



UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A ++' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section

Email: academicsectionju14@gmail.com

NOTIFICATION **(25/June/Adp./o8)**

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the syllabi and courses of studies for **Post Graduate Programme in Remote Sensing and GIS** under **NEP-2020** as per details given below:-

Two Year Post Graduate Programme under NEP-2020

Subject	Semester	For the examinations to be held in the year
Remote Sensing & GIS	Semester-I	December 2025, 2026 and 2027
	Semester-II	May 2026, 2027 and 2028
	Semester-III	December 2026, 2027 and 2028
	Semester-IV	May 2027, 2028 and 2029

The Syllabi of the courses are also available on the University website: www.jammuuniversity.ac.in

Anju Bhasin
DEAN, ACADEMIC AFFAIRS

No. F. Acd/II/25/3311-25
Dated:- 19.06.2025

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Copy for information and necessary action to:

1. Dean, Faculty of Science
2. Convener, Board of Studies in **Remote Sensing**
3. Director, Centre for IT Enabled services and Management, University of Jammu for information and for uploading on University Website.
4. All members of the Board of Studies
5. Joint Registrar (Evaluation/P.G. Exam.)
6. Programmer, Computer Section, Examination Wing

**PG Syllabi of Remote Sensing and GIS 2025
(Programme code-PCFSR007)**

S.No.	Course No.	Course Title	No. of credit	Credit level	Credit point	Course type	Marks		Nature of course	Swayam / MOOC	Vocational course	Research project /Summer Internship/Dissemination
							Theory	Practical				
	P2RSTC101	Information Technology	4	6.5	26	Core	100		✓			
	P2RSTC102	Fundamentals of Remote Sensing and Image Interpretation	4	6.5	26	Core	100		✓			
	P2RSTC103	Aerial photography, Aerial and Digital Photogrammetry	4	6.5	26	Core	100		✓			
	P2RSTC104	Cartography and Global Navigation Satellite System	4	6.5	26	Core	100		✓			
	P2RSPC105	Information Technology, RS and Image Interpretation	4	6.5	26	-	100					✓
	P2RSPC106	Photogrammetry, Cartography and GNSS	4	6.5	26	-	100					✓
	P2RSTC201	Applied Statistics	4	6.5	26	Core	100		✓			
	P2RSTC202	Digital Image Processing	4	6.5	26	Core	100		✓			
	P2RSTC203	Geographical Information System	4	6.5	26	Core	100		✓			
	P2RSTC204	Thermal,	4	6.5	26	Core	100		✓			

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		Microwave and LIDAR Remote Sensing																	
	P2RSPC205	Statistics and Digital Image Processing	4	6.5	26	-		100				✓							
	P2RSPC206	Geographical Information System and Microwave Remote Sensing	4	6.5	26	-		100			✓								
	P2RSVC251	Vocational Course	4	6.5	26	-													Vocational
	P2RSTC301	Remote Sensing and GIS in Geosciences	4	6.5	26	Core		100		✓									
	P2RSTC302	Remote Sensing and GIS in Water Resources	4	6.5	26	Core		100		✓									
	P2RSTC303	Remote Sensing and GIS in Agriculture Soil and Land Evaluation Studies	4	6.5	26	Core		100		✓									
	P2RSTC304	Remote Sensing and GIS in Forestry	4	6.5	26	Core		100		✓									
	P2RSPC305	Remote Sensing and GIS in Geosciences and Water Resources	4	6.5	26			100			✓								
	P2RSPC306	Remote Sensing and GIS in Agriculture Soil and Land Evaluation Studies and Forestry	4	6.5	26			100			✓								
	P2RSMO351	MOOC/SWAYA M Course	4	6.5	26														MOOC/ SWAY AM Course
	P2RSTTE401	Remote Sensing	4	6.5	26	Elective		100		✓									

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Course Outcomes

Semester-1

1. Information Technology (P2RSTC101)

It enables students to learn the basic professional skills pertaining to Information Technology, such as hardware, software and data, coding- ASCII, UNICODE, DBMS, logical data model, physical and logical views, spatial databases available for natural resources and terrain, communication systems, communication types, major types of networks-LAN, WAN, MAN etc., topologies, internet, WWW, web server, client, web browser, TCP/IP Protocol Suite, IP Address, introduction to C, operators, conditional control statements, looping control statements, functions, pointers, single dimensional arrays, double dimensional arrays, strings, standard and library functions, structures & unions, and files

2. Fundamentals of Remote Sensing and Image Interpretation (P2RSTC102)

To become aware about the fundamental concept of Remote Sensing, EM Radiation and EM Spectrum, black body radiation, laws of radiation, interaction of EMR with atmosphere and earth's surface, platforms- aerial and space borne characteristics, satellites and their characteristics, earth resources satellites, meteorological satellites, basic concept and principles of active and passive sensors, sensors types and their characteristics, optical imaging sensors, concept of resolution, steps and elements of image interpretation, multirate, multispectral and multiresolution concepts, instruments for visual interpretation, Remote Sensing data products, ground truth collection, commonly used ground truth equipments, display forms- computer printouts, thematic maps and dot density maps.

3. Aerial Photography, Aerial and Digital Photogrammetry (P2RSTC103)

It enables students to learn the basic professional skills pertaining to basic information, specifications, types and geometry of aerial photographs, planning and execution of photographic flights, aerial cameras, aerial film negative and its processing- completion of photographic task, making measurements from aerial photographs, measurement of height from aerial photographs, relief displacement of vertical features and its determination, vertical exaggeration and slopes, elements of photointerpretation, symbols and colour schemes used in photointerpretation, definition and terms in photogrammetry, theory of orientation relationship between image and corresponding ground coordinates, collinearity and coplanarity of aerial photographs, aerial mosaics, scale of aerial photographs and its determination, stereovision and stereoscopes, stereoscopic exaggeration, concept of omega, phi and kappa, stereoscopic parallax and parallax equations, orthophotos and digital orthophotography, principles of stereo photogrammetry and digital photogrammetry, model deformation and rectification, triangulation, bundle core formation, DEM Orthophotogeneration, difference between DEM, DTM and DSM,

terrain analysis and modelling, advances in terrain analysis and potential applications of DEM in natural resources management.

4. Cartography and Global Navigation Satellite System (P2RSTC104)

The content of the course helps to understand the basic concept of cartography, nature and scope of cartography, scale, reference and coordinate system, conventional mapping vs digital mapping, digital cartography, relation between digital cartography, RS & GIS, cartographic transformations and reasons for transforming cartographic data, study of different types of maps, survey of India national series maps, layout and numbering of topographical maps, thematic maps and base maps, basics of map creation -principles of drawing, base materials-instruments, cartographic design - map design principles, symbolization and layout, representation of natural and cultural features, relief representations, map digitization, map compilation, fair drawing, editing of maps, and map reproduction process, introduction to Global Navigation Satellite System (GNSS), GNSS system elements and signals, classification of GNSS receivers, GNSS measurements and accuracy of GNSS, GNSS field survey design, GNSS data processing and data correction, augmented and regional navigation system and emerging trends in GNSS

Semester-2

1. Applied Statistics (P2RSTC201)

This course deals with the statistical techniques which are utilized in the remote sensing subject, for example skewness, moments, kurtosis, matrix algebra, multiple and partial correlation, simple linear regression, sampling techniques, sample size determination, standard discrete distributions, normal distribution with applications of standard normal curve, exponential distribution, concept of sampling distribution and standard error, concept of hypothesis, Chi square test for goodness of fit and test of independence, concept of analysis of variance(ANOVA), ANOVA with one way and two-way classification, introduction to design of experiment, CRD and RBD, introduction to multivariate techniques like multiple regression and multiple correlation, MANOVA, PCA, discriminant analysis and factor analysis, and case studies on multivariate analysis through SPSS/Excel software.

2. Digital Image Processing (P2RSTC202)

It enables students to learn the basic professional skills pertaining to concept of digital image, digitization of photographic image, image visualization, digital image data formats, image data storage, image retrieval, statistics used in digital image processing, image rectification, radiometric correction, geometric correction, image enhancement techniques, multi-image manipulation, enhancement by using colours, intensity hue saturation, PCA, image fusion



techniques, change detection techniques, supervised classification, unsupervised classification and advanced classification techniques.

3. Geographical Information Systems (P2RSTC203)

This course helps to understand the fundamental concept of Geographical Information Systems (GIS), computer fundamentals for GIS, hardware and software requirements for GIS, coordinate system and projections in GIS, data structure and formats, spatial data models, spatial data quality and uncertainty, data base design, editing and topology creation in GIS, linkage between spatial and non-spatial data, vector based spatial data analysis, raster based spatial data analysis, buffer analysis, network analysis, data quality and sources of errors, integration of RS and GIS data, digital elevation model and derivation of parameters, GIS data integration and modeling, open sources software and cloud computing, overview of spatial data infrastructure and decision support systems, recent trends in GIS -AM/FM, virtual 3d GIS, mobile GIS, OLAP, internet GIS, open GIS, GIS customization and GIS for citizen science.

4. Thermal, Microwave and LiDAR Remote Sensing (P2RSTC204)

This course deals with fundamentals of thermal, microwave and LIDAR remote sensing, for example, thermal radiation principles, thermal properties, characteristics of thermal IR images and factors affecting thermal images, interaction of thermal radiation with terrain elements, thermal image and types of available data products and interpretation, land surface temperature mapping with thermal scanner data, single channel and multichannel thermal data analysis, information extraction from thermal mapping, active and passive microwave remote sensing, interaction of passive microwave radiometers and surface materials- brightness temperature, dielectric constant, and polarization, interaction of radar and surface materials-complex dielectric properties, surface roughness polarization, side looking airborne radar (SLAR), synthetic aperture radar (SAR)-imaging modes, radar data calibration, geometric corrections and data interpretation, fundamentals of interferometry and polarimetry, radar altimetry, microwave remote sensing applications, physics of laser, laser interaction with objects, platform of laser scanning, LiDAR-components of LiDAR system, type of LiDAR and potential applications of LiDAR data.

5. Project Work in Geospatial Technology (P2RSRVC251)[Vocational course]

The dissertation or project work in Geospatial Technology is a crucial component of a vocational course, providing students with hands-on experience and practical application of theoretical knowledge. It allows students to engage in real-world problem-solving using tools such as Remote Sensing (RS), Geographic Information System (GIS), Global Positioning System (GPS), and related geospatial technologies. This component enhances critical thinking, technical proficiency, and project management skills by enabling students to work on issues such as land use planning, disaster management, environmental monitoring, urban development, agriculture, and natural resource management. Through guided research or field-based projects, students learn how to acquire, process, analyze, and interpret spatial data to derive meaningful insights and solutions.

Semester-3

1. Remote Sensing & GIS in Geosciences (P2RSTC301)

To become aware about the use of Remote Sensing & GIS technology and datasets in geology, geomorphology and resultant landforms. Study of spectral characteristics of rocks and minerals, drainage patterns, interpretation of folds, faults, fluvial, glacial, coastal, eolian, volcanic, karst landforms, structural and denudational landforms. Role of Remote Sensing in neo-tectonics and active tectonic, seismicity and geodynamics in NW Himalaya, mineral exploration, oil exploration, geological hazards mapping and disaster management.

2. Remote Sensing & GIS in Water Resources (P2RSTC302)

To focus on implementation of Remote Sensing & GIS technology in hydrological cycle, surface water, snow cover and glacier mapping, ground water exploration, drainage mapping and morphometric analysis. Significance of geological mapping of rocks and structures and their hydro geological properties in groundwater exploration, watershed management, soil erosion and runoff estimation, water harvesting structures and optimum site selection for rain water harvesting, snow and glacial runoff modeling, flood plain mapping and hydrological response to climate change and Land use/ land cover change

3. Remote Sensing & GIS in Agriculture Soil and Land Evaluation Studies (P2RSTC303)

This subject deals with the awareness of integrating Remote Sensing & GIS technology in crop identification, crop acreage estimation, crop inventory, crop condition and stress assessment, crop yield modeling, drought assessment and monitoring, land use / land cover, soil physical properties and classification, soil mapping, distribution of soil types in India, wasteland mapping and management, land degradation identification and mapping, mapping of salt affected soil, soil erosion and erosion hazard assessment, land use capability classification, land irrigability classification, irrigation infrastructure and command area mapping, soil moisture estimation and crop water requirement assessment and land evaluation for optimal land use planning

4. Remote Sensing & GIS in Forestry (P2RSTC304)

The students develop expertise in implementation of Remote Sensing & GIS technology and datasets in forest cover mapping, forest density monitoring, distribution of forests, forest cover change detection, mapping of stressed vegetation, biomass estimation, growing stock estimation, biodiversity studies, wildlife habitat analysis, biological invasion and monitoring of invasive species and forest management information system.

Semester-4

1. Remote Sensing & GIS in Urban Studies (P2RSTC401)

It renders societal concern and proactive measures for use of Remote Sensing & GIS in urban and regional planning, different methods for population estimation, urban sprawl and change detection studies, master plan monitoring and urban growth modeling.

2. Remote Sensing & GIS in Environmental Science (P2RSTC402)

It enables students to learn the application of Remote Sensing & GIS in ecological and biological aspects of environment, water quality monitoring, environmental pollution, solid waste management, wastewater management, man-made and natural disasters, forest fire risk assessment, environmental impact assessment and environmental management plan.

3. Cryospheric Systems and Climate Change Science (P2RSTE403)

This course equips students with a comprehensive understanding of the cryosphere and its interactions with the global climate system. Learners will explore the elements, formation, and classification of glaciers, including dry and wet-based types, and gain insight into glacier dynamics, sediment transport, and the physics of glacier ice and snow. They will study glacial erosional and depositional features using remote sensing and GIS, and analyze glacier drainage characteristics and the dating of glacial landforms through space-based methods. The course delves into the origin of ice ages, including significant periods such as the Last Glacial Maximum and Little Ice Age, along with the instrumentation and techniques used in glaciological research. Students will evaluate meltwater discharge, its chemistry, and the limitations of various dating methods for glaciogenic deposits. The curriculum also covers the influence of meteorological parameters and aerosols on glaciers, energy and mass balance studies, glacier snout monitoring, and isotope-based assessments of climate change. Additionally, the course examines permafrost characteristics, associated mass movements, and mitigation strategies. Students will apply geospatial techniques to model snow and glacial runoff, study glacier lakes, assess hazards from Glacier Lake Outburst Floods (GLOFs), and understand the impact of black carbon on glacier melting and climate change. Finally, the course provides a deep understanding of global climate systems, including carbon cycling across physical, biological, marine, and terrestrial domains; the El Niño-Southern Oscillation and its climatic effects; global ocean circulation patterns such as the Gulf Stream and Atlantic Conveyor; and global wind systems, with particular focus on the Indian Summer and Winter Monsoons.

4. Disaster, Risk Reduction and Hazard Assessment (P2RSTE404)

This course provides a holistic understanding of natural and anthropogenic disasters, emphasizing the ability to differentiate between hazards, disasters, risk, and vulnerability while assessing disaster vulnerability across different groups and locations. Students will explore preparedness and mitigation strategies, disaster effects, and management approaches. The role of

satellite remote sensing and GIS in real-time and post-disaster assessment—such as inundation, earthquakes, floods, crop loss, and forest fire risk—is thoroughly examined. The course integrates the use of GPS for early warning systems, GIS for risk analysis, and recent advancements in Geoinformatics for disaster management, including seismic microzonation using geological, geophysical, and GNSS data. Students will analyze heatwaves, cold waves, and droughts in spatial and temporal contexts, and study avalanche formation, classification, and mitigation using geospatial tools. Additionally, the course covers earthquake hazards, measurement techniques, flood zonation, landslide classification and management, and the study of Glacier Lake Outburst Floods (GLOFs) and avalanches through geospatial technologies, preparing students to assess, manage, and mitigate various disaster risks using modern scientific and technological approaches.

3. Project Work (P2RSRC405)

Implementing the knowledge of Remote Sensing & GIS in various fields such as, forestry, agriculture, water resources, snow/glaciers, geology, geomorphology, environmental science, pollution monitoring, water quality monitoring, urban sprawl, urban planning, disaster management and planning.

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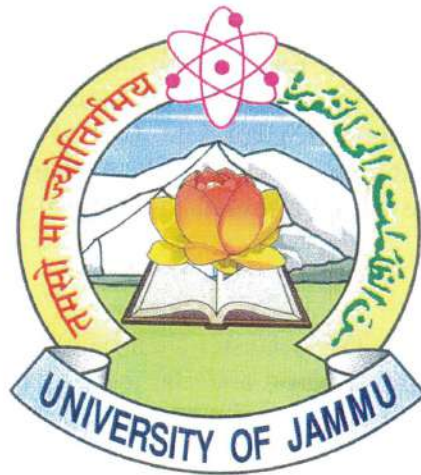
Programme Specific outcomes

M.Sc. Programme

- To understand the principles, applications, trends, and pertinent issues of geographical information systems and sciences, including Remote Sensing (RS), Photogrammetry, Cartography and Global Positioning Systems (GPS). To know about the characteristics of different satellites and sensors, and latest developments of space mission program.
- To develop technical skills and competence in satellite data acquisition, extraction, management and analysis; spatial and statistical modeling; mapping and visualization.
- Practical courses assist students to develop higher level of professional skills to tackle multidisciplinary and complex problems related to “Remote Sensing and GIS”. To integrate Remote Sensing knowledge with GIS and able to work with GIS software in various application fields. Apply principles of Remote Sensing and GIS to collect data, maps and retrieve spatial information. Monitoring and management of natural and manmade resources using geospatial models and methods.
- Each student in the fourth semester is assigned a dissertation that allows them to develop professional and intellectual integrity. They learn practically to implement the knowledge of Remote Sensing & GIS in various fields such as, forestry, agriculture, water resources, snow/glaciers, geology, geomorphology, environmental science, pollution monitoring, water quality monitoring, urban sprawl, urban planning, disaster management and planning.
- Development of communication skills, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

SYLLABUS

MASTER OF SCIENCE
IN
REMOTE SENSING & GIS
(Programme code-PCFSRO07)



UNIVERSITY OF JAMMU
JAMMU
2025-2027

**EXAMINATION PROCEDURE
OF
M.Sc. REMOTE SENSING AND GIS**

- i. The duration of course for the Master's degree in Remote Sensing and GIS shall be divided into four semesters covering two academic sessions. The first academic session will comprise of first and second semesters and the second academic session comprise of third and fourth semesters. Each semester normally comprises of 45 working days.
- ii. The minimum attendance required by a candidate will be as per university rules.
- iii. Each of Ist, IInd and IIIrd Semester shall consist of four theory courses and two laboratory courses. Fourth semester shall have to choose two theory courses among four elective courses, and the Project Work. Further, first and third semesters shall have Remote Sensing Field Work (GNSS Survey) and Remote Sensing Field Work (Ground Truth) respectively.
- iv. Each theory university examination shall be of THREE hours' duration whereas each laboratory University examination shall be of FOUR hours. Each theory and laboratory course shall consist of 100 marks. For theory papers 60 marks shall be for major examination and 40 marks for two minor examination, while for practical Examination there shall be mid-term appraisal for 25% marks and 75% marks for External Examination which includes 50% for project report and 25% of viva-voce. Besides this, the Remote Sensing field work of respective First and Third semesters shall consist of 30 marks included in the practicals. The evaluation of Remote Sensing Field Work shall be done internally and the marks awarded included in the practicals shall be sent to the University by the Head.

The Project Dissertation Work of IVth semester shall be of 400 marks, (100 marks for the mid-term appraisal, 200 marks for project report and 100 marks for viva voce). The evaluation of the Project report will be done by the External and Internal (Supervisor) examiners including the viva-voce before a committee consisting of Head and external as well as internal examiners. The marks of the Project Dissertation Work shall be sent to the University by the Head. The student shall have to pass separately each of the theory courses, laboratory courses, fieldwork, project work and the internal assessments (theory and laboratory).

A candidate for a pass at each semester Examination shall be required to obtain:

- a. At least 36% marks or requisite Grade in the aggregate of the paper prescribed for the examination.
 - b. At least 36% marks in the practical's or requisite Grade
- v. Minor & Major Examination: -
- a. **Theory**
Two minor tests of 20 marks for each theory course shall be held on the dates and time specified in the Academic calendar and/or by the Head. The one major test of 60 marks for each theory course shall be held on the dates and time specified in the Academic calendar and/or by the Head.
 - b. **Laboratory**

Mid -term appraisal of 25% marks shall be carried out in the middle of the ongoing semester's practical course for each laboratory course work will be done on the basis of regularity and proper maintenance of records, test and viva-voce.

Remote Sensing Field Work: -

Remote Sensing Field work/training is an integral part of this Course. As such, the students of M.Sc. Ist and IIIrd Semester are required to undergo field work separately in each academic session to acquire comprehensive and detailed field training in various aspects, such as GNSS survey, field checking, ground truth studies. At the end of the above field work, each student will be required to submit the field report covering all aspects for evaluation, normally within two weeks after the completion of the field work. The evaluation based on field work report, and viva - voce shall be done by the Teacher In-Charge of the Field Work and Head.

Any student failing to undergo /complete his /her Field Work & Training due to major set back such as severe or prolonged illness/ death of the nearest kith and kin shall be allowed, with the permission of Vice - Chancellor, a second chance. The student shall have to carry out, at his /her own cost, the field work in any of the area /aspect in and around Jammu provinces, as assigned by the Head and submit his /her field report for evaluation and appear at viva - voce examination along with his / her batch of students of the same year.

The attendance required during the field training is 100%. However, the attendance up to 10% may be condoned by the Vice Chancellor on the recommendation of the Teacher in-Charge duly forwarded by the Head. Such condonation shall be granted only in genuine case of severe illness of a student rendering him/her unfit to carry out the fieldwork.

Project Work/ Dissertation: -

The subject/topic of the Project Dissertation, related to the problems of Remote Sensing and GIS will be allotted to each student in the beginning of the M.Sc. IVth Semester. The students, in consultation with their respective supervisors, may give their choice of preference of problem /topic / area. However, the decision of the Head shall be final. Each student will be required to work independently on the problem assigned including literature consultation, data collection, fieldwork and/or training, laboratory investigations, report writing etc., under the guidance of his/her supervisor. The students will have to submit to the department three typed (bound) copies of his/her work, in the form of Project Report. After the evaluation, a copy of which will be returned to the concerned supervisor and the student separately.

Scheme of Examination: (for 04 credit course having five units)

MCQ on LMS + Subjective Test	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)	
TEST I (after 30 days)	20%	1 hour	10 + 10	
TEST II (after 60days)	21 to 40%	1 hour	10 + 10	
Theory	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)	
Major test (after 90 days)	100%	3 hours	60	
Total			100	
Practical / Research (thesis/project/dissertation)				
MCQ on LMS + Subjective Test	Time allots for the examination	% Weightage (Marks)		
Mid-term appraisal	4 hours	25%		
External Examination	4 hours	75%	50%	Project report
			25%	Viva Voce
Total			100	

The student shall be continuously evaluated during the conduct of each course on the basis of his/her performance as follows

:Test I and Test II

The Subjective Test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of two sections, Section-A and Section-B. Section-A will have one compulsory question comprising of 08 parts (minimum 01 from each unit) of 03 marks each. Section B will have 06 questions of 12 marks each to be set from the last three units (02 from each unit). In section B students are required to attempt 01 question from each unit. **In major test there should not be a gap of more than two days in between two tests.**

External Practical/ Research (thesis/project/dissertation) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

Note: -

However, for evaluation of thesis/project/dissertation concerned Board of Studies (BoS) has the flexibility to change the pattern of evaluation.

Restructuring of M.Sc. Remote Sensing and GIS course as Per NEP2020

Course No.	Title of the course	Credit Level	Credits	Credit point	Major Exam(Mark)	Minor Exam (Marks)	Total Credits
SEMESTER – I							
P2RSTC101	Information Technology	6.5	4	26	60	40	24
P2RSTC102	Fundamentals of Remote Sensing and Image Interpretation	6.5	4	26	60	40	
P2RSTC103	Aerial photography, Aerial and Digital Photogrammetry	6.5	4	26	60	40	
P2RSTC104	Cartography and Global Navigation Satellite System	6.5	4	26	60	40	
P2RSPC105	Information Technology, RS and Image Interpretation	6.5	4	26	Mid Term appraisal -25 marks <u>External Exams</u> (Project Report-50 marks Viva Voce -25 marks (Total: 100 marks)		
P2RSPC106	Photogrammetry, Cartography and GNSS	6.5	4	26	Mid Term appraisal -25 marks <u>External Exams</u> (Project Report-50 marks Viva Voce -25 marks (Total: 100 marks)		
Field work: GNSS Survey, Remote Sensing data with Field Verification							
SEMESTER – II							
P2RSTC201	Applied Statistics	6.5	4	26	60	40	24
P2RSTC202	Digital Image Processing	6.5	4	26	60	40	
P2RSTC203	Geographical Information System	6.5	4	26	60	40	
P2RSTC204	Thermal, Microwave and LiDAR Remote Sensing	6.5	4	26	60	40	
P2RSPC205	Statistics and Digital Image Processing	6.5	4	26	Mid Term appraisal -25 marks <u>External Exams</u> Project Report-50 marks Viva Voce -25 marks (Total: 100 marks)		
P2RSPC206	Geographical Information System and Microwave Remote Sensing	6.5	4	26	Mid Term appraisal -25 marks <u>External Exams</u> (Project Report-50 marks Viva Voce -25 marks (Total: 100 marks)		
P2RSVC251	Vocational Course	6.5	4	26	100		
SEMESTER – III							
P2RSTC301	Remote Sensing and GIS in Geosciences	6.5	4	26	60	40	28
P2RSTC302	Remote Sensing and GIS in Water Resources	6.5	4	26	60	40	
P2RSTC303	Remote Sensing and GIS in Agriculture Soil and Land Evaluation Studies	6.5	4	26	60	40	
P2RSTC304	Remote Sensing and GIS in Forestry	6.5	4	26	60	40	
P2RSPC305	Remote Sensing and GIS in Geosciences and Water Resources	6.5	4	26	Mid Term appraisal -25 marks <u>External Exams</u> Project Report-50 marks Viva Voce -25 marks (Total: 100 marks)		
P2RSPC306	Remote Sensing and GIS in Agriculture Soil and Land Evaluation Studies and Forestry	6.5	4	26	Mid Term appraisal -25 marks <u>External Exams</u> (Project Report-50 marks Viva Voce -25 marks (Total: 100 marks)		
P2RSMO351	MOOC/SWAYAM Course	6.5	4	26	As per MOOC guidelines (100 Marks)		
Field Work: Field Work for Ground Truth Verification							
SEMESTER – IV							
P2RSTE401	Remote Sensing and GIS in Urban Studies	6.5	4	26	60	40	Choose any two elective course 8
P2RSTE402	Remote Sensing and GIS in Environmental Sciences	6.5	4	26	60	40	
P2RSTE403	Cryospheric Systems and Climate Change Science	6.5	4	26	60	40	
P2RSTE404	Disaster, Risk Reduction and Hazard Assessment	6.5	4	26	60	40	
P2RSRC405	Project/ Dissertation Work	6.5	16	104	Mid Term appraisal -100 marks <u>External Exams</u> Project Report-200 marks Viva Voce -100 marks (Total: 400 marks)		16
Total Credit							100

Note:

Elective Course shall only be offered to the students in Semester-IV

First three semesters all courses are compulsory, whereas in the Semester-IV all courses are elective in nature expect the Project Dissertation

Scheme of Examination: (for 04 credit course having five units)

The student shall be continuously evaluated during the conduct of each course on the basis of his/her performance as follows:

MCQ on LMS + Subjective Test	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)	
TEST I (after 30 days)	20%	1 hour	10 + 10	
TEST II (after 60days)	21 to 40%	1 hour	10 + 10	
Theory	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)	
Major test (after 90 days)	100%	3 hours	60	
Total			100	
Practical / Research (thesis/project/dissertation)				
MCQ on LMS + Subjective Test	Time allots for the examination	% Weightage (Marks)		
Mid-term appraisal	4 hours	25%		
External Examination	4 hours	75%	50%	Project report
			25%	Viva Voce
Total				100

Test I and Test II

The Subjective Test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of two sections, Section-A and Section-B. Section-A will have one compulsory question comprising of 08 parts (minimum 01 from each unit) of 03 marks each. Section B will have 06 questions of 12 marks each to be set from the last three units (02 from each unit). In section B students are required to attempt 01 question from each unit. **In major test there should not be a gap of more than two days in between two tests.**

External Practical/ Research (thesis/project/dissertation) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

Note:-

However, for evaluation of thesis/project/dissertation concerned Board of Studies (BoS) has the flexibility to change the pattern of evaluation.

A-1

The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO P2RSTC101

TITLE: Information Technology

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit-1

- 1.1 Introduction: Hardware, software and data, Von-Neumann architecture
- 1.2 Software: System, Application, Open source, DBMS
- 1.3 Coding: ASCII, UNICODE
- 1.4 Problem Solving Tools: Algorithm, Flowchart Designing

Unit-2

- 2.1 Communication systems, wired and wireless communication, communication types
- 2.2 Major types of networks-LAN, WAN, MAN etc., Topologies
- 2.3 WWW, web server, web browser, HTML: Text Formatting Tags, Adding Lists, Table, Paragraphs, Links, Lists
- 2.4 TCP/IP Protocol Suite, IP Address

Unit-3

- 3.1 Introduction to C: keywords, data types, variables, constants, expressions
- 3.2 Operators: Mathematical, Unary, Binary, Relational and Logical operators, Operator precedence and associativity
- 3.3 Conditional Control statements: if statement, if else statement, nested if statement, if else if ladder and Ternary operator, Switch case statement
- 3.4 Looping control Statements: While loop, Do while Loop, For loop, Nested loops

Unit-4

- 4.1 Functions: Definition, Types of Function, Scope, Call by Value
- 4.2 Pointers: Declaration, Definition, Indirection, Arithmetic, Call by Reference
- 4.3 Single dimensional arrays: Definition, Declaration, Accessing, Passing to function
- 4.4 Double dimensional arrays: Definition, Declaration, Accessing, Passing to function

Unit-5

- 5.1 Strings: Declaration, Initialization, Accessing, Passing to function, declaring and accessing array of strings
- 5.2 Standard and library functions: string length, string copy, finding substring, concatenating strings etc.
- 5.3 Structures & Unions: Declaring, Initializing and Accessing structures, passing structures to functions
- 5.4 Files: File opening modes, Opening and closing a data file, Reading, Writing

Books Recommended

Introduction to Information Technology by EFRAIM TURBAN, R. KELLY RAINER and RICHARD E. POTTER Published by John Wiley & Sons.

Computer Networks by Andrew S. Tanenbaum

Gottfrfield, B.S.: Programming with C, Tata McGraw Hill Publishing Co. Ltd.

Programming in C by Jamwal Shubhnandan, Pearson Publications

E. Balaguruswamy: Programming in ANSIC, Tata McGraw Hill Publishing Co. Ltd.

The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO P2RSTC101*

TITLE: Information Technology

Guidelines for setting of question paper

Test I and Test II

MCQ on LMS (10 marks) and the subjective test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

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The Major test will comprise of two sections, Section-A and Section-B. Section-A will have one compulsory question comprising of 08 parts (minimum 01 from each unit) of 03 marks each. Section B will have 06 questions of 12 marks each to be set from the last three units (02 from each unit). In section B students are required to attempt 01 question from each unit. **In major test there should not be a gap of more than two days in between two tests.**

G. S.

The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO. P2RSTC102

TITLE: Fundamentals of Remote Sensing and Image Interpretation

Maximum Marks: 100

Major Examination: 60

Credit: 4

Time allowed: 3 hours

Minor Examination: 40

Unit – 1

- 1.1 Remote sensing - history & development, definition, concept and principles
- 1.2 Energy resources, radiation principles, EM Radiation and EM Spectrum
- 1.3 Black body radiation, laws of radiation
- 1.4 Interaction of EMR with atmosphere and earth's surface

Unit – 2

- 2.1 Platforms - aerial and space borne characteristics
- 2.2 Satellites and their characteristics - Geo-stationary and Sun-synchronous
- 2.3 Earth Resources Satellites- LANDSAT, SPOT, IRS, IKONOS etc.
- 2.4 Meteorological satellites -INSAT, NOAA, GOES etc.

Unit – 3

- 3.1 Basic concept and principles of active and passive sensors
- 3.2 Sensors - types and their characteristics, across track (whiskbroom) and along track (pushbroom) scanning
- 3.3 Optical Imaging sensors - MSS, TM, LISS, WiFS, PAN etc.
- 3.4 Concept of resolution - spatial, spectral, temporal, radiometric

Unit – 4

- 4.1 Basic principles, types, steps and elements of image interpretation
- 4.2 Techniques of visual interpretation and interpretation keys
- 4.3 Multidate, multispectral and multiresolution concepts
- 4.4 Instruments for visual interpretation

Unit – 5

- 5.1 Remote sensing data products - open data and commercial EO data
- 5.2 Ground truth collection - spectral signatures
- 5.3 Commonly used ground truth equipments - use of spectro-radiometers
- 5.4 Display forms - computer printouts, thematic maps, dot density maps

Books Recommended

- Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications
Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag
Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall.
Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Sabbins, F.F., 1985: Remote Sensing Principles and interpretation. W.H. Freeman and company

The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO. P2RSTC102

TITLE: Fundamentals of Remote Sensing and Image Interpretation

Guidelines for setting of question paper

Test I and Test II

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The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO. P2RSTC103 TITLE: Aerial Photography, Aerial and Digital Photogrammetry

Guidelines for setting of question paper

Test I and Test II

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The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO. P2RSTC104 TITLE: Cartography and Global Navigation Satellite System

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit – 1

- 1.1 Introduction to cartography: Definition, nature and scope of cartography
- 1.2 Cartography as a science of communication, Basis of map readings.
- 1.3 Scale: Definition, Significance of scale, methods of representing scale
- 1.4 Types of scale and their importance.

Unit – 2

- 2.1 Classification and significance of maps
- 2.2 Map reference and coordinate system
- 2.3 Cartographic symbols: Point, line, Area symbols, their definitions and significance
- 2.4 Cartographic methods: Quantitative and Non-quantitative areal distribution maps with the help of following methods: Isopleth, Choropleth, Dot, Chorocromatic and Choroschematic methods; their merits and demerits

Unit – 3

- 3.1 Map Projection- Concept, classification and choice of map projection
- 3.2 Study of Topographical maps: Survey of India National series maps, layout and numbering of topographical maps
- 3.3 Representation of natural and cultural features, relief representations
- 3.4 Digital cartography: Conventional mapping vs Digital mapping, Elements of digital cartography; relation between digital cartography, Remote Sensing and GIS.

Unit – 4

- 4.1 Introduction to Global Navigation Satellite System (GNSS) - fundamental concepts
- 4.2 GNSS system elements and signals
- 4.3 Classification of GNSS receivers
- 4.4 GNSS measurements and accuracy of GNSS

Unit –5

- 5.1 GNSS field survey design
- 5.2 GNSS data processing and data correction
- 5.3 Augmented and regional navigation system
- 5.4 Emerging trends in GNSS

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications
Mishra R.P and Ramesh A. 1989: Fundamentals of Cartography. Concept Publishing Company
Nag P. and Kudrat M. 1998: Digital Remote Sensing. Concept Publication
Rampal K.K. 1993: Mapping and compilation. Concept publication
Robinson A., Morrison, J.L., Muehrcke P.C., Guptil S.C. 2002: Elements of Cartography. John Wiley
Taylor, D.R.F. 1985: Education and Training in Contemporary Cartography, John Willey

The Syllabi M.Sc. Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2025, Dec. 2026 and Dec. 2027

COURSE NO. P2RSTC104 TITLE: Cartography and Global Navigation Satellite System

Guidelines for setting of question paper

Test I and Test II

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A. Y.

COURSE NO. P2RSPC105

TITLE: PRACTICALS RELATING TO COURSE No.
**P2RSTC101 and P2RSTC102

Maximum Marks: 100

Credit: 4

Time allowed: 4 hours

Mid Term appraisal -25 marks

External Exams

Project Report- 50 marks

Viva Voce -25 marks

- i) MS OFFICE
- ii) MS EXCEL
- iii) MS ACCESS
- Internet and HTML
- Elementary C-Programming
- Working knowledge of Image analysis softwares
- Study of satellite image, metadata information and marking reference system
- Analysis of spectral reflectance curves
- Visual interpretation of satellite images
- Interpretation of different resolution IRS satellite images – LISS III, LISS IV, PAN, AWIFS etc.
- Interpretation of cultural & natural details from IRS satellite image

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COURSE NO P2RSPC106

**TITLE: PRACTICALS RELATING TO COURSE No.
P2RSTC103 and P2RSTC104**

Maximum Marks: 100

Credit: 4

Time allowed: 4 hours

Mid Term appraisal -25 marks

External Exams

Project Report- 50 marks

Viva Voce -25 marks

- Stereo test and orientation of aerial photograph
- Determination of photo scale
- Use of parallax bar, determination of heights
- Preparation of photo line index
- Identification of features on vertical aerial photographs
- Visual interpretation of aerial photographs
- Study of SOI topographic sheets
- Calculation of map numbering and imaging reference system
- Base map preparation
- Handling of GNSS, data collection and integration of GNSS data

REMOTE SENSING FIELD WORK (GNSS SURVEY)

- Familiarization with GNSS receiver and to know the set up unit
- Initialisation of the system in the field
- To get acquainted with the various functions of the GNSS
- Using GNSS with map & compass
- Area calculation by GNSS
- Navigation by way points
- Navigation by track points
- Transfer of way points
- Map preparation and map upgradation

The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC201

TITLE: Applied Statistics

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit -1

- 1.1 Statistical data: types and sources, discrete and continuous series, scales of measurement, measures of location and dispersion
- 1.2 Skewness, moments and kurtosis
- 1.3 Matrix algebra: types and properties of matrices, addition, subtraction, multiplication, inverse of a matrix
- 1.4 Time series - definition, components (trend, seasonal, irregular and cyclical), forecasting based on moving average, single exponential smoothing, trend fitting (linear and exponential growth)

Unit- 2

- 2.1 Correlation: introduction, types, properties, product moment and rank Correlation
- 2.2 Simple linear regression with examples (using SPSS/Excel software)
- 2.3 Multiple and partial correlation: concept, computation for three variables only
- 2.4 Introduction to sampling, sampling techniques, sample size determination

Unit-3

- 3.1 Random variable-discrete and continuous, concept of classical probability and probability distribution, simple applications
- 3.2 Mathematical expectation and related elementary results
- 3.3 Standard discrete distributions- binomial and poisson with applications
- 3.4 Normal distribution with applications of standard normal curve, exponential distribution with examples

Unit -4

- 4.1 Concept of sampling distribution and standard error, sampling distribution of mean
- 4.2 Concept of Hypothesis - The Elements of a Test of Hypothesis - Basic Concepts - Null and Alternative Hypotheses - Type I and Type II Errors - Test statistic, point and interval estimation, hypothesis, two types of error, level of significance and concept of confidence level
- 4.3 Small and large sample test - concerning proportions, means, variances (such as Z, t and F test)
- 4.4 Chi square test for goodness of fit and test of independence

Unit -5

- 5.1 Concept of analysis of variance (ANOVA), ANOVA with one way and two-way classification
- 5.2 Introduction to design of experiment, CRD and RBD
- 5.3 Introduction to multivariate techniques like multiple regression and multiple correlation, MANOVA, PCA, discriminant analysis and factor analysis concepts only
- 5.4 Case studies on multivariate analysis through SPSS/Excel software

Books Recommended

1. Paul L. Meyer: Introductory Probability and Statistical Applications, Adson Wesley.
2. Kapoor and Gupta: Fundamentals of Mathematical Statistics, S Chand and Sons.
3. Kapoor and Gupta: Fundamentals of Applied Statistics, S Chand and Sons.
4. Shanti Narayan: Textbook of Matrices, S. Chand and Co.
5. R.A. Johnson: Applied Multivariate Statistical Analysis, Pearson.

A-1

The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSGTC201

TITLE: Applied Statistics

Guidelines for setting of question paper

Test I and Test II

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Major Test

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A-1

The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC202

Maximum Marks: 100

Major Examination: 60

Minor Examination: 40

TITLE: Digital Image Processing

Time allowed: 3 hours

Credit: 4

Unit – 1

- 1.1 Introduction to digital image processing- concept of digital image, steps in DIP
- 1.2 Image processing systems -hardware and software considerations
- 1.3 Digitization of photographic image and image visualization
- 1.4 Digital image data formats, image data storage and retrieval

Unit – 2

- 2.1 Basic statistical concept in DIP
- 2.2 Fundamental of image rectification, definition, principle and procedure
- 2.3 Radiometric & geometric correction of remotely sensed data
- 2.4 Image calibration methods (DN to radiance, radiance to reflectance)

Unit – 3

- 3.1 Image enhancement techniques - an overview
- 3.2 Contrast enhancement - linear and non-linear, histogram equalization and density slicing
- 3.3 Spatial filtering and edge enhancement
- 3.4 Multi image manipulation -addition, subtraction, ratioing and spectral indices

Unit 4

- 4.1 Enhancement by using colours - advantages, types of colour enhancements
- 4.2 Image transformation -Intensity Hue Saturation (HIS) and PCA
- 4.3 Image fusion techniques
- 4.4 Change detection techniques

Unit – 5

- 5.1 Image classification types - supervised and unsupervised, advantage and limitations
- 5.2 Advanced classification techniques
- 5.3 Classification accuracy assessment
- 5.4 Overview of classification techniques for high spatial resolution and hyperspectral data

Books Recommended

- Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
- Gibson, P.J. 2000: Digital Image Processing. Routledge Publication
- Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
- Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
- Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
- Nag P. and Kudrat M. 1998: Digital Remote Sensing. Concept Publication
- Pratt.W.K. 2004: Digital Image Processing. John Wiley
- Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H. Freeman and Company

The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC202

TITLE: Digital Image Processing

Guidelines for setting of question paper

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The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC203

TITLE: Geographical Information System

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit - 1

- 1.1 Introduction to GIS - definition, concept and history of developments in the field of information systems
- 1.2 Computer fundamentals for GIS
- 1.3 Hardware and software requirements for GIS
- 1.4 Coordinate system and projections in GIS

Unit - 2

- 2.1 Data structure and formats
- 2.2 Spatial data models - raster and vector, data inputting & GIS
- 2.3 Spatial data quality and uncertainty
- 2.4 Data base design - editing and topology creation in GIS, linkage between spatial and non-spatial data

Unit - 3

- 3.1 Spatial data analysis - significance and type, attribute query, spatial query
- 3.2 Vector based spatial data analysis- topological analysis
- 3.3 Raster based spatial data analysis- local, neighborhood, regional and global operations
- 3.4 Buffer analysis, network analysis

Unit - 4

- 4.1 Data quality and sources of errors
- 4.2 Integration of RS and GIS data
- 4.3 Digital elevation model and derivation of parameters
- 4.4 GIS data integration and modeling

Unit - 5

- 5.1 Open sources software and cloud computing
- 5.2 Overview of spatial data infrastructure and decision support systems (DSS)
- 5.3 Overview of image processing & GIS Packages
- 5.4 Recent trends in GIS- AM/FM, Virtual 3D GIS, Mobile GIS, OLAP, Internet GIS, Open GIS, GIS customization and GIS for citizen science

Books Recommended

- Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications
- Chang, T.K. 2002: Geographic Information Systems. Tata McGrawHill
- Heywood, I., Cornelius S, Crver Steve. 2003: An Introduction to Geographical Information Systems. Pearson Education
- Ram Mohan Rao. 2002: Geographical Information Systems. Rawat Publication.
- Skidmore A. 2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis
- Tar Bernhardsen. Geographical Information Systems. John Wiley.
- Wise S. 2002: GIS Basics. Taylor Publications
- ESRI Map book: GIS the Language of Geography by ESRI-USA ESRI-2004
- Satellite Geodesy: Gunter Seeba

The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC203

TITLE: Geographical Information System

Guidelines for setting of question paper

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The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC204

Maximum Marks: 100

Major Examination: 60

Minor Examination: 40

TITLE: Thermal, Microwave and Lidar Remote Sensing

Credit: 4

Time allowed: 3 hours

Unit 1

- 1.1 Thermal radiation principles and sources,
- 1.2 Thermal Radiant energy- basic considerations and thermal properties
- 1.3 Broad band thermal IR Sensing
- 1.4 Concept of temperature estimation from thermal bands

Unit 2

- 2.1 Thermal IR multispectral sensing, ground and space based thermal sensors and their applications
- 2.2 Characteristics of thermal IR images and factors affecting thermal images
- 2.3 Interaction of thermal radiation with terrain elements
- 2.4 Thermal scanning, aerial and space based thermal scanner and their applications

Unit 3

- 3.1 Introduction to microwave remote sensing: active and passive microwave remote sensing, classifications of active sensors and passive sensor
- 3.2 Microwave data sets and their specifications and advances
- 3.3 History and concept of radar and air borne and space radar Concept of Synthetic Aperture Radar (SAR), Side looking airborne radar (SLAR), equation and components
- 3.4 Radar equation, synthetic Aperture Radar (SAR) – and its imaging modes

Unit – 4

- 4.1. Active microwave system components surface materials- brightness temperature, dielectric constant, complex dielectric properties, surface roughness polarization
- 4.1 Geometry of Radar, concept of relief displacement shadow and foreshortening and layover
- 4.2 Concept of Interferometry DInSAR and PSInSAR and its applications
- 4.3 Concept of polarimetry and its applications

Unit – 5

- 5.1 Microwave remote sensing applications, and response of radar to vegetation water, soil moisture,
- 5.2 Physics of laser, laser interaction with objects, Platform of laser scanning (ground, air, space)
- 5.3 LiDAR – components of LiDAR system, type of LiDAR (topographic, bathymetric, etc.) and Potential applications of LiDAR data
- 5.4 Concept of Radar Altimetry and its potential applications

Books Recommended

- Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
- Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
- Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
- Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
- Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
- Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and company

The Syllabi M.Sc. Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2026, May 2027 and May 2028

COURSE NO: P2RSTC204

TITLE: Thermal, Microwave and Lidar Remote Sensing

Guidelines for setting of question paper

Test I and Test II

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COURSE NO. P2RSPC205

TITLE: PRACTICALS RELATING TO COURSE No.
**P2RSTC201 and P2RSTC202

Maximum Marks: 100

Credit: 4

Time allowed: 4 hours

Mid Term appraisal -25 marks

External Exams

Project Report- 50 marks

Viva Voce -25 marks

- Frequency distribution, moments of distribution
- Matrix algebra: types and properties of matrices, addition, subtraction, multiplication, inverse
- Correlation: concepts and methods
- Regression: Bi-variate, linear
- Exponential and power
- Multivariate, principle component analysis
- Normal, binomial, poisson
- Introduction to Boolean and fuzzy logic
- Pattern analysis, measures of arrangement & dispersion autocorrelation, semivariogram analysis

Following tasks to be done using ERDAS image processing software:

- Free download Images such as Landsat (ETM+, OLI/TIRS), MODIS, NOAA, SRTM, GTOPO, ASTER
- To load digital data and to convert image data
- Display of B&W and FCC using ERDAS
- File management- raster layer and layer information
- Image enhancements - spectral, radiometric and spatial
- Look up table and histogram manipulation
- Low pass filters, high pass filters, band rationing, principal component analysis
- Geometric correction and mosaicing of image
- Vector functions - Spatial & attribute query
- Data import and export
- Geometric & Radiometric correction
- Unsupervised classification
- Supervised classification
- Use of model maker for band rationing
- Map composition

COURSE NO. P2RSPC206

**TITLE: PRACTICALS RELATING TO COURSE No.
P2RSTC203 and P2RSTC204**

Maximum Marks: 100

Credit: 4

Time allowed: 4 hours

Mid Term appraisal -25 marks

External Exams

Project Report- 50 marks

Viva Voce -25 marks

- Familiarization with ARC GIS software
- Geo-referencing in ARC GIS
- Digitization and layer creation
- Data input, data editing and topology creation
- Editing the layers (use of snap tolerance, remove overlap, gaps, union & intersect etc.)
- Non spatial data entry
- Linking spatial and non- spatial data (Join & Relate)
- Create new table, add field to table, add record to table, calculate area and perimeter
- Buffer analysis and query analysis (selection by location and selection by attributes)
- Overlay analysis
- Network analysis –finding the shortest route between two places, finding the optimum path etc.
- Output map generation
- Calculation of at satellite radiance and surface radiance from thermal imagery
- Computation of brightness temperature from thermal imagery
- Calculation of thermal emissivity
- Calculation of land surface temperature
- Backscattering image generation
- Processing of radar image: speckle removal through different filters
- Radar Image Interpretation

P2RSVC251

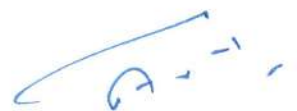
TITLE: Project Work in Geospatial Technology (Vocational course)

Maximum Marks: 100

Credit: 4

Time allowed: 8 week

The students who intend to exit after first year (after Semester-II) of the two year PG programme in RS & GIS and desire to get PG Diploma in RS & GIS after one year shall have to carry out the project work in geospatial technology



The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC301

TITLE: Remote Sensing and GIS in Geosciences

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit – 1

- 1.1 Remote sensing in geology - an overview
- 1.2 Basic concept of geomorphology, earth surface process and resultant landforms
- 1.3 Spectral characteristics of rocks and minerals
- 1.4 Drainage patterns - types and its significance in geological studies

Unit -2

- 2.1 Interpretation of landforms due to folding and faulting, geomorphic indices of active tectonics
- 2.2 Interpretation of fluvial landforms
- 2.3 Interpretation of glacial, coastal, eolian and volcanic landforms
- 2.4 Interpretation of karst landforms

Unit - 3

- 3.1 Lithological interpretation of igneous, sedimentary and metamorphic rocks
- 3.2 Interpretation of structural and denudational landforms - cuesta, hogback, butte, mesa etc.
- 3.3 Interpretation of landforms related to igneous, sedimentary and metamorphic rocks
- 3.4 Digital Elevation Model, terrain evaluation and geomorphological mapping

Unit – 4

- 4.1 Identification and mapping of geological structures: folds, faults, unconformities and lineaments
- 4.2 Structural and tectonic landforms mapping and analysis
- 4.3 Neo-tectonics and active tectonic
- 4.4 Seismicity and geodynamics in NW Himalaya

Unit – 5

- 5.1 Remote sensing in mineral exploration - an overview and application of remote sensing in mineral exploration - Indian examples
- 5.2 Remote sensing in oil exploration - features helpful in detection of target areas for oil exploration
- 5.3 Engineering geological investigation, alignment studies - roads, tunnels, canals etc. site selection studies - dams, bridges, highways, airstrips etc
- 5.4 Geological hazards mapping and disaster management

Books Recommended

- Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
- Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
- Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
- Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
- Paine, D.P., 1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.
- Pandey, S.N., 1987: Principles and Applications of Photogeology. Wiley Eastern.
- Ray, R.G., 1969: Aerial Photographs in Geologic Interpretations. USGS Prof, Paper 373.
- Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H. Freeman and Company
- Skidmore A. 2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC301

TITLE: Remote Sensing and GIS in Geosciences

Guidelines for setting of question paper

Test I and Test II

MCQ on LMS (10 marks) and the subjective test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of two sections, Section-A and Section-B. Section-A will have one compulsory question comprising of 08 parts (minimum 01 from each unit) of 03 marks each. Section B will have 06 questions of 12 marks each to be set from the last three units (02 from each unit). In section B students are required to attempt 01 question from each unit. **In major test there should not be a gap of more than two days in between two tests.**

A-11

The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC302

TITLE: Remote Sensing and GIS in Water Resources

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit 1

- 1.1 Basic concept of water resources: hydrological cycle and water balance
- 1.2 Issues in water resources development, management and utilization
- 1.3 Spectral characteristics of water and snow and relevance of RS techniques for hydrological investigations
- 1.4 Surface water, Snow cover and glacier interpretation, mapping and monitoring using Remote Sensing

Unit – 2

- 2.1 Remote sensing in ground water exploration and factors affecting ground water occurrence
- 2.2 Fundamentals of groundwater hydrology - Porosity, permeability, transmissibility, specific yield, specific retention and hydraulic conductivity and types of aquifers
- 2.3 Drainage mapping and morphometric analysis
- 2.4 Darcy's law and Groundwater flow, surface and groundwater interaction, control and occurrence of groundwater movement

Unit – 3

- 3.1. Remote sensing in evaluating hydrogeological features and elements
- 3.2 Significance of geological mapping of rocks and structures and their hydrogeological properties in groundwater exploration
- 3.3 Ground water targeting in various terrain types - hard rock terrain and in alluvial terrain
- 3.5 Geophysical investigation and satellite based measurements for groundwater studies

Unit – 4

- 4.1 Watershed management- introduction, philosophy and concept and role of remote Sensing and GIS in watershed conservation, planning and management
- 4.2 Geospatial methods for Watershed mapping and physical characterization
- 4.3 Soil erosion and Runoff estimation using hydrological modeling
- 4.4 Water harvesting structures and optimum site selection for rain water harvesting

Unit – 5

- 5.1 Snow and glacial runoff modeling
- 5.2 Flood and flood plain mapping, monitoring and zoning
- 5.3 Water quality monitoring and hydrogeological modeling using RS and GIS
- 5.4 Hydrological response to climate change and land use/ land cover change

Books Recommended

- Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications
Chow, V.T., 1988: Advances in Hydro Science McGraw Hill
Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall

The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC302

TITLE: Remote Sensing and GIS in Water Resources

Guidelines for setting of question paper

Test I and Test II

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The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC303 TITLE: Remote Sensing and GIS in Agriculture, Soil and Land Evaluation Studies

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit -1

- 1.1 Remote sensing in agriculture - an overview
- 1.2 Spectral characteristics of crops and factors affecting spectral signatures of crops
- 1.3 Principles of crop identification and crop acreage estimation
- 1.4 RS and GIS applications in crop inventory

Unit – 2

- 2.1 Crop condition and stress assessment using RS techniques
- 2.2 Agro-meteorology -its importance and application of RS in agro-meteorology
- 2.3 Crop yield modeling using remote sensing
- 2.4 Drought assessment and monitoring through remote sensing

Unit –3

- 3.1 Land use / land cover - basic concept, classification and mapping using remote sensing
- 3.2 Soil physical properties and classification schemes
- 3.3 Soil mapping using aerial and satellite remote sensing data
- 3.4 Distribution of soil types in India and introduction of remote sensing in soil survey

Unit – 4

- 4.1 Wasteland: mapping and management using remote sensing
- 4.2 Land degradation -degraded soils, their identification and mapping of degraded lands
- 4.3 Salt affected soil and mapping of salt affected soil using remote sensing
- 4.4 Soil erosion and erosion hazard assessment through remote sensing

Unit –5

- 5.1 Land use capability classification (LUCC), Land irrigability classification (LCC)
- 5.2 Irrigation infrastructure and command area mapping using remote sensing and GIS
- 5.3 Soil moisture estimation and crop water requirement assessment using RS
- 5.4 Land evaluation for optimal land use planning

Books Recommended

- Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications
Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Skidmore A. 2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC303 TITLE: Remote Sensing and GIS in Agriculture, Soil and Land Evaluation Studies

Guidelines for setting of question paper

Test I and Test II

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A.M.

The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC304

Maximum Marks: 100

Major Examination: 60

Minor Examination: 40

TITLE: Remote Sensing and GIS in Forestry

Credit: 4

Time allowed: 3 hours

Unit – 1

- 1.1 Forest: Introduction and distribution of forests
- 1.2 Forest types of India
- 1.3 Forestry: Introduction and concept of forestry
- 1.4 Role of RS and GIS in forestry

Unit – 2

- 2.1 Interaction of EMR with vegetation and spectral characteristics of vegetation
- 2.2 Temporal characteristics of vegetation
- 2.3 Vegetation indices for monitoring vegetation health and forest fires
- 2.4 Forest cover mapping through RS and GIS

Unit – 3

- 3.1 Forest types and forest density mapping
- 3.2 Remote Sensing application in forest cover change detection
- 3.3 Remote Sensing application in mapping of stressed vegetation
- 3.4 Study of association between rock and forest types using RS and GIS

Unit – 4

- 4.1 Biomass estimation by non-destructive method
- 4.2 Growing stock estimation using RS and GIS
- 4.3 Remote sensing application in formulation of forest working plan
- 4.4 Role of advanced remote sensing techniques in forest studies

Unit – 5

- 5.1 Bio diversity studies using RS and GIS
- 5.2 Wildlife habitat analysis using RS and GIS
- 5.3 Biological invasion and monitoring of invasive species through RS and GIS
- 5.4 Forest management information system (FMIS)

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications
Franklin S.E. 2001. Remote Sensing for Sustainable Forest Management. Lewis Publication
Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.

The Syllabi M.Sc. Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec. 2026, Dec. 2027 and Dec. 2028

COURSE NO. P2RSTC304

TITLE: Remote Sensing and GIS in Forestry

Guidelines for setting of question paper

Test I and Test II

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COURSE NO. P2RSPC305

**TITLE: PRACTICALS RELATING TO COURSE No.
P2RSTC301 and P2RSTC302**

Maximum Marks: 100

Credit: 4

Time allowed: 4 hours

Mid Term appraisal -25 marks

External Exams

Project Report- 50 marks

Viva Voce -25 marks

- Visual interpretation of satellite images and aerial photographs to study the following: geomorphology, lithology, geology and structure, surface water, snow and glacier
- Digital image processing for the study of geomorphology, structure, and lineaments
- Digital Terrain Modeling
- Geomorphic mapping
- Structural/ Lineament mapping
- Drainage mapping and morphometric analysis
- Hydrogeomorphology interpretation
- Preparation of groundwater potential zone maps
- Estimation of evapotranspiration using remote sensing based energy balance
- Climatic water balance through empirical method

COURSE NO. P2RSPC306

TITLE: PRACTICALS RELATING TO COURSE No.
P2RSTC303 and P2RSTC304

Maximum Marks: 100

Credit: 4

Time allowed: 4 hours

Mid Term appraisal -25 marks

External Exams

Project Report- 50 marks

Viva Voce -25 marks

- Land use / land cover mapping
- Waste land mapping
- Soil erosion mapping
- Identification of degraded lands
- Spectral indices for vegetation and soil monitoring
- Crop acreage estimation studies
- Digital image enhancements for vegetation/forest
- Vegetation mapping from satellite images
- Digital classification for forest cover mapping
- Identification of forest species from aerial photographs/ high resolution images
- Forest change detection studies

A. S.

GEOSCIENCES FIELD WORK (GROUND TRUTH)

Pre field preparations

- Preparation of various thematic maps in the lab
- Image Classification in the lab for lithological Mapping

Field work

- Field validation of the above-mentioned themes and maps in the field
- Study of the different signatures for the different different rock & mineral in the field.
- Ground truth collection for lithological Mapping
- Any other relevant data collection in the field

Post Field work in the lab

- Training site selection for supervised classification
- Thematic map generation
- Thematic maps correction after the field checking
Report submission

P2RSMO351

TITLE: (MOOC/SWAYAM Course)

Maximum Marks: 100

Credit: 4

Time allowed: 12weeks

By using the standing instructions for MOOC/SYAMYAM implementation in the University of Jammu

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The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO. P2RSTC401

TITLE: Remote Sensing and GIS in Urban Studies

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit – 1

- 1.1 Remote sensing in human settlement and urban planning - an overview
- 1.2 Principles of urban area development planning and land use
- 1.3 Data requirement for urban and regional planning
- 1.4 Large scale mapping for cadastral database in urban areas

Unit – 2

- 2.1 Settlement patterns – image characterization and recognition
- 2.2 Urban and Rural settlements - detection, interpretation, delineation and analysis
- 2.3 Methods of population estimation using remote sensing
- 2.4 Concepts of URDPFI guidelines

Unit – 3

- 3.1 Slum, squatter settlement - detection, interpretation, delineation and analysis
- 3.2 Built up extraction and Urban material characterization using microwave and hyperspectral data
- 3.3 Urban sprawl and change detection studies
- 3.4 Transportation/ road network analysis through RS and GIS

Unit - 4

- 4.1 Urban land use classification, mapping and analysis
- 4.2 Remote sensing applications in regional and district level planning
- 4.3 Site selection and suitability analysis for urban development
- 4.4 Remote sensing in monitoring master plan / new town development area

Unit – 5

- 5.1 Urban environment studies: Green spaces, Solid waste management, Urban pollution
- 5.2 Urban growth modeling
- 5.3 Urban hazards and risk management through RS and GIS
- 5.4 Government of India initiatives for urban planning: Smart cities, AMRUT, Swachh Bharat, Housing for all, HRIDAY

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications

Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.

Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall

Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.

The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO. P2RSTC401

TITLE: Remote Sensing and GIS in Urban Studies

Guidelines for setting of question paper

Test I and Test II

MCQ on LMS (10 marks) and the subjective test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of two sections, Section-A and Section-B. Section-A will have one compulsory question comprising of 08 parts (minimum 01 from each unit) of 03 marks each. Section B will have 06 questions of 12 marks each to be set from the last three units (02 from each unit). In section B students are required to attempt 01 question from each unit. **In major test there should not be a gap of more than two days in between two tests.**

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The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO. P2RSTE02

TITLE: Remote Sensing and GIS in Environmental Sciences

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit –1

- 1.1 Ecological, biological aspects of environment
- 1.2 Environmental pollution and types of environmental pollution
- 1.3 Change detection studies with the help of multi temporal data
- 1.4 Remote sensing in pollution monitoring

Unit – 2

- 2.1 Air quality mapping and monitoring
- 2.2 Remote sensing in water quality mapping, monitoring and management
- 2.3 Solid waste management – introduction classification and environmental problems
- 2.4 Remote sensing and GIS in solid waste & waste water management

Unit – 3

- 3.1 Man made disasters: introduction and types
- 3.2 Application of remote sensing & GIS in management of man-made disasters
- 3.3 Nuclear fuel, power plants, nuclear waste management, global and Indian scenario
- 3.4 Forest fire and fire risk assessment and management using RS & GIS

Unit – 4

- 4.1 Natural disasters – introduction and types
- 4.2 Disaster management cycle and role of remote sensing and GIS in disasters management
- 4.3 Remote sensing and GIS application in hazard zonation mapping
- 4.4 Remote sensing and GIS application in post disasters

Unit – 5

- 5.1 Overview of UN sustainable development goals (SDG) and potential remote sensing applications
- 5.2 Impact assessment – basic concepts, environmental impact assessment (EIA) methods
- 5.3 EIA of mining areas and river valley project through remote sensing
- 5.4 Environmental management plan (EMP), its importance and role of GIS in preparation of EMP

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications

Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.

Jensen, J. R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall

Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.

Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO. P2RSTE402

TITLE: Remote Sensing and GIS in Environmental Sciences

Guidelines for setting of question paper

Test I and Test II

MCQ on LMS (10 marks) and the subjective test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

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The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO.: P2RSTE403

Title: Cryospheric Systems and Climate Change Science

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60 Minor Examination: 40

Unit -I

- 1.1 Elements of the cryosphere; importance of the cryosphere, role of the cryosphere, in the climate system
- 1.2 Glaciers: Glacier formation, glacier types and facies.
- 1.3 Dry and wet based glaciers and factors responsible, sediment transport and deposition by glaciers, physics of glacier ice and snow.
- 1.4 Glacier movement. Glacial erosional and depositional features; surface and subsurface features of glacier using Remote Sensing and GIS technique.

Unit-2

- 2.1 Glacier drainage characteristics, geochronology of glacial landforms using space based inputs
- 2.2 Origin of ice-ages, Glacial and interglacial periods. Concepts of Last Glacial Maximum; Younger Drya; Ice age; Little ice age.
- 2.3 Instrumentation for glaciological studies.
- 2.4 Techniques employed for the dating of glaciogenic deposits and their limitations, sediment discharge by meltwater and chemistry of meltwater.

Unit -3

- 3.1 Meteorological parameters vis-a-vis glacier, affect of debris/aerosols on glacier surface.
- 3.2 Energy balance, mass balance study of glaciers, various methods of mass balance study, glacier dynamics and snout monitoring techniques.
- 3.3 Isotope study of glacier ice and snow vis-a-vis climate change, chemistry of snow/ice.
- 3.4 Characteristics of permafrost areas, rock and soil characters in cryosphere, mass movement in permafrost areas – causes and mitigation.

Unit- 4

- 4.1 Snow and glacial runoff modeling using geospatial techniques
- 4.2 Glacier lakes, classification, characteristics
- 4.3 Glacier recession and Glacier Lake Outburst Floods (GLOFs) and concept of Potential Dangerous Glacier Lakes (PDGLs) and its hazards
- 4.4 Black carbon deposition on glaciers and its impacts on melting, and its impact on climate change

Unit -5

- 5.1 Carbon Cycling: physical carbon pump, biological carbon pump, marine carbon cycle, terrestrial carbon cycle.
- 5.2 El Niño and the Southern Oscillation, El Niño and its Effects, upwelling and climate.
- 5.3 Global Ocean Circulation –Introduction and Overview, Strawberries in Norway, Icelandic Whirlpool, Origin of the Gulf Stream, The Deep Atlantic Conveyor.
- 5.4 Global Wind Systems: Trade Winds, Hadley Cell, Highs and Lows of Westerlies, Concept and importance of Indian Summer Monsoon and Winter monsoon.

Books Recommended

- Bigg, G., 1999 Ocean and Climate. Springer- Verlag
Bradley, F., 2000. Paleoclimatology: Reconstructing Climates of the Quaternary. Springer- Verlag.
Evelyn Brown et al. 2001. Ocean Circulation. Elsevier.
Davind Randall 2015 Introduction to the Global Circulation of the atmosphere. Princeton Press.
M. Satoh 2014. Atmospheric Circulation dynamics and general circulation models. Sprinder- Verlag.
Taloor, A K., Kotlia B.S., Kireet Kumar 2021. Water Cryosphere and Climate changes in the Himalayas: A geospatial approach
Petri Pellikka, W. Gareth Rees 2010. Remote Sensing of Glaciers Techniques for Topographic, Spatial and Thematic Mapping of Glaciers

The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO. P2RSTE403

TITLE: Cryospheric Systems and Climate Change Science

Guidelines for setting of question paper

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The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO.: P2RSTE404

Title: Disaster, Risk Reduction and Hazard Assessment

Maximum Marks: 100

Credit: 4

Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit -I

- 1.1 Understanding natural disaster, differentiate hazard, disaster, risk and vulnerability, disaster vulnerability
- 1.2 Preparedness and mitigation measures for various disasters.
- 1.3 Disaster management, effects and efforts to mitigate disaster
- 1.4 Anthropogenic disasters; disaster vulnerability assessment of a location and vulnerable groups.

Unit-2

- 2.1 Remote sensing for disaster assessment Satellite remote sensing for disaster assessment, real time disaster analysis and management,
- 2.2 Post disaster analysis of inundated areas, earthquake-hit areas and post-flood, c using Remote Sensing and GIS
- 2.3 Crop loss estimation using Remote sensing and GIS
- 2.4 Forest fire risk modelling and its impact on climate change using geospatial technique

Unit-3

- 3.1 GPS for early warning system for disasters.
- 3.2 GIS for Risk assessment analysis for natural disaster,
- 3.3 Recent trends in geoinformatics for disaster management.
- 3.4 Seismic microzonation using geological, geophysical and GNSS data

Unit -4

- 4.1 Characteristics of heat waves from a disaster perspective
- 4.2 Spatial & temporal analysis of cold-wave incidences using GIS
- 4.3 Drought, types and causes space and time characteristics of droughts.
- 4.4 Avalanches, formation, types and classification mitigation and management plans using geospatial technology

Unit -5

- 5.1 Earthquakes occurrence and measurement new techniques hazards and its impacts and risk mitigation
- 5.2 Flood hazards, zonation and risk management studies using geospatial techniques
- 5.3 Landslides classification of landslides, causes of landslides, management, and Role of RS and GIS Studies
- 5.4 Glacier Lakes Outburst floods hazards and avalanches studies using geospatial techniques

Books Recommended

- Aki, K. and Richards P.G. 2002. Quantitative Seismology, University Science Books, S,C A.
- Bolt, B.A. 1992. Inside the Earth, W.H. Freeman, San Francisco.
- R P GUPTA 2014 2nd edition Remote Sensing of Geology Springer publisher
- Pascale Zarate 2008. Collaborative Decision Making: Perspectives and Challenges, James and James Science publisher
- Fowler, C.M.R. 1990. The Solid Earth: An Introduction to Global Geophysics, C. Press
- Demer, Michael, N. 2000. Fundamentals of Geographic Information Systems: John Wiley and Sons, Inc.
- Iyer, H.M. and Hirahara K. (Eds.) 1993. Seismic Tomography Theory and Practice,
- Kyoji S., Paolo C. 2008. Landslides-Risk reduction, Kluwer Academic Publishers

A-2

The Syllabi M.Sc. Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2027, May 2028 and May 2029

COURSE NO. P2RSTE404

TITLE: Disaster, Risk Reduction and Hazard Assessment

Guidelines for setting of question paper

Test I and Test II

MCQ on LMS (10 marks) and the subjective test of Test I and Test II would consist of three short answer type questions (05 marks each). Students are required to answer two questions. **No preparatory holidays shall be provided for the Test I and Test II.** Those candidates who have appeared in Test I and Test II and failed to get the minimum required marks i.e. 14 out of 40 will be eligible to re-appear in the Test I and Test II only once.

Major Test

The Major test will comprise of two sections, Section-A and Section-B. Section-A will have one compulsory question comprising of 08 parts (minimum 01 from each unit) of 03 marks each. Section B will have 06 questions of 12 marks each to be set from the last three units (02 from each unit). In section B students are required to attempt 01 question from each unit. **In major test there should not be a gap of more than two days in between two tests.**

COURSE NO. P2RSGRC405

PROJECT/ DISSERTATION WORK

- To carry out project work on a problem based on Remote Sensing and GIS application in the available Infrastructures in their own Institution or one of the National Remote Sensing Institutes/ laboratories /GIS Companies/Any Government institution where the academic research of PG dissertations level shall be carried out / etc. to get acquainted with various image processing and GIS softwares.

