Course Structure & Syllabus
(w.e.f. Session 2022-23)

Master of Technology (Remote Sensing)

SPECIALISATIONS OFFERED:
I. Earth Resources   II. Environment & Climate

DEPARTMENT OF REMOTE SENSING
BIRLA INSTITUTE OF TECHNOLOGY
Mesra, Ranchi- 835215

Jharkhand, INDIA

2022

Institute Vision

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

Institute Mission

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

Department Vision

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

Department Mission

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

Programme Educational Objectives (PEOs)	Programme Outcomes (POs)
1. To prepare the students in identifying, analysing and solving geospatial problems.	1. An ability to independently carry out research/ investigation and development work to solve real life geospatial problems.
2. To train the students in developing practical and executable solutions to the challenges of growing field of Remote Sensing and GIS.	2. An ability to write and present a substantial technical report/document and publish international level research articles.
3. To impart the students with strong base of knowledge that makes them suitable both for industries as well as for teaching and research.	3. Students should be able to demonstrate a degree of mastery over the areas of Remote Sensing and GIS technology. The mastery should be at a level higher than the requirements in the appropriate bachelor program. .
4. To inculcate the students with the sensitivity towards ethics, public policies and their responsibilities towards the society.	4. An ability to share theoretical and practical knowledge in both teaching and research as well as in industries.
	5. An ability to apply professional ethics, accountability and equity.

M.Tech. (Remote Sensing)

PROGRAMME SCHEME - SEMESTER WISE DISTRIBUTION

S. No	Semester	Course Category	Credits	Total
1	FIRST	3 Programme Core (PC)	9	21.5
		1 Progammet Elective (PE)	3	
		5 LABS (4 PC + 1 PE)	9.5	
2	SECOND	3 Programme Core (PC)	9	19.5
		1 Progamme Elective (PE)	3	
		4 LABS (3 PC + 1 PE)	7.5	
3	THIRD	Research Project - Thesis (Part – I)	8	14
		1 Open Elective (OE-I)/ MOOC	3	
		1 Open Elective (OE-II)/ MOOC	3	
4	FOURTH	Research Project - Thesis (Part – II)	16	16
TOTAL				**71**

PROGRAMME CORE (PC) for both i. EARTH RESOURCES ii. ENVIRONMENT & CLIMATE (*offered in* MO session *only*)

S. No	Course Code	Course Title	Pre requisites / Co requisites	Credits
1	RS 501	Principles of Remote Sensing and Digital Satellite Image Processing	Basic Physics/Science Computer Knowledge	3
2	RS 502R2	Geographic Information System and Satellite Navigation System	Basic Sciences/ Basic Computing	3
3	RS 511	Aerial and Satellite Photogrammetry & Image Interpretation	RS 501	3
4	RS 503	Remote Sensing and Digital Satellite Image Processing Laboratory	RS 501	2
5	RS 504	GIS &Satellite Navigation System Laboratory	RS 502R2	2
6	RS 513	Aerial and Satellite Photogrammetry & Image Interpretation Laboratory	RS 511	2
7	MT 132	Communication Skills I		1.5

PROGRAMME CORE (PC) FOR EARTH RESOURCES (*offered in* SP session *only*)

S. No	Course Code	Course Title	Pre requisites / Co requisites	Credits
1	RS 512R1	Advanced Remote Sensing and Geospatial Modelling	RS 501, RS 502R2	3
2	RS 521	Data Sources, Statistics and Research Methods in Geospatial Domain	RS 501, RS 502R2	3
3	RS 522	Programming concepts for spatial data handling	RS 501, RS 502R2	3
4	RS 514	Advance Remote Sensing and Geospatial Modelling Laboratory	RS 512	2
5	RS 515R1	Programming and Customisation in geospatial domain Laboratory	RS 501, RS 502R2	2
6	MT 133	Communication Skills II		1.5

PROGRAMME CORE (PC) FOR ENVIRONMENT & CLIMATE (*offered in* SP session *only*)

S. No	Course Code	Course Title	Pre requisites / Co requisites	Credits
1	RS 523	Physical Meteorology	RS 501, RS 502R2	3
2	RS 521	Data Sources, Statistics and Research Methods in Geospatial Domain	RS 501, RS 502R2	3
3	RS 522	Programming concepts for spatial data handling	RS 501, RS 502R2	3
4	RS 525	Meteorological Laboratory	RS 512	2
5	RS 515R1	Programming and Customisation in geospatial domain Laboratory	RS 501, RS 502R2	2
6	MT 133	Communication Skills II		1.5

PROGRAMME ELECTIVE (PE) (Theory & Laboratory)

S. No	Course Code	Course Title	Pre requisites / Co requisites	Credits
EARTH RESOURCES: MO SESSION 'GROUP-A'				
1	RS 505	Remote Sensing in Agriculture & Forestry	RS 501 & RS 502R2.	3
2	RS 507	Remote Sensing in Hydrology & Water Resources		3
3	RS 508	Remote Sensing in Agriculture & Forestry Laboratory	RS 503, RS 504 & RS 505	2
4	RS 510	Remote Sensing in Hydrology & Water Resources Laboratory	RS 503, RS 504 & RS 507	2
ENVIRONMENT & CLIMATE: MO SESSION 'GROUP-A'				
1	RS 517	Remote Sensing in Climate Change and Environmental Impact Assessment	RS 501 & RS 502R2.	**3**
2	RS 519	Remote Sensing in Climate Change and Environmental Impact Assessment Laboratory	RS 503, RS 504 & RS 506	2
EARTH RESOURCES: SP SESSION 'GROUP-B'				
1	RS 516	Remote Sensing in Snow and Glacier Hydrology	RS 501, RS 502R2	3
2	RS 506	Remote Sensing in Disaster Management	RS 501 & RS 502R2	3
3	RS 518	Remote Sensing in Snow and Glacier Hydrology Laboratory	RS 503, RS 504 & RS 516	2
4	RS 509	Remote Sensing in Disaster Management Laboratory	RS 503, RS 504 & RS 517	2
ENVIRONMENT & CLIMATE: SP SESSION 'GROUP-B'				
1	RS 524	Dynamic Meteorology	RS 501, RS 502R2	3
2	RS 526	Numerical Modelling Laboratory	RS 501 & RS 502R2	2
3	RS 527	Remote Sensing of Environment	RS 503, RS 504 & RS 516	3
4	RS 528	Remote Sensing of Environment Laboratory	RS 503, RS 504 & RS 517	2

Students should complete *Programme Electives* and *Open electives* as per the semester-wise **course structure** below:

COURSE STRUCTURE
SEMESTER – I (BOTH FOR I. EARTH RESOURCES & II. ENVIRONMENT & CLIMATE)

Course Category	Course Code	Subjects	L	T	P	Credit
PC	RS 501	Principles of Remote Sensing and Digital Satellite Image Processing	3	0	0	3
	RS 502R2	Geographic Information System and Satellite Navigation System	3	0	0	3
	RS 511	Aerial and Satellite Photogrammetry & Image Interpretation	3	0	0	3
	RS 503	Remote Sensing and Digital Satellite Image Processing Laboratory	0	0	4	2
	RS 504	Geographic Information System&Satellite Navigation SystemLaboratory	0	0	4	2
	RS 513	Aerial and Satellite Photogrammetry & Image Interpretation Laboratory	0	0	4	2
	MT 132	Communication Skills I	0	0	3	1.5
PE	RS *	ELECTIVE – I	3	0	0	3
	RS *	ELECTIVE – I Laboratory	0	0	4	2
Total Credits (1st Semester)						**21.5**

SEMESTER – II EARTH RESOURCES

Course Category	Course Code	Subjects	L	T	P	Credit
PC	RS 512	Advanced Remote Sensing and Geospatial Modelling	3	0	0	3
	RS 521	Data Sources, Statistics and Research Methods in Geospatial Domain	3	0	0	3
	RS 522	Programming concepts for spatial data handling	3	0	0	3
	RS 514	Advanced Remote Sensing and Geospatial Modelling Laboratory	0	0	4	2
	RS 515R1	Programming and Customisation in geospatial domain Laboratory	0	0	4	2
	MT 133	Communication Skills II	0	0	3	1.5
PE	RS *	ELECTIVE – II	3	0	0	3
	RS *	ELECTIVE – II Laboratory	0	0	4	2
Total Credits (2nd Semester)						**19.5**

SEMESTER – II ENVIRONMENT & CLIMATE

Course Category	Course Code	Subjects	L	T	P	Credit
PC	RS 523	Physical Meteorology	3	0	0	3
	RS 521	Data Sources, Statistics and Research Methods in Geospatial Domain	3	0	0	3
	RS 522	Programming concepts for spatial data handling	3	0	0	3
	RS 525	Meteorological Laboratory	0	0	4	2
	RS 515R1	Programming and Customisation in geospatial domain Laboratory	0	0	4	2
	MT 133	Communication Skills II	0	0	3	1.5

PE	RS *	ELECTIVE – II	3	0	0	3
	RS *	ELECTIVE – II Laboratory	0	0	4	2
		Total Credits (2ⁿᵈSemester)				**19.5**

SEMESTER – III

Course Category	Course Code	Subjects	L	T	P	Credit
PC	RS 601	Thesis (Part – I)				8
OE⁺		**OPEN ELECTIVE / MOOC**	3	0	0	3
OE⁺		**OPEN ELECTIVE / MOOC**	3	0	0	3
		Total Credits (3ʳᵈSemester)				**14**

SEMESTER – IV

Course Category	Course Code	Subjects	L	T	P	Credit
PC	RS 604	Thesis (Part – II)				16
		Total Credits (4ᵗʰSemester)				**16**

TOTAL (41+30) = 71 credits

*PROGRAM ELECTIVES:
'GROUP - A' MO SESSION
Semester-I EARTH RESOURCE

Course No.	Course Title
RS 505	Remote Sensing in Agriculture & Forestry
RS 507	Remote Sensing in Hydrology & Water Resources
RS 508	Remote Sensing in Agriculture & Forestry Laboratory
RS 510	Remote Sensing in Hydrology & Water Resources Laboratory

Semester-I ENVIRONMENT & CLIMATE

RS 517	Remote Sensing in Climate Change and Environmental Impact Assessment
RS 519	Remote Sensing in Climate Change and Environmental Impact Assessment Laboratory

'GROUP - B' SP SESSION
Semester- II EARTH RESOURCES

RS 516	Remote Sensing in Snow and Glacier Hydrology
RS 506	Remote Sensing in Disaster Management
RS 518	Remote Sensing in Snow and Glacier Hydrology Laboratory
RS 509	Remote Sensing in Disaster Management Laboratory

Semester- II ENVIRONMENT & CLIMATE

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RS 524	Dynamic Meteorology
RS 526	Numerical Modelling Laboratory
RS 527	Remote Sensing of Environment
RS 528	Remote Sensing of Environment Laboratory

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

Thesis (Part – II) Semester IV – Focus on systematic execution of work plan, data processing, analysis, interpretation, inferences and fulfillment of objectives and research questions, and report preparation, and finally leading to a research publication in peer reviewed journals.

OE⁺ - OPEN ELECTIVE /MOOC – To be opted as offered by other Departments/ SWAYAM or NPTEL

BLOOM'S TAXONOMY FOR CURRICULUM DESIGN AND ASSESSMENT:
Preamble
The design of curriculum and assessment is based on Bloom's Taxonomy. A comprehensive guideline for using Bloom's Taxonomy is given below for reference.
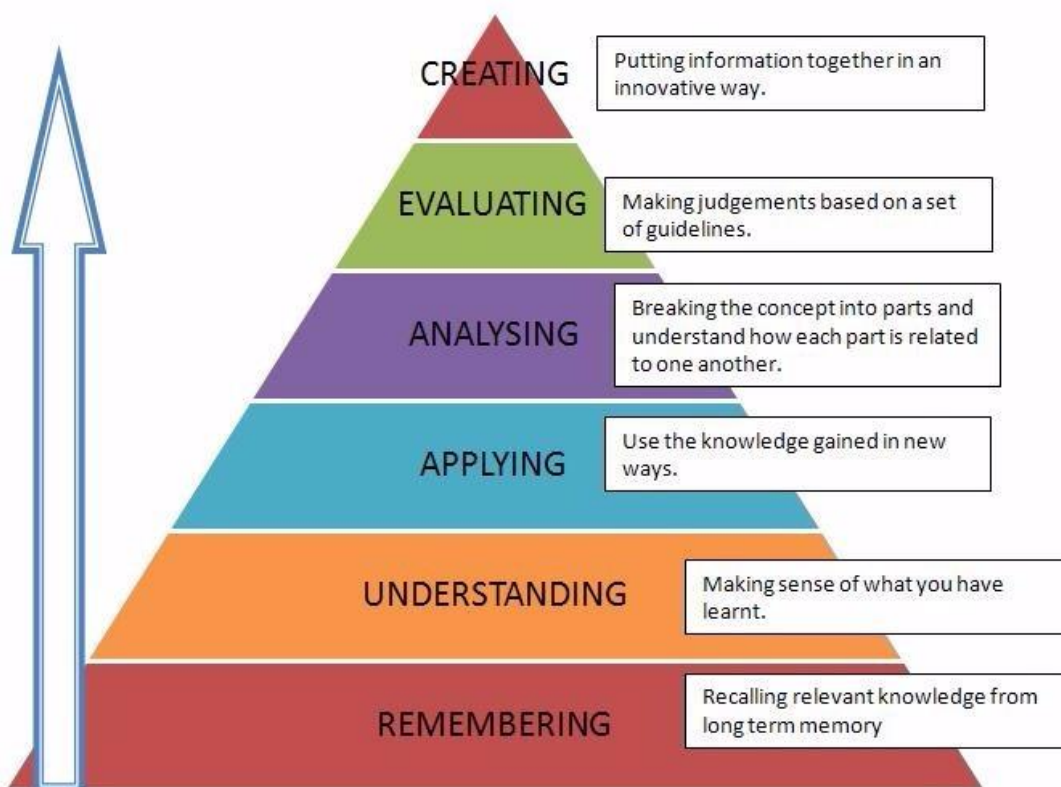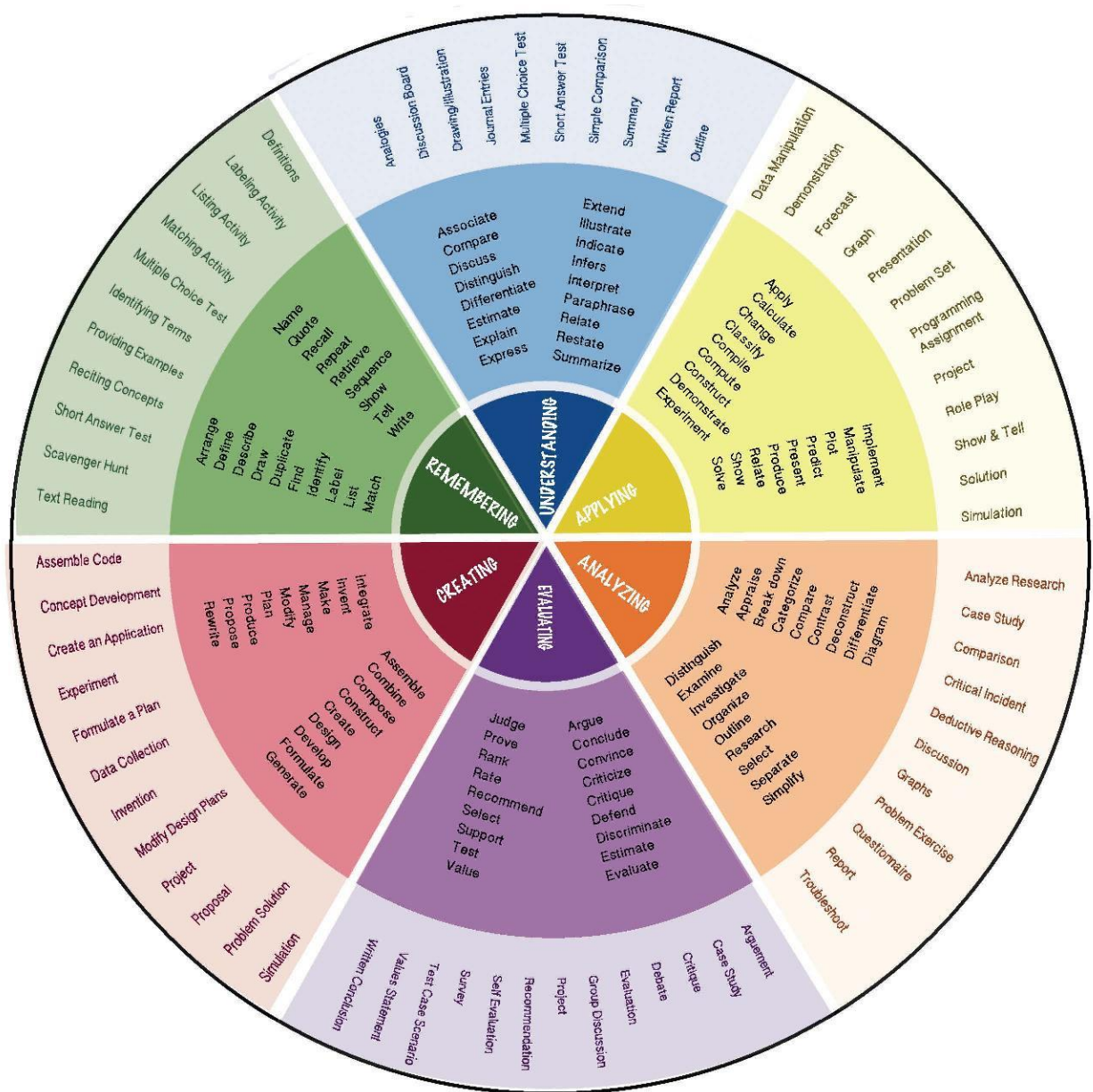
SEMESTER IV :
EARTH RESOURCES / ENVIRONMENT & CLIMATE

Course code: RS 604
Course title: RESEARCH PROJECT (Thesis Part I and II)
Pre-requisite(s): All the courses of semester I and semester II
Co- requisite(s):

Credits: L: T: P: C: 8 (Part I) + 16 (Part II)

Class schedule per week: 4
Class: M. TECH
Semester / Level: 03&04/06
Branch: REMOTE SENSING

Course Objectives

This course aims to make the student with following abilities:

A.	Carry out Independent Research Project addressing real life geospatial problems with sound scientific framework.
B.	Prepare thematic and topographic maps from satellite data and other sources, and Utilise various Geospatial processing and modelling techniques and Create research report with acceptable quality and ethics, and communicate results to stakeholders.

Course Outcomes (CO):

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

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

Mapping Course Outcome with Programme Outcome

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

Low = 1, Medium = 2, High= 3