AC:

Item No.

Rayat Shikshan Sanstha's

KARMAVEER BHAURAO PATIL COLLEGE, VASHI,

EMPOWERED AUTONOMOUS COLLEGE

Sector-15- A, Vashi, Navi Mumbai -400 703

NAAC Grade "A+" with CGPA 3.53

Choice Based Credit System Syllabus

Program: M.Sc. Geoinformatics

Course: Geoinformatics

Semester: III and IV

(As per Choice Based Credit System (CBCS)
with effect from the academic year 2023-24)

Karmaveer Bhaurao Patil College Vashi, Navi Mumbai

Autonomous College

[University of Mumbai]

Syllabus for Approval

Sr. No.	Heading	Particulars
1	**Title of Course**	M.Sc.Geoinformatics Part-II. Sem.-III-IV
2	**Eligibility for Admission**	• Students having completed Part I (Sem I & II) successfully with no ATKT's remaining of MSc. course in Geoinformatics.
3	**Passing Marks**	40%
4	**Ordinances/Regulations (if any)**	
5	**No. of Years/Semesters**	One year/Two semester
6	**Level**	P.G.
7	**Pattern**	Semester
8	**Status**	New (CBCS)
9	**To be implemented from Academic year**	2023-24

Preamble of the Syllabus:

Geoinformatics is a newly emerging discipline which is having wide application in various Government and non-government organisations. It has an ability to solve the real world problems. The field of Geoinformatics consists of Remote Sensing, Geographical information system and Global Navigation Satellite System with information technology.

It has a wide application in various fields including military and defense, Town Planning. Transport Management, Environmental Modeling, Disaster Management and Rescue Operation, Resource Mapping, Natural Resource Monitoring, Urban Planning and Management, Marketing, Business Management and so on.

Students undergoing the training for this course from various discipline such as Geography, Geology,Zoology, Botany, Microbiology, Computer Science, Environment Science, Engineering, Agriculture, etc would be able to develop an interdisciplinary approach in solving the problems using the Geospatial Technologies.

The students acquiring this degree and expertise in the field would be having a vast opportunities in the field of Academics, Government Sectors, Private Industries and Non Profit Sector too.

The master science program is design to provide theoretical background as well as hands on training to the students to develop their career proficiency.

Specific Objectives of Learning:

To introduce Geoinformatics as an advance tool consists of various advance science and technologies used for mapping and managing earth resources.

1. To introduce the advanced and emerging technologies involved in Geoinformatics.
2. To make learners create solutions to manage and process spatial information and proficiently interact with group of experts in various fields
3. To apply Geoinformatics in various fields

Course No.	Course Title	Course Type	Course Code	CIE Marks	SEE Marks	Total	Credit Points
Semester III							
1.1	GNSS and Advanced Geospatial Technologies	Core Course	PGGINF301	40	60	100	6
1.2	Geoinformatics for Disaster and Climate change studies	Core Course	PGGINF302	40	60	100	6
1.3	Resource Evaluation Lab	Core Course	PGGINF303	40	60	100	6
1.4	Geoinformatics for Agriculture and Forestry	DSE	PGGINF304A	40	60	100	6
	Mapping Beyond Earth	DSE	PGGINF304B	40	60	100	6
1.5	Python Programming	SEC	PGGINF305	40	60	100	4
Total						**500**	**28**
Semester IV							
2.1	Dissertation – Major Project	Core Course	PGGINF401	40	60	100	16
2.2	Decision Support System for Resource Management	DSE	PGGINF402	40	60	100	6
2.3	Satellite Meteorology	SEC	PGGINF403	40	60	100	6
Total						**300**	**28**

Draft Syllabus under Autonomy
For M. Sc. GEOINFORMATICS at Semester III & IV
with effect from the Academic Year 2023-24

GNSS AND ADVANCED GEOSPATIAL TECHNOLOGIES
(Core Course)

Course Outcome:
On successfully completion of this course, the students will able to -

1. Understand Satellite based navigation system.
2. Understand the process of Indian and World navigation system.
3. Understand the LiDAR technology.
4. Understand Drone and UAV working principles.
5. Understand the processing involved.

Modules at a Glance

GNSS and Advanced Geospatial Technologies (PGGINF301)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Principles and Application of GNSS	15
2	LiDAR system and processing	15
3	Introduction to Drone Technology	15
4	Drone data processing and Applications	15

M. Sc. GEOINFORMATICS-II **CORE COURSE** **GNSS And Advanced Geospatial Technologies** SEMESTER:III COURSE CODE:PGGINF301, CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
Unit- I Principles and Application of GNSS		15
1.1	Historical development - Conventional navigation, background, concepts and evolutions of global navigation satellite systems (GPS, GLONASS,Galileo, BeiDou/ COMPASS) and regional navigations satellite systems (IRNSS,QZSS).	
1.2	Various peripherals and System overview of GPS and GNSS system	
1.3	Differential Global Navigation Satellite System (DGNSS), Satellite Based Augmentation System (SBAS).	
1.4	Location - Navigation - Tracking - Mapping and Tinning -Misuses of GNSS - Intelligence collection augmentation with weapon system, integration into ballistic and cruise missile systems; Future uses – position information society - consumer based GNSS products.	
Unit – II LiDAR system and processing		15
2.1	Introduction to LiDAR, LIDAR system components, characteristics of LIDAR data, LIDAR remote sensing platforms, bathymetric mapping systems.	
2.2	Registration of LIDAR data, LIDAR filtering, DTM generation, point cloud processing, building extraction, forestry.	
2.3	LIDAR and forests, measuring forests with LIDAR, basic forest metrics, 3D urban modeling, mobile LIDAR mapping, fusion with other sensors	
Unit – III Introduction to Drone Technology		15
3.1	Concept – Vocabulary Terminology- History of drone	
3.2	Types of current generation of drones ,classification of UAV, Overview of the main drone parts- Technical characteristics of the parts -Function of the component parts	
3.3	Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program -Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.	
Unit-IV Drone data processing and Applications		15
4.1	Drone data import, integration, processing and analysis	
4.2	Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing	
4.3	The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms	

References

1. Hofmann – Wellenhof, Lichtenegger, and Wasle, (2008). Global Navigational Satellite Systems (GNSS) Springer, New York.
2. Elliott D.Kaplan, Artech House, 2005. Understanding GPS: Principles and Applications
3. Shan, J. and C. Toth, Taylor & Francis, 2nd edition. 2018. Topographic Laser Ranging and Scanning, Principles and Processing,
4. Pinliang and Qi Chen 2018 LiDAR Remote Sensing and Applications, CRC Press.

GEOINFORMATICS FOR DISASTER AND CLIMATE CHANGE STUDIES
(Core Course)

Course Outcome:
On successfully completion of this course, the students will able to -

1. Understand the process of Disaster and Natural hazards.
2. Understand the characteristics of Climate change.
3. Know the application of GIS, RS in climate modeling.
4. Understand the elements of Geoinformatics for disaster mitigation and preparedness.
5. Evaluate the climate and risk assessment models.

Modules at a Glance

Geoinformatics for Disaster and Climate Change Studies
(PGGINF302)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Introduction to Disasters and Mitigation measures	15
2	Risk assessment and Emergency planning	15
3	Basics of Climate change	15
4	Change assessment and climate models	15

M. Sc. GEOINFORMATICS-II **CORE COURSE** **Geoinformatics for Disaster and Climate Change Studies** SEMESTER: III COURSE CODE: PGGINF 302 CREDITS: 6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
	Unit- I Introduction to Disasters and Mitigation measures	15
1.1	Disaster: Definition and Classification - Hydrological and geological disasters, characteristics crisis and consequences - Role of Government administration, University research organization and NGO's - International disaster assistance - Sharing technology and technical expertise.	
1.2	Needs and approach towards prevention - Principles and components of mitigation Disaster legislation and policy - Insurance - Cost effective analysis - Utilization of resources - Training -Education - Public awareness - Roles of media.	
1.3	Slope stability of Ghat roads -Structural safety of Dams, Bridges, Hospitals, Industrial structures, -Disaster resistant structures - Low cost housing for disaster prone areas - Cyclone shelter projects and their implications - Reconstruction after disasters: Issues of practices.	
	Unit – II Risk assessment and Emergency planning	15
2.1	Remote sensing in Hazard evaluation - Zonation - Risk assessment - Damage assessment- Land use planning and regulation for sustainable development –Communication satellite applicationNetwork- Use of Internet - Warning system - Post disaster review - Case studies	
2.2	Information systems management - Spatial and non-spatial data bank creation – Operational emergency management - Vulnerability analysis of infrastructure and settlements - Predisaster and post disaster planning for relief operations -	
2.3	Potential of GIS application in development planning - Disaster management plan - Case studies	
	Unit – III Basics of Climate change	15
3.1	Concepts of climatic cycles and long term changes – earth orbital variations – solar flares and outputs.	
3.2	Magnetic and force fields – earth movements and energy release – ocean variability and periodic cycles –impacts of earthquakes and volcanoes.	
3.3	Anthropogenic impacts on agriculture , industries–urbanization – vehicles, transport and fossil fuels - chemicals, synthetics, solid wastes and gas outputs –municipal wastes	
	Unit-IV Change assessment and climate models	15
4.1	Historical evidences – archeological evidences – indicators of vegetation: species limits, pollens, tree rings and fossils	
4.2	Temperature and precipitation trends – evidences from terrain evaluation –ice and glacier changes – sea- level assessments – under water assessments – sediment analysis	
4.3	Climate change Models – RCM –GCM-Ozone depletion – greenhouse gas carbon-sequestrationIPCC and Indian scenario.	

References

1. William James Burroughs, Climate change : A multi-disciplinary Approach,2nd Edition,2007
2. Jane Mc Adam, ‖ Climate change and Displacement Multi-disciplinary Perspectines‖2010
3. J. P. Singhal (2010), Disaster Management, Laxmi Publications, ISBN-10:9380386427, ISBN 13:978-9380386423.
4. Tushar Bhattacharya (2012), Disaster Science and Management, McGraw Hill India Education Pvt Ltd., ISBN-10: 1259007367, ISBN-13:978-1259007361.
5. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E &F.N SPON Routledge, London. 2012.
6. George G. Penelis and Andreas J. Kappos - Earthquake Resistant concrete Structures. E & F.N SPON, London, 2010.
7. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991.
8. Gupta Anil K, Sreeja S, Nair. 2013 Disaster Mangement and Risk reduction: Role of Environmental Knowledge, Narosa Publishing House, NIDM, New Delhi.
9. Kapur Anu ,Vulnerable India: A Geographical study of Disasters, IIAS and sage Publishers, New Delhi,2010.

RESOURCES EVALUATION LAB
(Core Course)

Course Outcome:
On successfully completion of this course, the students will able to -

1. To acquire skill in working with various kinds of spatial data.
2. Understand the concepts of spatial data models, analysis tools and techniques.
3. Integrate multiple data layers and to produce accurate results
4. Create and utilize models to address and provide GIS based solutions to problems

Modules at a Glance

RESOURCES EVALUATION LAB
(PGGINF303)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Basic spatial analysis	15
2	Moderate spatial modeling and prioritization	15
3	Zonation and Assessments	15
4	Advanced models	15

M. Sc. GEOINFORMATICS II **CORE COURSE** **Resources Evaluation Lab** SEMESTER:III COURSE CODE:PGGINF 303, CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
Unit- I Basic Spatial Analysis		15
1.1	Lab 1: Data Collection for Resources analysis	
1.2	Lab 2: Landuse/Landcover change analysis	
1.3	Lab 3: Crop suitability for rainfed agriculture	
Unit – II Moderate spatial modeling and prioritization		15
2.1	Lab 4: Morphometric analysis and Prioritization of watershed	
2.2	Lab 5: Rainfall runoff modelling	
2.3	Lab 6: Soil erosion modelling & Water quality modelling	
2.4	Lab 7: Urban heat island modelling	
Unit – III Zonation and Assessments		15
3.1	Lab 8: Groundwater prospects zonation	
3.2	Lab 9 : Flood inundation mapping	
3.3	Lab 10: Earthquake hazard zonation	
3.4	Lab 11: Landslide susceptibility mapping	
Unit-IV Advanced models		15
4.1	Lab 12: Strom surge vulnerability assessment	
4.2	Lab 13: Drought monitoring and assessment	
4.3	Lab 14 : Multi Criteria Analysis	
4.4	Lab 15 : Machine Learning ensemble Model	

References

1. Lyon, J.G, (2003) GIS for Water Resource and Watershed Management, Taylor and Francis, New York.
2. Haywood. L, Comelius. S and S. Carver (1988). An Introduction to Geographical Information Systems, Addison Wiley Longmont, New York.
3. Lillisand T.M and R.W. Kiefer (1994). Remote Sensing and Image Interpretation (3rd edition). John Wiley & Sons, New York.
4. Sabins F.F Jr. (1987). Remote Sensing: Principles and Interpretation, W.H.Freeman & Co., New York.
5. Burrough P.A (1986) Principles of Geographical Information System for Land Resources Assessment, Clarendon Press, Oxford.
6. Burrough P A and McDonnell [2000] Principles of Geographical Information Systems, Oxford University Press, London.
7. Lo.C.P., Yeung. K.W. Albert (2002) Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India, New Delhi.
8. Monkhouse, F.J. and Wilkinson, H.R. (1994) Maps and Diagrams, Methuen, London.
9. Sarkar A. K. (1997) Practical Geography: A Systematic Approach, Oriental Longman, Calcutta.
10. Michael Law (2021) Getting to Know ArcGIS Pro 2.8 Fourth Edition, ESRI Press, U.S.A

GEOINFORMATICS FOR AGRICULURE AND FORESTRY
Discipline Specific Elective (DSE)

Course Outcome:
On successfully completion of this course, the students will able to -

1. Understand and apply remote sensing and GIS techniques in various fields of agriculture, soil, land and forest resources.
2. Understand the spectral properties of agricultural crops and their applications
3. Understand the spectral properties of Forest species and application to forest management.
4. Understand the spectral properties of soil and applications.

Modules at a Glance

Geoinformatics for Agriculture and Forestry
(PGGINF304A)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Crop Inventory and Remote Sensing	15
2	Remote Sensing for Soil	15
3	Damage Assessment	15
4	Forest Management	15

M. Sc. GEOINFORMATICS –II **Discipline Specific Elective (DSC)** **Practical in Remote Sensing** SEMESTER:III COURSE CODE:PGGINF304A CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
	Unit- I Crop Inventory and Remote Sensing	15
1.1	Introduction - leaf optical properties - identification of crops and crop inventorying – crop acreage estimation - vegetation indices.	
1.2	Yield estimation - crop production forecasting through digital analysis	
1.3	Microwave and hyper spectral sensing for crop inventory - crop monitoring and condition assessment in command areas - case studies.	
	Unit – II Remote Sensing for Soil	15
2.1	Introduction - soil survey, types of soil surveys - soil genesis and soil classification -soil taxonomy.	
2.2	Soil reflectance properties - soil mapping using remote sensing – problem soils -saline, alkali soil characteristics.	
2.3	Mapping of saline alkaline soils - soil erosion and sedimentation - assessment of soil erosion - estimation of reservoir capacity.	
	Unit – III Damage Assessment	15
3.1	Introduction - damage by pests and diseases - crop loss assessment by floods - flood hazard zone mapping.	
3.2	Remote sensing capabilities and contributions for drought management - land degradation due to water logging and salinity.	
3.3	Crop stress - reflectance properties of stressed crops - identification of crop stress - Agricultural insurance in India – CCIS, ECIS, FIIS and NAIS.	
	Unit-IV Forest Management	15
4.1	Introduction - forest taxonomy - inventory of forests - forest type and density mappingbiomass assessment - timber volume estimation.	
4.2	Factors for forest degradation-mapping degraded forests deforestation and afforestation.	
4.3	Forest fire mapping and damage assessment – species mapping - sustainable development of forests.	

References:

1. Srinivas, M.G., Remote Sensing Applications, Narosa Publishing House, New Delhi, 2001.
2. Andrew Rencz, Manual of Remote Sensing. Vol.3. Edn.3. Remote Sensing for the Earth Sciences, American Society for Photogrammetry and Remote Sensing, John Wiley & Sons, New York, 1999.
3. A.K.Singh &U.K. Chopra, Geoinformatics Applications in Agriculture, New India Publishing Company, 2007.
4. Peter James Eredics, Mapping Forestry, ESRI Press, 2010.
5. Nicholas Baghdadi, Clement Mallet, Mehrez Zribi, QGIS & applications in Agriculture and forest, John wiley &Sons, 2018.

MAPPING BEYOND EARTH
Discipline Specific Elective (DSE)

Course Outcome:
On successfully completion of this course, the students will able to -

1. Introduce the students about the principles of planetary Remote Sensing and image acquisition systems.
2. Be aware of basic and modern space missions
3. Familiarize the concepts and resolutions of different remote sensing imaging on various planets in solar system.

Modules at a Glance

Mapping Beyond Earth
(PGGINF304B)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Universe and Solar System	12
2	Lunar and Martian Studies	12
3	Remote Sensing for Planetary Geology	12
4	Planetary Exploration Missions	12

M. Sc. GEOINFORMATICS –II **Discipline Specific Elective (DSC)** **Mapping Beyond Earth** SEMESTER:III COURSE CODE:PGGINF304B CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
Unit-I Universe and Solar System		12
1.1	Origin of Universe - Big Bang and Steady state theories, Solar System.	
1.2	Planets, satellites asteroids, meteorites and comets and internal differentiation of the planets	
1.3	Planetary exploration mission and sensors.	
Unit 2 - Lunar and Martian Studies		12
2.1	Lunar orbiters - Sensors - Lunar Surface mapping – Indian and International missions.	
2.2	Mars orbiters, Sensors, Mars Surface mapping – Indian and International missions.	
Unit 3– Remote Sensing for Planetary Geology		12
3.1	Approaches to Remote Sensing analysis of the planetary surfaces;	
3.2	Applications derived from interaction of electromagnetic radiation (X-ray, gamma-ray, visible, near-IR, mid-IR. radar).	
Unit 4 – Planetary Exploration Missions		12
4.1	Laser Altimetry and its application in Planetary science - Past, present and future missions.	
4.2	Analyses and Interpretation of data gathered through various missions: identification of morphological feature	

References

1. Curran P.J (1985). Principles of Remote Sensing, Longman, London.
2. Lillisand T.M and R.W. Kiefer (1994). Remote Sensing and Image Interpretation (3rd edition). John Wiley & Sons, New York.
3. Sabins F.F Jr. (1987). Remote Sensing: Principles and Interpretation, W.H.Freeman & Co., NewYork.
4. James B. Campbell, Randolph H. Wynne, Valerie A. Thomas (2022). Introduction to Remote Sensing, Guilford Press, New York
5. Shuanggen Jin (2014)Planetary Geodesy and Remote Sensing 1st Edition, CRC PRESS, U.S.A
6. Bo Wu, Kaichang Di, Jürgen Oberst, Irina Karachevtseva (2018) Planetary Remote Sensing and Mapping 1st Edition, CRC Press,U.S.A
8. Michael Jacobson (2005) Earth System Science, Elsevier Science
9. Timothy Lenton (2016) Earth System Science A Very Short Introduction, Oxford University Press
10. Brian J. Skinner, Barbara Winifred Murck (1996) The Blue Planet An Introduction to Earth System Science, Wiley

PYTHON PROGRAMMING
Skill Enhanced Course (SEC)

Course Outcome:
On successfully completion of this course, the students will able to -

1. Develop Python programs with conditionals, loops and functions.
2. Use Python data structures – lists, tuples, dictionaries
3. Do input/output with files in Python.
4. To use modules, packages and frameworks in python

Modules at a Glance
Python Programming
(PGGEO305)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Basics of Python	15
2	Data types and Conditional Statements	15
3	File Handling and Exception Handling	15
4	Object Oriented Programming in Python	15

M. Sc. GEOINFORMATICS –II **Skill Enhanced Course (SEC)** **Python Programming** SEMESTER:III COURSE CODE:PGGEO305, CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
Unit- I Basics of Python		15
1.1	Introduction to Python: Python Introduction, History of Python, Python features, Python interpreter.	
1.2	Overview of programming in Python, Basic data types. Global and local variables.	
1.3	Basic Operators: Arithmetic Operators, Comparison Operators, Logical (or Relational) Operators, Assignment Operators, Conditional (or ternary) Operators.	
Unit – II Data types and Conditional Statements		15
2.1	Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution.	
2.2	Packages – Making Your Own Module – The Python Standard Libraries.	
2.3	Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop.	
2.4	Break Statement-Continue statement – Function Call and Returning Values – Parameter Passing	
Unit – III File Handling and Exception Handling		15
3.1	Files: Introduction – File Path – Opening and Closing Files	
3.2	Reading and Writing Files –File Position –Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions	
Unit-IV Object Oriented Programming in Python		15
4.1	Creating a Class, Class methods, Class Inheritance	
4.2	Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.	
4.3	Python libraries - PyTorch, NumPy, TensorFlow, Matplotlib, Pandas, SciPy	

References

1. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python Network Theory Ltd., First edition, 2011
2. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, First edition, 2017
3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff, O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/
4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press, 2013
5. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, First Edition,

DISSERTATION AND VIIVA VOCE

Core Course (CC)

(PGGINF401)

(Credit 16)

SR. No.	Topics to be covered	Weightage of Marks (in %)
1	Problem Identification and Literature Review	
2	Data Acquisition / Collection	
3	Field Work/Validation	
4	Data Processing	
5	Results and Interpretation	
6	Report Writing	
7	Presentation	

DECISION SUPPORT SYSTEM FOR RESOURCE MANAGEMENT
Discipline Specific Elective (DEC)

Course Outcome:
On successfully completion of this course, the students will able to -

1. Acquire knowledge about structure of Expert system and its difference with Conventional programming.
2. Interprete Expert Systems, fuzzy logic and operation research techniques.
3. Integrate Operation research and geomatic tools to design a Hybrid model to solve real world problems.
4. Plan, control and Monitor the activities of the project properly for effective implementation..

Modules at a Glance

Decision Support System for Resource Management
(PGGINF402)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Structure of Expert Systems	15
2	Rule Based Expert Systems	15
3	Operation Research	15
4	Network And Inventory Models	15

M. Sc. GEOINFORMATICS-III **CORE COURSE** **Decision Support System for Resource Management** SEMESTER:III COURSE CODE:PGGINF402, CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
Unit- I Basics of Maps		15
I	Definition – Features, needs, components – characteristics – players - Structure and phases of building ES – Human vs Artificial Expertise, Conventional programming vs Expert system-Types –Rule based, Frame based & Hybrid – Activities - Design, Planning, monitoring, Controlling-Expert system - examples in geoinformatics	
Unit – II Rule Based Expert Systems		15
II	Levels and sources of Knowledge-Knowledge Engineering - process - Knowledge Acquisition Methods- RGA analysis - Machine learning – Validation, Representation schemes, Rule, Semantic network, frames and logic – Types of Reasoning deductive, inductive, adductive, analogical and non-monotonic – Rule based Expert system - Evolution – Architecture - conflict resolution - types of inference: forward and backward chaining - search techniques– Examples in Geoinformatics.	
Unit – III Operation Research		15
III	Origin - Nature and significance - Models and Modeling – Applications and Scope – Linear programming - Problem formulation – structure and assumptions - standard form – Graphical solution – solution by simplex method – Sensitivity Analysis - Duality – Formulations of Dual problem – Geoinformatics problems & solutions- use of AHP	
Unit-IV Network And Inventory Models		15
IV	Shortest route - minimal spanning tree - maximum flow models - project network- CPM and PERT network-critical path scheduling - Types of Inventory- The classical EOQ model -Deterministic inventory problems - Price breaks - Stochastic inventory problems- selective inventory control techniques.	

Reference Books

1. Donald A.Waterman., ―A Guide to Expert systems‖, Pearson Education, 2001.
2. Durkin.J., ―Expert Systems Design and Development‖, Prentice Hall, 1994
3. Dan.W.Patterson, ―Introduction to Artificial Intelligence and Expert systems, Prentice Hall, 2009.
4. Ermine.J.I, ―Expert Systems: Theory and Practice‖, Prentice2004
5. Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems",7th Edition Addison Wesley Company,2015

SATELLITE METEOROLOGY
Core Course (CC)

Course Outcomes:

On successfully completion of this course, the students will able to -

1.Understand basic concepts of meteorology

2. Gain the knowledge on meteorological applications in weather forecasting aviation and trade applications.

3. Understand the fundamentals of Network Analysis.

4. Familiarize the Indian Meteorological satellites and sensors.

Modules at a Glance

Satellite Meteorology (PGGINF403)

Unit No.	Unit	Unit Wise Weightage of Marks (in %)
1	Weather Satellites and Sensing Systems	15
2	Data Records and Applications	15
3	Meteorological Applications	15
4	Management and Monitoring	15

M. Sc. GEOINFORMATICS-II **CORE COURSE** **Satellite Meteorology** SEMESTER:III COURSE CODE:PGGINF203, CREDITS:6 Teaching Hours 60 + Notional Hours 60 = Total hours 120		
Units	**Name of the Sub Topic**	**No of Lectures**
Unit- I Fundamental Statistics		15
I	Weather Satellites and Sensing Systems — Orbit Types and Altitudes — View Angle and Implications —INSAT and KALPANA — TRMM and GPM and others — American and European Missions, availability of data and derived data sets.	
Unit – II Data Records and Applications		15
II	Data Records and Applications — Active and Passive Sensor Data — Microwave Sensors and Applications — Altitude. Wind.. Temperature and Wave Measurements and Sensors — AWS Global Network in Measurements.	
Unit – III Meteorological Applications		15
III	Meteorological Applications — Oceanographic Applications — Weather Forecasting — Aviation Meteorology — Agriculture and Irrigation Management — Meteorology in Transportation Industry —Business and Trade Application.	
Unit-IV Management and Monitoring		15
IV	Satellite Meteorology in Welfare Management — Cyclone Warning Systems — World Precipitation and Warming — Sea level Monitoring — Ice and Snow — Flood and Storm Surge Warning Systems —Storms — Wild Fires and Volcanic Ash	

References

1. Asnani, G.C ―Tropical Meteorology‖, Vol.I and II, 3rd Edition, 2016
2. Doviak and Zrnic, ― Doppler Radar and Weather observations‖, Academic press, London,2014.
3. Sauvageot, ―Radar Meteorology‖, Artech House Publishers, Norwood, MA, 1992
4. S.R.Kalsi, ―Use of Satellite Image in Tropical Cyclone Intensity Analysis and Forecasting‖, India Meteorological Department, New Delhi, Meteorological Monograph, Cyclone warning Division No.1/2002.
5. Kelkar R.R. Satellite Meteorology, B S

EVALUATION PATTERN OF THEROY PAPERS

M. Sc. GEOINFORMATICS - II

SEMESTER-III and SEMESTER IV

(With effect from the academic year 2023-24)

INTERNAL ASSESSMENT- 40 MARKS

Practical Examination will be conducted separately

Evaluation type	Marks
Internal Evaluation	**40**
a) Online Examination	20
b) Class Room Presentation	10
c) Field Visit and report writing d) Project Report e) Attendance Seminar, Conference and workshop f) Paper Presentation in Seminar & Conference g) Making Models (As per the syllabus) h) Free Online Courses	10

EXTERNAL ASSESSMENT- 60 MARKS

- Duration – 2 Hours for each paper.
- There shall be eight questions each of 15 marks on each unit.
- All questions shall be compulsory with internal choice within the questions.

Questions	Sub. Question	Unit	Marks
1	a) OR b)	Based on Unit - I	15
2	a) OR b)	Based on Unit – II	15
3	a) OR b)	Based on Unit – III	15
4	a) OR b)	Based on Unit – IV	15

EVALUATION PATTERN OF PRACTICAL PAPER

M. Sc. GEOINFORMATICS - II

SEMESTER-III and SEMESTER IV

(With effect from the academic year 2023-24)

INTERNAL ASSESSMENT- 40 MARKS

Practical Examination will be conducted separately

Evaluation type	Marks
Internal Evaluation	**40**
a) Class Test	20
b) Problem Solving / viva	10
c) Field Visit and report writing d) Project Report e) Attendance Seminar, Conference and workshop f) Paper Presentation in Seminar & Conference g) Making Models (As per the syllabus) h) Free Online Courses i) Assignments	10

EXTERNAL ASSESSMENT- 60 MARKS

- Duration – 3 Hours for each paper.
- Each unit carries 15 marks.
- All questions shall be compulsory with internal choice within the questions.
- **External Examiner/s will be appointed from other university.**

Questions	Unit	Marks
1	Based on Unit - I	15
2	Based on Unit – II	15
3	Based on Unit – III	15
4	Journal + Viva	15