated area using pre and post flood satellite image and its comparison with dataset provided by "Bhuvan"
Lab 3	Identification of coal-mine fire with the help of LST derived from satellite image
Lab 4	Identification of disaster prone areas in a satellite image w.r.t.Earthquake
Lab 5& 6	Identification of regions prone to meteorological drought by downloading and analyzing rainfall data and generating drought indices
Lab 7	Identification of disaster prone areas in a satellite image w.r.t. Forest fires and its comparison with dataset provided by "Bhuvan"
Lab 8	Mapping of areas prone to road accidents
Lab 9	Performing water quality analysis for different parameters to test its suitability for drinking purposes
Lab10,11	Performing air quality analysis by calculating AQI using CPCB dataset
Lab 12	Analysing lightning disaster by using satellite data and meteorological data
Lab 13	Prepare list of Do's and Dont's for at least three natural disaster and prepare the administrative hierarchy of disaster management of home district

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
2 Quizzes	20 % (2 × 10%)
Day to Day Performance & Lab File	30%
Viva	20%
Final Exam	30%

Indirect Assessment –

1. Student Feedback on Faculty

Course Delivery Methods

CD1	Laboratory experiments

Mapping Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CO1	2		3	3	
CO2	2	3		3	2
CO3	1	2	3	3	

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)