DEPARTMENT OF CIVIL ENGINEERING
ANNA UNIVERSITY, CHENNAI

OUR VISION:

Department of Civil Engineering, Anna University, shall strive hard to develop and impart technical knowledge and professional skills required for Civil Engineering practice through excellence in teaching, research and consultancy to address sustainable infrastructure development needs at local, national and International levels.

OUR MISSION:

Department of Civil Engineering, Anna University shall contribute to technological and development by

1. Providing a firm scientific and technological base in Civil Engineering to achieve self-reliance.
2. Providing quality education through innovation in teaching practices at par with global standards.
3. Nurturing leadership and entrepreneurship qualities with ethical values.
4. Developing and disseminating latest knowledge and technologies in emerging areas of Civil Engineering.
5. Sharing intellectual resources and infrastructure facilities through collaborative partnership.
6. Ensuring supporting conditions for enhancing the employability skills.

ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS
B.E. GEOINFORMATICS

REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Programme B.E. Geoinformatics will help to

PEO1	prepare the students for successful careers in Geospatial and Information Technology industries that meet the global needs.
PEO2	develop the professional ability of the students in data collection, analysis and synthesis for solving real world problems.
PEO3	inculcate entrepreneurship skills, leadership qualities and to work in teams on trans disciplinary projects.
PEO4	develop required skills in the mathematical, scientific and engineering fundamentals necessary to provide robust solutions using modern instrumentation and software tools
PEO5	provide opportunity to imbibe requisite qualities to practice the geospatial technology with professional ethics.

PROGRAMME OUTCOMES (POs)

Graduates of B.E. Geoinformatics students will be able to

PO1	Knowledge of Engineering Sciences	Apply the Knowledge of mathematics, science and Engineering fundamentals in the field of Geoinformatics Engineering.
PO2	Problem Analysis	Identify, formulate and provide solution for multi-disciplinary Problems using Geoinformatics.
PO3	Design / development of Solutions	design and evaluate solutions for efficient management of natural, socio-economic resources through intervention of Geoinformatics tools.
PO4	Investigations	Conduct investigations of geoinformatics engineering problems including literature survey, appropriate methodology, analysis, interpretation of data and synthesis of information to provide valid conclusion
PO5	Use of Modern Technology	Design, use and apply modern technology, tools and software to address and solve the problems with due understanding of the limitations.
PO6	Individual and Team work	Function effectively as on individual and as member or leader in diverse teams and in multi-disciplinary settings and demonstrating a capacity for self-management and teamwork, decision-making based on open –mindedness, objectivity and rational analysis.
PO7	Communication	Communicate effectively with the engineering community and also with society at large, and write reports and make effective presentations.
PO8	Engineer and Society	Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Geo Informatics Engineering Practice.
PO9	Ethics	Understand the commitment to professional ethics and

		responsibilities of Geo Informatics Engineers and to contribute to the comprehensive societal development
PO10	Environment and Sustainability	Understand the Socio economic impact of Geo Informatics Engineering solutions for sustainable development
PO11	Project Management and Finance	Demonstrate Knowledge of management and business practices, such as risk and change management and understand their limitations
PO12	Life Long Learning	Develop ability to engage in independent and life-long learning to improve competence by critical examination of the outcomes of one's actions in addressing Geo Informatics Engineering issues and learning from corrective and preventive measures.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Graduates of B.E. Geoinformatics students will be able to

PSO1	Knowledge of Geoinformatics discipline	Demonstrate in-depth knowledge of Geoinformatics engineering discipline with an ability to evaluate, analyse and synthesise existing and new knowledge.
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	Critically analyze complex Geoinformatics problems and apply independent judgment for synthesizing information and mazzzke innovative advances in a theoretical, practical policy context.
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	Conceptualize and solve Geoinformatics engineering problems, evaluate potential solutions and arrive at technically feasible, economically viable and environmentally sound solutions with due consideration of health, safety and socio cultural factors.

1. **PEO / PO Mapping:**

Programme Educational Objectives	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
II	✓	✓	✓		✓			✓			✓	✓
III		✓	✓	✓				✓				✓
IV	✓	✓	✓	✓	✓			✓			✓	✓
V			✓					✓	✓	✓		✓

CO-PO Mapping –

		Course Name	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
YEAR I	SEMESTER I	Technical English															
		Engineering Mathematics I															
		Engineering Physics															
		Engineering Chemistry															
		Problem Solving and Python Programming	✓	✓	✓	✓	✓			✓	✓			✓			
		Basic Sciences Laboratory															
		Problem Solving and Python Programming Laboratory	✓	✓	✓	✓	✓			✓	✓			✓			
	SEMESTER II	Professional Communication															
		Engineering Mathematics II															
		Engineering Graphics	✓		✓		✓										
		Basics of Electrical and Electronics Engineering	✓	✓	✓	✓	✓										
		Engineering Mechanics	✓		✓												
		Physics for Geoinformatics Engineering	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		Workshop Practices Laboratory	✓	✓	✓	✓											
		Electrical and Electronics Engineering Laboratory	✓	✓	✓	✓	✓				✓		✓				
YEAR II	SEMESTER III	Transform Techniques and Statistics	2	2	3		1			3			3	2	3	3	3
		Spatial Database Management System	2	2	2	3	3	1		2	2			2	2	2	2
		Surveying I	2	3			3	3	1	2	2		2	3	3	3	3
		Remote Sensing I	2	3	2	3	3	2	3	3	1	2	1	2	3	3	2
		Photogrammetry	3	3	3	3	3	3	2	2	3	2	2	3	3	3	3
		Elective – Humanities I															
		Surveying Laboratory I	3	2		3	2	2		2	2		2	3	3	3	3
		Remote Sensing and Photogrammetry	1	1	2	2	3	2	1	1	1	1	2	2	2	2	1

	SEMESTER IV	Total Quality Management	2	2	1	2	3	2	2				1	2	1	1	1
		Remote Sensing II	3	3	3	3	3	3	3	3	3	2	3	2	3	2	2
		Cartography and GIS	2	1	2	1	2						1	2	3	3	3
		Object Oriented Programming Using C++	3	3	2	2	3	2				2		2	2	2	3
		Geodesy	2	3	2		3			2			2	2	3	2	3
		Surveying II	3	2	2	1	3	2	1	2	1	1	2	2	2	2	1
		Surveying Laboratory II	1	1	2	1	3	2	1	2	1	1	2	1	2	2	1
		Cartography and GIS Laboratory	2	1	2	1	2								2	2	2
YEAR III	SEMESTER V	Elective – Humanities I															
		Audit Course I															
		Spatial data adjustment	2	3	2		2	2		1	1	1	2	2	2	3	2
		Digital Image Processing	3	3	3	3	3	2	2					2	3	3	3
		Total Station and GPS Surveying	3	3	3	1	3			3	3		2	3	3	3	3
		Professional Elective I															
		Digital Image Processing Laboratory	3	3	3	3	3	3	2					3		2	3
		Total Station and GPS Surveying Laboratory	3	3	3	1	3		3	3				3	3	3	3
		Summer Internship (2 Weeks)	3	2	2		3	2	2	2	2	2	2	3	3	3	3
	SEMESTER VI	Spatial Analysis and Applications	2	3	2	3	2		1					2	2	2	2
		Environmental Sciences															
		Audit Course II															
		Soft Computing Techniques	3	3		3	3	2	2	3	2	2	2	2		3	3
		Professional Elective II															
		Professional Elective III															
		Open Elective I															
		Spatial Analysis and Applications Laboratory	2	2	2	3	3	1	2		1		2		2	2	3
		Survey Camp	2	1	2	1	3	2	1	1	2	1	1	2	3	3	2

YEAR IV	SEMESTER VII	Decision Support System for Resource Management	2	3	3	3	2	3	2			3	3	3	2	3	2
		Geospatial analysis with R Programming	1	3	2	2	3		2	1			1	2	1	2	1
		Mat Lab Programming and Applications	3	3	3	3	3	3				1	3	3	3	3	3
		Professional Elective IV															
		Professional Elective V															
		Open Elective II															
		Customization Laboratory	3	3	3	3	3	2	2	3		2		3	3	3	3
		Project I	3	2	1	3	1	3	2	2	2	1	1	3	3	3	3
	SEMESTER VIII	Professional Elective VI															
		Professional Elective VII															
		Project II	3	2	2	2	2	3	2	2	2	2	2	3	3	3	3

PROFESSIONAL ELECTIVES

Course Name	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
Climate Change Studies	2	3	3	3	3	2		3				3			
Big data Analytics	2	1	2	2	2										
Urban Geoinformatics	3	1	3	3			1	2	1	3	2	2	2	3	2
Hydrology and Water Resources Engineering for Geoinformatics	3	3	3	3	3	2	2	3	3	3	2	3	3	3	3
Transportation Geoinformatics	2	3	3	2	3	2	3	2	1	2	2	3	3	3	3
Environmental Geoinformatics	2	3	3	2	3	2	3	3	2	3	2	3	3	3	3
Airborne and Terrestrial Laser Mapping	3	2	2	1	2								2	3	3
Advanced Geo Data Analysis		3	3	2	2		2	1		1	2	1	2	3	2
Oceanography and Coastal Processes	2	3	3	3	2	3	2	3	3	2	2	2	2	2	2
Health GIS	1	2	1	2				1		1	2	1	1	2	2
Geoinformatics for Agriculture and Forestry	2		3	3				2					2	1	1
GIS based Disaster Preparedness and Mitigation	2	2	2	3	3	3	3	3	2	2	2	3	3	2	2
Planetary Remote sensing	3	2	2	2	2	2							2	2	
Satellite Meteorology	2	3	3	3	3	3	3	3	3	3	3	2	3	3	3
Professional Ethics in Engineering	2	2		1		1	1	1	3	1					
Web GIS	1	1	2	1	3		2	2	1L				2	2	2
Geology for Geoinformatics	2	2	2	3	2	2	1	2	2	2	2	2	2	3	2
Mobile Application development	1	2	2	1	2			1					2		2
Micowave Remote Sensing	3	3	2	3	2	3	3	2	2	2	3	3	2	3	3

ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS
B.E. GEOINFORMATICS
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM
CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS

(Applicable to Students admitted from the Academic Year 2020-2021 onwards)

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS5151	Technical English	HSMC	4	0	0	4	4
2.	MA5158	Engineering Mathematics I	BSC	3	1	0	4	4
3.	PH5151	Engineering Physics	BSC	3	0	0	3	3
4.	CY5151	Engineering Chemistry	BSC	3	0	0	3	3
5.	GE5153	Problem Solving and Python Programming	ESC	3	0	0	3	3
PRACTICALS								
7.	BS5161	Basic Sciences Laboratory	BSC	0	0	4	4	2
8.	GE5161	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
			TOTAL	**16**	**1**	**8**	**25**	**21**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS5251	Professional Communication	HSMC	4	0	0	4	4
2.	MA5252	Engineering Mathematics II	BSC	3	1	0	4	4
3.	GE5151	Engineering Graphics	ESC	1	0	4	5	3
4.	EE5251	Basics of Electrical and Electronics Engineering	ESC	3	0	0	3	3
5.	GE5152	Engineering Mechanics	ESC	3	1	0	4	4
6.	PH5201	Physics for Geoinformatics Engineering	BSC	3	0	0	3	3
PRACTICALS								
7.	GE5162	Workshop Practices Laboratory	ESC	0	0	4	4	2
8.	EE5261	Electrical and Electronics Engineering Laboratory	ESC	0	0	4	4	2
			TOTAL	**17**	**2**	**12**	**31**	**25**

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA5301	Transform Techniques and Statistics	BSC	3	1	0	4	4
2.	GI5301	Spatial Database Management System	ESC	3	0	0	3	3
3.	GI5302	Surveying I	PCC	3	0	0	3	3
4.	GI5303	Remote Sensing I	PCC	3	0	0	3	3
5.	GI5304	Photogrammetry	PCC	3	0	0	3	3
6.		Elective – Humanities I	HSMC	3	0	0	3	3
PRACTICALS								
7.	GI5311	Surveying Laboratory I	PCC	0	0	4	4	2
8.	GI5312	Remote Sensing and Photogrammetry Laboratory	PCC	0	0	2	2	1
			TOTAL	**18**	**1**	**6**	**25**	**22**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	GE5451	Total Quality Management	HSMC	3	0	0	3	3
2.	GI5401	Remote Sensing II	PCC	3	0	0	3	3
3.	GI5402	Cartography and GIS	PCC	3	0	0	3	3
4.	GI5403	Object Oriented Programming Using C++	PCC	2	0	2	4	3
5.	GI5404	Geodesy	PCC	3	0	0	3	3
6.	GI5405	Surveying II	PCC	3	0	0	3	3
PRACTICALS								
7.	GI5411	Surveying Laboratory II	PCC	0	0	4	4	2
8.	GI5412	Cartography and GIS Laboratory	PCC	0	0	2	2	1
			TOTAL	**17**	**0**	**8**	**25**	**21**

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Elective – Humanities I	HSMC	3	0	0	3	3
2.		Audit Course I*	AC	3	0	0	3	0
3.	GI5501	Spatial data adjustment	PCC	3	0	0	3	3
4.	GI5502	Digital Image Processing	PCC	3	0	0	3	3
5.	GI5551	Total Station and GPS Surveying	PCC	3	0	0	3	3
6.		Professional Elective I	PEC	3	0	0	3	3
PRACTICALS								
7.	GI5511	Digital Image Processing Laboratory	PCC	0	0	4	4	2
8.	GI5512	Total Station and GPS Surveying Laboratory	PCC	0	0	2	2	1
9.	GI5513	Summer Internship (2 Weeks)	EEC	0	0	0	0	1
			TOTAL	**18**	**0**	**6**	**24**	**19**

* Audit Course is optional

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	GI5601	Spatial Analysis and Applications	PCC	3	0	0	3	3
2.	GE5251	Environmental Sciences	BSC	3	0	0	3	3
3.		Audit Course II*	AC	3	0	0	3	0
4.	GI5602	Soft Computing Techniques	PCC	3	0	0	3	3
5.		Professional Elective II	PEC	3	0	0	3	3
6.		Professional Elective III	PEC	3	0	0	3	3
		Professional Elective IV	PEC	3	0	0	3	3
7.		Open Elective I	OEC	3	0	0	3	3
PRACTICALS								
8.	GI5611	Spatial Analysis and Applications Laboratory	PCC	0	0	4	4	2
9.	GI5612	Survey Camp	EEC	-	-	-	-	2
			TOTAL	**24**	**0**	**4**	**28**	**25**

* Audit Course is optional

SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	GI5701	Decision Support System for Resource Management	PCC	3	0	0	3	3
2.	GI5702	Geospatial analysis with R Programming	PCC	3	0	0	3	3
3.	GI5703	Matlab Programming and Applications	PCC	3	0	2	5	4
4.		Professional Elective V	PEC	3	0	0	3	3
5.		Professional Elective VI	PEC	3	0	0	3	3
6.		Open Elective II	OEC	3	0	0	3	3
PRACTICALS								
8.	GI5711	Customization Laboratory	PCC	0	0	2	2	1
9.	GI5712	Project I	EEC	0	0	6	6	3
			TOTAL	**18**	**0**	**10**	**28**	**23**

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	GI5811	Project II	EEC	0	0	16	16	8
			TOTAL	**0**	**0**	**16**	**16**	**8**

TOTAL CREDITS: 164

HUMANITIES AND SOCIAL SCIENCES (HSMC) – MANAGEMENT AND OTHERS

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	HS5151	Technical English	4	0	0	4	1
2.	HS5251	Professional Communication	4	0	0	4	2
3.	GE5451	Total Quality Management	3	0	0	3	4
					Total Credits:	**11**	

HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

Sl. No	Course Code	Course Title	Periods per week			Credits
			Lecture	Tutorial	Practical	
1.	HU5171	Language and Communication	3	0	0	3
2.	HU5172	Values and Ethics	3	0	0	3
3.	HU5173	Human Relations at Work	3	0	0	3
4.	HU5174	Psychological Processes	3	0	0	3
5.	HU5175	Education, Technology and Society	3	0	0	3
6.	HU5176	Philosophy	3	0	0	3
7.	HU5177	Applications of Psychology in Everyday Life	3	0	0	3

BASIC SCIENCE COURSE [BSC]

Sl. No	Course Code	Course Title	Periods Per Week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	MA5158	Engineering Mathematics I	3	1	0	4	1
2.	PH5151	Engineering Physics	3	0	0	3	1
3.	CY5151	Engineering Chemistry	3	0	0	3	1
4.	BS5161	Basic Sciences Laboratory	0	0	4	2	1
5.	MA5252	Engineering Mathematics II	3	1	0	4	2
6.	PH5201	Physics for Geoinformatics Engineering	3	0	0	3	2
7.	MA5301	Transform Techniques and Statistics	3	1	0	4	3
8.	GE5251	Environmental Sciences	3	0	0	3	6
					Total Credits	**26**	

ENGINEERING SCIENCE COURSE [ESC]

Sl. No	Course Code	Course Title	Periods Per Week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	GE5153	Problem Solving and Python Programming	3	0	0	3	1
2.	GE5161	Problem Solving and Python Programming Laboratory	0	0	4	2	1
3.	GE5151	Engineering Graphics	1	0	4	3	2
4.	GE5162	Workshop Practices Laboratory	0	0	4	2	2
5.	EE5251	Basics of Electrical and Electronics Engineering	3	0	0	3	2
6.	GE5152	Engineering Mechanics	3	1	0	4	2
7.	EE5261	Electrical and Electronics Engineering Laboratory	0	0	4	2	2
8.	GI5301	Spatial Database Management System	3	0	0	3	3
					Total Credits	**22**	

PROFESSIONAL CORE COURSES [PCC]

Sl. No	Course Code	Course Title	Periods Per Week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	GI5302	Surveying I	3	0	0	3	3
2.	GI5303	Remote Sensing I	3	0	0	3	3
3.	GI5304	Photogrammetry	3	0	0	3	3
4.	GI5311	Surveying Laboratory I	0	0	4	2	3
5.	GI5312	Remote Sensing and Photogrammetry Laboratory	0	0	2	1	3
6.	GI5401	Remote Sensing II	3	0	0	3	4
7.	GI5402	Cartography and GIS	3	0	0	3	4
8.	GI5403	Object Oriented Programming Using C++	2	0	2	3	4
9.	GI5404	Geodesy	3	0	0	3	4
10.	GI5405	Surveying II	3	0	0	3	4
11.	GI5411	Surveying Laboratory II	0	0	4	2	4
12.	GI5412	Cartography and GIS Laboratory	0	0	2	1	4
13.	GI5501	Spatial data adjustment	3	0	0	3	5
14.	GI5502	Digital Image Processing	3	0	0	3	5
15.	GI5551	Total Station and GPS Surveying	3	0	0	3	5
16.	GI5511	Digital Image Processing Laboratory	0	0	4	2	5
17.	GI5512	Total Station and GPS Surveying Laboratory	0	0	2	1	5
18.	GI5601	Spatial Analysis and Applications	3	0	0	3	6

19.	GI5602	Soft Computing Techniques	3	0	0	3	6
20.	GI5611	Spatial Analysis and Applications Laboratory	0	0	4	2	6
21.	GI5701	Decision Support System for Resource Management	3	0	0	3	7
22.	GI5702	Geospatial analysis with Python and R Programming	3	0	0	3	7
23.	GI5703	MatLab Programming and Applications	3	0	2	4	7
24.	GI5711	Customization Laboratory	0	0	2	1	7
					Total Credits	**61**	

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	GI5513	Summer Internship (2 Weeks)	0	0	0	1	5
2.	GI5612	Survey Camp	-	-	-	2	6
3.	GI5712	Project I	0	0	6	3	7
4.	GI5811	Project II	0	0	16	8	8
					Total Credits	**14**	

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

Sl. No	Course Code	Course Title	Periods Per Week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	AD5091	Constitution of India	3	0	0	0	**5/6**
2.	AD5092	Value Education	3	0	0	0	
3.	AD5093	Pedagogy Studies	3	0	0	0	
4.	AD5094	Stress Management by Yoga	3	0	0	0	
5.	AD5095	Personality Development Through Life Enlightenment Skills	3	0	0	0	
6.	AD5096	Unnat Bharat Abhiyan	3	0	0	0	
7.	AD5097	Essence of Indian Knowledge Tradition	3	0	0	0	
8.	AD5098	Sanga Tamil Literature Appreciation	3	0	0	0	
					Total Credits:	**0**	

PROFESSIONAL ELECTIVE COURSES

S. NO.	Course Code	Course Title	Periods Per Week			Credits
			Lecture	Tutorial	Practical	
1.	GI5001	Climate Change Studies	3	0	0	3
2.	GI5002	Big data Analytics	3	0	0	3
3.	GI5003	Urban Geoinformatics	3	0	0	3
4.	GI5004	Hydrology and Water Resources Engineering for Geoinformatics	3	0	0	3
5.	GI5005	Transportation Geoinformatics	3	0	0	3
6.	GI5006	Environmental Geoinformatics	3	0	0	3
7.	GI5007	Airborne and Terrestrial Laser Mapping	3	0	0	3
8.	GI5008	Advanced Geo Data Analysis	3	0	0	3
9.	GI5009	Oceanography and Coastal Processes	3	0	0	3
10.	GI5010	Health GIS	3	0	0	3
11.	GI5011	GIS based Disaster Preparedness and Mitigation	3	0	0	3
12.	GI5012	Planetary Remote Sensing	3	0	0	3
13.	GI5013	Satellite Meteorology	3	0	0	3
14.	GI5014	Web GIS	3	0	0	3
15.	GI5015	Mobile Application development	3	0	0	3
16.	GI5071	Geoinformatics for Agriculture and Forestry	3	0	0	3
17.	GE5076	Professional Ethics in Engineering	3	0	0	3
18.	AG5027	Geology for Geoinformatics	3	0	0	3

SUMMARY

Name of the Programme										
	Subject Area	Credits Per Semester								Credits Total
		I	II	III	IV	V	VI	VII	VIII	
1.	HSMC	4	4	3	3	3	0	0	0	17
2.	BSC	12	7	4	0	0	3	0	0	26
3.	ESC	5	14	3	0	0	0	0	0	22
4.	PCC	0	0	12	18	12	8	11	0	61
5.	PEC	0	0	0	0	3	9	6	0	18
6.	OEC	0	0	0	0	0	3	3	0	6
7.	EEC	0	0	0	0	1	2	3	8	14
8.	Credit / Audit Course					✓	✓			
	Total	**21**	**25**	**22**	**21**	**19**	**25**	**23**	**08**	**164**

HS5151 **TECHNICAL ENGLISH** **L T P C**
4 0 0 4

OBJECTIVES:

The first semester English course entitled 'Technical English' aims to,

- Familiarise first year students of engineering and technology with the fundamental aspects of technical English.
- Develop all the four language skills by giving sufficient practice in the use of the skills in real life contexts.
- Enhance the linguistic and communicative competence of first year engineering and technology students.

UNIT I INTRODUCING ONESELF 12

Listening: Listening and filling a form, listening to speeches by specialists from various branches of engineering and completing activities such as answering questions, identifying the main ideas of the listening text, style of the speaker (tone and tenor) – **Speaking**: Introducing oneself – introducing friend/ family - **Reading:** Descriptive passages (from newspapers / magazines)- **Writing**: Writing a paragraph (native place, school life)- **Grammar:** Simple present, present continuous – **Vocabulary Development**: One word substitution

UNIT II DIALOGUE WRITING 12

Listening: Listening to conversations (asking for and giving directions) –**Speaking:** making conversation using (asking for directions, making an enquiry), Role plays-dialogues- **Reading:** Reading a print interview and answering comprehension questions-**Writing**: Writing a checklist, Dialogue writing- **Grammar**: Simple past – question formation (Wh- questions, Yes or No questions, Tag questions)- **Vocabulary Development**: Stress shift, lexical items related to the theme of the given unit.

UNIT III FORMAL LETTER WRITING 12

Listening: Listening to speeches by famous people and identifying the central message of the speech – answering multiple-choice questions)-**Speaking:** Giving short talks on a given topic-**Reading:** Reading motivational essays on famous engineers and technologists (answering open-ended and closed questions)- **Writing:** Writing formal letters/ emails (Complaint letters)-**Grammar**: Future Tense forms of verbs, subject and verb agreement-**Vocabulary Development**: Collocations – Fixed expressions

UNIT IV WRITING COMPLAINT LETTERS 12

Listening: Listening to short talks (5 minutes duration and fill a table, gap-filling exercise) note taking/note making- **Speaking:** Small group discussion, giving recommendations-**Reading:** Reading problem – solution articles/essays drawn from various sources- **Writing:** Making recommendations – Writing a letter/ sending an email to the Editor- note making- **Grammar:** Modals – Phrasal verbs – cause and effect sentences- **Vocabulary Development**: Connectives, use of cohesive devices in writing, technical vocabulary.

UNIT V WRITING DEFINITIONS AND PRODUCT DESCRIPTION 12

Listening: Listening to a product description (labeling and gap filling) exercises- **Speaking:** Describing a product and comparing and contrasting it with other products- **Reading**: Reading graphical material for comparison (advertisements)-**Writing:** Writing Definitions (short and long) – compare and contrast paragraphs- **Grammar:** Adjectives – Degrees of comparison - compound nouns- **Vocabulary Development**: Use of discourse markers – suffixes (adjectival endings).

TOTAL :60 PERIODS

Learning Outcomes

At the end of the course the students will have gained,

- Exposure to basic aspects of technical English.
- The confidence to communicate effectively I various academic situations.
- Learnt the use of basic features of Technical English.

Textbook:

1. Revised Edition of 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited 2019.

Assessment Pattern

- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5158	ENGINEERING MATHEMATI CS – I (Common to all branches of B.E. / B.Tech. Programmes in I Semester)	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II DIFFERENTIAL CALCULUS **12**

Limit of function – One sided limit – Limit Laws – Continuity – left and right continuity – types of discontinuities – Intermediate Value Theorem – Derivatives of a function - Differentiation rules – Chain rule – Implicit differentiation – logarithmic differentiation – Maxima and minima – Mean value theorem – (Optional: Polar coordinate system – Differentiation in polar coordinates).

UNIT III FUNCTIONS OF SEVERAL VARIABLES **12**

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS **12**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT V MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TOTAL :60 PERIODS

OUTCOMES:

At the end of the course the students will be able to

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
2. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, 6th Edition, New Delhi,2013.
3. Joel Hass, Christopher Heil and Maurice D.Weir, "Thomas' Calculus", Pearson, 14th Edition, New Delhi, 2018.
4. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi, 2009.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2015.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5th Edition, New Delhi, 2017.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi , 2012.
6. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

PH5151 ENGINEERING PHYSICS L T P C

(Common to all branches of B.E / B.Tech programmes) **3 0 0 3**

OBJECTIVE

- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS 9

Moment of inertia (M.I) - Radius of gyration - Theorems of M .I - M.I of circular disc, solid cylinder , hollow cylinder , solid sphere and hollow sphere - K.E of a rotating body – M.I of a diatomic molecule – Rotational energy state of a rigid diatomic molecule - centre of mass – conservation of linear momentum – Relation between Torque and angular momentum - Torsional pendulum.

UNIT II ELECTROMAGNETIC WAVES 9

Gauss's law – Faraday's law - Ampere's law - The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect - reflection and refraction of light waves - total internal reflection - interference - interferometers - air wedge experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser - applications.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

OUTCOME

After completion of this course, the students should able to

- Understanding the importance of mechanics.
- Express the knowledge of electromagnetic waves.
- Know the basics of oscillations, optics and lasers.
- Understanding the importance of quantum physics.
- Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education, 2017.
2. D.Halliday, R.Resnick and J.Walker. Principles of Physics. John Wiley & Sons, 2015.
3. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

REFERENCES

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D.J.Griffiths. Introduction to Electrodynamics. Pearson Education, 2015
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.

CY5151 ENGINEERING CHEMISTRY L T P C
(COMMON TO ALL BRANCHES) 3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photoprocesses and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers:

Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Structure, Properties and uses of: PE, PVC, PC, PTFE, PP, Nylon 6, Nylon 66, Bakelite, Epoxy; Conducting polymers – polyaniline and polypyrrole.

UNIT II NANOCHEMISTRY 9

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties. Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Properties (optical, electrical, mechanical and magnetic) and Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law (derivation and problems). Photo physical processes – Jablonski diagram. Chemiluminescence, photo-sensitization and photoquenching – mechanism and examples. Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Width and intensities of spectral lines. Atomic absorption spectroscopy, UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV ENERGY CONVERSIONS AND STORAGE 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells – H_2-O_2 and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V WATER TECHNOLOGY 9

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - zeolite (permutit) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

TOTAL: 45 PERIODS

OUTCOMES:

- To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
- To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:

1. Jain P. C. & Monica Jain., “Engineering Chemistry”, 16th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. S.S.Dara, “A text book of Engineering Chemistry”, Chand Publications, 2014.

REFERENCE BOOKS:

1. Schdeva M V, “Basics of Nano Chemistry”, Anmol Publications Pvt Ltd
2. B.Sivasankar, “Instrumental Methods of Analysis”, Oxford University Press. 2012.
3. Friedrich Emich, “Engineering Chemistry”, Scientific International Ltd.
4. V RGowariker, N V Viswanathan and Jayadev Sreedhar, “Polymer Science” New AGE International Publishers, 2009.

GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 9

Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudocodes and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms – Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators– Values and Types – Statements.

Suggested Activities:

- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

Suggested Evaluation Methods:

- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.

UNIT II CONDITIONALS AND FUNCTIONS 9

Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

Suggested Activities:

- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

Suggested Evaluation Methods:

- Tutorials on the above activities.
- Group Discussion on external learning.

UNIT III SIMPLE DATA STRUCTURES IN PYTHON 10

Introduction to Data Structures – List – Adding Items to a List – Finding and Updating an Item – Nested Lists – Cloning Lists – Looping Through a List – Sorting a List – List Concatenation – List Slices – List Methods – List Loop – Mutability – Aliasing – Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations – Sets.

Suggested Activities:

- Implementing python program using lists, tuples, sets for the following scenario:
  - Simple sorting techniques
  - Student Examination Report
  - Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

Suggested Evaluation Methods:

- Tutorials on the above activities.
- Group Discussion on external learning component.

UNIT IV STRINGS, DICTIONARIES, MODULES 10

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating – Basic Built-In String Functions – Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function – Finding Key and Value in a Dictionary – Modules – Module Loading and Execution – Packages – Python Standard Libraries.

Suggested Activities:

- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student's choice) and importing into the application.

Suggested Evaluation Methods:

- Tutorials on the above activities.

UNIT V FILE HANDLING AND EXCEPTION HANDLING 7

Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

Suggested Activities:

- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks - for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

Suggested Evaluation Methods:

- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course, students will be able to:

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6:Read and write data from/to files in Python programs.

TEXT BOOK:

1. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/thinkpython/).

REFERENCES:

1. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2", Network Theory Ltd., 2011.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press , 2013
3. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.
4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2012.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓									✓
CO2	✓		✓		✓							✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓	✓	✓							✓
CO5	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
CO6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

BS5161 **BASIC SCIENCES LABORATORY** **L T P C**

(Common to all branches of B.E. / B.Tech Programmes) **0 0 4 2**

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE

- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

LIST OF EXPERIMENTS

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of Young's modulus
3. Uniform bending – Determination of Young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Photoelectric effect
14. Michelson Interferometer.

15. Estimation of laser parameters.
16. Melde's string experiment

TOTAL: 30 PERIODS

OUTCOME

Upon completion of the course, the students will be able

- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler‟s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Phase change in a solid.

TOTAL: 30 PERIODS

OUTCOMES:

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To determine the molecular weight of polymers by viscometric method.
- To quantitatively analyse the impurities in solution by electroanalytical techniques
- To design and analyse the kinetics of reactions and corrosion of metals

TEXTBOOKS:

1. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).
2. Vogel's Textbook of Quantitative Chemical Analysis (8^{th} edition, 2014).

GE5161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To articulate where computing strategies support in providing Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
8. Implementing programs using written modules and Python Standard Libraries.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

OUTCOMES:

On completion of the course, students will be able to:

CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓									✓
CO2	✓		✓		✓							✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓	✓	✓							✓
CO5	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
CO6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

HS5251 PROFESSIONAL COMMUNICATION L T P C
4 0 0 4

COURSE OBJECTIVES

The course entitles ‘Professional Communication” aims to,

- Improve the relevant language skills necessary for professional communication.
- Develop linguistic and strategic competence in workplace context.
- Enhance language proficiency and thereby the employability of budding engineers and technologists.

UNIT I TECHNICAL COMMUNICATION 12

Listening: Listening to telephone conversations (intent of the speaker and note taking exercises)- Speaking: Role play exercises based on workplace contexts, introducing oneself- Reading: Reading the interview of an achiever and completing exercises (skimming, scanning and predicting)- Writing: Writing a short biography of an achiever based on given hints- Grammar: Asking and answering questions, punctuation in writing, prepositional phrases- Vocabulary Development: use of adjectives.

UNIT II SUMMARY WRITING 12

Listening: Listening to talks/lectures both general and technical and summarizing the main points- Speaking: Participating in debates- Reading: Reading technical essays/ articles and answering comprehension questions-Writing: Summary writing-Grammar: Participle forms, relative clauses- Vocabulary Development: Use of compound words, abbreviations and acronyms.

UNIT III PROCESS DESCRIPTION 12

Listening: Listening to a process description and drawing a flowchart-Speaking: Participating in Group Discussions, giving instructions- Reading: Reading instruction manuals- Writing: Writing process descriptions- Writing instructions- Grammar: Use of imperatives, active and passive voice, sequence words- Vocabulary Development: Technical jargon

UNIT IV REPORT WRITING 12

Listening: Listening to a presentation and completing gap-filling exercises- Speaking: Making formal presentations- Reading: Reading and interpreting charts/tables and diagrams- Writing: Interpreting charts/tables and diagrams, writing a report- Grammar: Direct into indirect speech, use of phrases- Vocabulary Development: reporting words

UNIT V WRITING JOB APPLICATIONS 12

Listening: Listening to a job interview and completing gap=filling exercises- Speaking: Mock interview, telephone interviews- Reading: Reading a job interview, SOP, company profile and completing comprehension exercises- Writing: job applications and resumes and SOPs-Grammar: Present perfect and continuous tenses- Vocabulary Development: Technical vocabulary.

TOTAL : 60 PERIODS

LEARNING OUTCOMES

At the end of the second semester the learners should be able to,

- Read and comprehend technical texts effortlessly.
- Write reports of a technical kind.
- Speak with confidence in interviews and thereby gain employability

Textbook

1. Revised Edition of ‘English for Engineers and Technologists’ Volume 1 published by Orient Black Swan Limited 2019.

Assessment Pattern

- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5252	ENGINEERING MATHEMATICS – II (Common to all branches of B.E. / B.Tech. Programmes in II Semester)	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in Engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem, Stoke's theorem and Gauss divergence theorem – Verification and application in evaluating line, surface and volume integrals.

UNIT II ANALYTIC FUNCTION **12**

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation $w = c + z,\ az,\ 1/z,\ z^2$

UNIT III COMPLEX INTEGRATION **12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT IV DIFFERENTIAL EQUATIONS **12**

Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT V LAPLACE TRANSFORMS **12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students will be able to:

- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
- Construct analytic functions and use their conformal mapping property in application problems.
- Evaluate real and complex integrals using the Cauchy's integral formula and residue theorem.
- Apply various methods of solving differential equation which arise in many application problems.
- Apply Laplace transform methods for solving linear differential equations.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2015.
2. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, 44th Edition, New Delhi, 2017.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi, 2009.
2. Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, 4th Edition, New Delhi, 2011.
3. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, 5th Edition, New Delhi, 2017.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.
5. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

GE5151 ENGINEERING GRAPHICS L T P C
1 0 4 3

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNITI PLANE CURVES AND FREE HANDSKETCHING 14
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNITII PROJECTION OF POINTS, LINES AND PLANE SURFACES 15
Orthographic projection- principles-Principle planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNITIII PROJECTION OF SOLIDS 15

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNITIV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNITV ISOMETRIC AND PERSPECTIVE PROJECTIONS 12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60)=75 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.

TEXT BOOKS:

1. Bhatt, N. D.,Panchal V M and Pramod R. Ingle, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
2. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015

REFERENCES:

1. Agrawal, B. and Agrawal C.M., “Engineering Drawing”, Tata McGraw, N.Delhi, 2008.
2. Gopalakrishna, K. R., “Engineering Drawing”, Subhas Stores, Bangalore, 2007.
3. Natarajan, K. V., “A text book of Engineering Graphics”, 28thEd., Dhanalakshmi Publishers, Chennai, 2015.
4. Shah, M. B., and Rana, B. C., “Engineering Drawing”, Pearson, 2ndEd., 2009.
5. Venugopal, K. and Prabhu Raja, V., “Engineering Graphics”, New Age,2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.9				0.9					0.6		0.6	0.6	0.9	0.6
2	0.9									0.6		0.6	0.6	0.6	
3	0.9				0.9					0.6		0.6	0.6	0.6	
4	0.9		0.6		0.9					0.6		0.6	0.6	0.6	
5	0.9		0.9		0.9					0.6		0.6	0.6	0.6	

EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts of electric circuits, magnetic circuits and wiring.
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices and circuits.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING 9

Electrical circuit elements (R, L and C)-Dependent and independent sources – Ohm's Law-Kirchhoff's laws - mesh current and node voltage methods (Analysis with only independent source) - Phasors – RMS-Average values-sinusoidal steady state response of simple RLC circuits. Types of wiring- Domestic wiring - Specification of Wires-Earthing-Methods-Protective devices.

UNIT II THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS 9

Three phase supply – Star connection – Delta connection –Balanced and Unbalanced Loads-Power in three-phase systems – Comparison of star and delta connections – Advantages-Magnetic circuits-Definitions-MMF, Flux, Reluctance, Magnetic field intensity, Flux density, Fringing, self and mutual inductances-simple problems.

UNIT III ELECTRICAL MACHINES 9

Working principle of DC generator, motor-EMF and Torque equation-Types –Shunt, Series and Compound-Applications. Working principle of transformer-EMF equation-Operating principles of three phase and single phase induction motor-Applications. Working principles of alternator-EMF equation-Operating principles of Synchronous motor, stepper motor-Applications.

UNIT IV BASICS OF ELECTRONICS 9

Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-Rectifier circuits-Wave shaping.

UNIT V CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES 9

Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 To be able to understand the concepts related with electrical circuits and wiring.
CO2 To be able to study the different three phase connections and the concepts of magnetic circuits.
CO3 Capable of understanding the operating principle of AC and DC machines.
CO4 To be able to understand the working principle of electronic devices such as diode and zener diode.
CO 5 To be able to understand the characteristics and working of current controlled and voltage controlled devices.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓	✓							
CO2	✓	✓	✓	✓	✓						✓	
CO3	✓	✓	✓	✓	✓						✓	✓
CO4	✓	✓	✓	✓	✓						✓	✓
CO5	✓		✓	✓	✓						✓	✓

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education, 2014
2. Del Toro, "Electrical Engineering Fundamentals", Second edition, Pearson Education, New Delhi, 1989.
3. John Bird, "Electrical Circuit theory and technology", Routledge; 5th edition, 2013

REFERENCES:

1. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education, 7th edition, 2017
3 Kothari DP and I.J Nagrath, "Basic Electrical Engineering", McGraw Hill, 2010.
4 Muhammad H. Rashid, "Spice for Circuits and electronics", 4th ed., Cengage India,2019

GE5152 ENGINEERING MECHANICS L T P C
3 1 0 4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I STATICS OF PARTICLES (9+3)

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNITII EQUILIBRIUM OF RIGID BODIES (9+3)

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNITIII DISTRIBUTED FORCES (9+3)

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration

UNIT IV FRICTION (9+3)

The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling Resistance, Ladder friction.

UNITV DYNAMICS OF PARTICLES (9+3)

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force , Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact, Method of Virtual Work - Work of a Force, Potential Energy, Potential Energy and Equilibrium.

TOTAL (L: 45 + T: 15)=60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11thEdition, 2017.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.9	0.6	0.6	0.3								0.6	0.9	0.3	0.3
2	0.9	0.6	0.6	0.3								0.6	0.9	0.3	0.3
3	0.9	0.6	0.9	0.3								0.6	0.9	0.3	0.6
4	0.9	0.6	0.9	0.3								0.6	0.9	0.3	0.6
5	0.9	0.6	0.9	0.3								0.6	0.9	0.3	0.6

PH5201 PHYSICS FOR GEOINFORMATICS ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To explore the physics in space weather and its impacts on satellites.
- To understand the principles of heat transfer.
- To know about fundamental optical principles in remote sensing.
- To understand the foundation of gravitation.
- To understand the different types of electro-optic sensors and its detection mechanism

UNITI INTRODUCTION TO SPACE WEATHER 9

Sun – Heliosphere : corona and the solar wind, interplanetary magnetic field, coronal mass ejections, cosmic rays - Earth's Space environment: dipole magnetic field, structure of inner magnetosphere, interaction of solar wind and magnetosphere, magnetic reconnection, magnetotail, plasma sheet convection - Earth's upper atmosphere: thermosphere, ionsophere, structure and variation, aurora -Radiation impacts on satellites - Radio communication and navigation impacts

UNITII HEAT TRANSFER 9

Modes of heat transfer- Conduction, Convection and Radiation –Importance of material properties in heat transfer – Thermal conductivity - Specific heat capacity - Steady state conduction through constant area - Principle of convection- Free & forced convective heat transfer- Radiation heat transfer-black and grey body radiation.

.UNIT III OPTICS FOR REMOTE SENSING 9

Lenses, mirrors, prisms - Defects in lens: chromatic aberration, longitudinal chromatic aberration, achromatism of lenses - achromatism for two lenses in contact and separated by a distance - spherical aberration - minimization of Spherical aberration - coma astigmatism - Radiative Transfer Functions - Lamella Pack - Volume scattering.

UNIT IV GRAVITATION 9

Newton's law of gravitation - Gravitational field and potential - Determination of gravity - Variation of acceleration due to gravity of the earth with depth, altitude and rotation of the earth – Refraction - Diffraction - Fresnel theory, Circular diffraction gravity, Polarisation double dittraction - Escape velocity - Kepler's law of planetary motion - Doppler effect.

UNIT V ELECTRO-OPTIC SENSORS 9

Photomultipliers, photo resistors, photodiodes, nonselective detectors - Optical receivers, PIN and APD, optical preamplifiers - Detectors: basic detector mechanisms, noise in detectors. thermal and photo emissive detectors, photoconductive and photovoltaic detectors, performance limits, photographic sensitivity, time and frequency response - hybrid photo detectors - Imaging detectors - eye and vision - photographic film - Camera tubes - Solid state arrays – video detector electronics, detector interfacing.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	acquire knowledge in specialty physics by further exploring space weather and effect of those environments on satellites.
CO2	Implement the heat transfer principles in remote sensing.
CO3	understand the basic optical principles
CO4	understand the fundamentals of gravitation.
CO5	gain knowledge about different types of electro-optic sensors and its detection mechanism

TEXT BOOKS:

1. Mark Moldwin, “Introduction to Space weather , Cambridge University Press, 2008
2. Frank Kreith, Raj M. Manglik, Mark S. Bohn, ‘Principles of Heat Transfer’, Cengage Learning; 8th edition, June 2016.
3. Gupta, S.K. “ Engineering Physics – Volume III,’ Krishna Prakasan Media Pvt Ltd. 1st Edition, 2001.
4. H.C. Verma, Concepts of Physics-Volume I,Bharati Bhavan Publishers, 2011 Edition.

REFERENCES:

1. John Keith Hargreaves, “The Solar-Terrestrial Environment: An Introduction to Geospace - the Science of the Terrestrial Upper Atmosphere, Ionosphere, and Magnetosphere”, Cambridge University Press, 1992
2. Holman, J.P.,"Heat Tansfer", 10th edn. The McGraw-Hill Companies, 2008
3. Graham Smith, F., Terry A. King and Dan Wllklns , “ Optics and Phtonics: An Introduction’, John Wiley & Sons, 2007.
4. David Halliday , Robert Resnick Jearl Walker, Fundamentals of Physics, 10th Edition 10th Edition, Wiley Publisher, 2015.
5. Ian S. McLean, Electronic Imaging in Astronomy: Detectors and Instrumentation”, Springer Science and Business Media, 2nd Edition, 2008.

CO – PO Mapping – Subject name: PHYSICS FOR GEOINFORMATICS ENGINEERING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3		2	2	3
PO2	Problem analysis	2	2		2	2	2
PO3	Design / development of solutions			2		2	2
PO4	Investigations			2			2
PO5	Usage of Modern Technology			2			2
PO6	Individual and Team work			2			2
PO7	Communication			2		2	2
PO8	Engineer and Society		2	2		2	2
PO9	Ethics			2			2
PO10	Environment and Sustainability	2	2	2			2
PO11	Project Management and Finance					2	2
PO12	Life Long Learning			2			2
PSO1	Knowledge of Geoinformatics discipline	2	2	2			2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations		2	2			2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2	2				2

GE5162 WORKSHOP PRACTICES LABORATORY L T P C
(Common to all Branches of B.E. / B. Tech. Programmes) 0 0 4 2

COURSE OBJECTIVES: The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planning and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

WIRING WORK:

a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
b) Wiring Stair case light.
c) Wiring tube – light.
d) Preparing wiring diagrams for a given situation.

Wiring Study:

a) Studying an Iron-Box wiring.
b) Studying a Fan Regulator wiring.
c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Studying a FM radio.
b) Studying an electronic telephone.

TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.6	0.3											0.3	0.3	
2		0.6	0.6											0.6	
3		0.6	0.3										0.6	0.6	
4		0.6	0.6	0.3										0.6	

EE5261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY L T P C
0 0 4 2

OBJECTIVES

1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators

List of Experiments

1. Verification of Kirchhoff's Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
4. Measurement power in three phase circuits by two-watt meter method.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.
7. Performance characteristics of single phase induction motor.
8. Characteristics of PN diode and Zener diode
9. Characteristics of Zener diode
10. Half wave and full wave Rectifiers
11. Application of Zener diode as shunt regulator.
12. Characteristics of BJT and JFET

TOTAL: 60 PERIODS

OUTCOMES:

1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops

MA5301 TRANSFORM TECHNIQUES AND STATISTICS L T P C
3 1 0 4

OBJECTIVES:

- To introduce the concept of Fourier series which is used in applied mathematics to represent a periodic signal in terms of cosine and sine waves.
- To expose the concept of Fourier transforms that take a signal and express it in terms of the frequencies of the waves that make up that signal.
- To impart knowledge of random variables (both discrete and continuous) and their associated probability distributions with examples relating to real time situations.
- To extend the concept and analysis of one dimensional random variables to bivariate random variables with thrust on the importance of Central Limit Theorem.
- To given an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions.

UNIT I FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 12

Fourier integral theorem – Fourier transform pair - Sine and cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT III RANDOM VARIABLE 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions - Functions of a random variable.

UNIT IV TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT V TESTING OF HYPOTHESIS 12

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – $\chi 2$- test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank – sum test (Wilcoxon test).

TOTAL : 60 PERIODS

OUTCOMES :

- It enables the students to represent any periodic function as a sum of trignometric sines and cosines.
- It enables the students to calculate the frequency spectrum of a signal that changes over time using Fourier transforms.
- It familiarizes the students with probability distributions that are apt for various real time situations.
- It equips the students to determine the correlation and regression for bivariate random variables with given probability distributions.
- It imparts the knowledge of various test statistics used in hypothesis testing for mean and variances of large and small samples.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
2. Johnson, R.A, Irwin Miller and John Freund., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, 8th Edition, New York, 2015.
3. Kreyszig, E. "Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", , Cengage Learning, 9th Edition, Boston, 2017.
2. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 3rd Reprint, New Delhi, 2008.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier, 5th Edition, New Delhi, 2014.
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill, 3rd Edition, Reprint, New Delhi, 2017.
5. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, 9th Edition, New Delhi, 2011.

GI5301 SPATIAL DATABASE MANAGEMENT SYSTEM L T P C

3 0 0 3

OBJECTIVE :

- To introduce the students to the concepts of DBMS, Spatial Database Management System (SDBMS), Spatial Database design, basic application program development and user interfaces.

UNIT I INTRODUCTION 9

Data – Information - File system vs DBMS – Database Management Systems – Database Architectures, users and administrators – Classification of Database Management Systems -

Spatial Data- Points, Lines, Polygons- definition of SDBMS -user classes of SDBMS – Multi layer architecture of SDBMS - GIS and SDBMS

UNIT II SPATIAL CONCEPTS AND DATA MODELS 9

Field based model – object based model – spatial data types – operations on spatial objects - Entity Relationship Model (ER Model) – Relational Model – Constraints and Normal forms of Relational Model - mapping ER model to Relational model – ER model with spatial concepts – Object-oriented data modeling with Unified Modeling Language (UML)

UNIT III QUERY LANGUAGE 9

SQL – Data Definition – Data Manipulation - Basic structure of SQL – Set operations – Aggregate Functions –Simple queries –spatial Vs non spatial- Nested sub queries – Complex queries – Views – Trigger - OGIS standard for extending SQL - example spatial SQL queries – Object relational SQL.

UNIT IV SPATIAL STORAGE AND INDEXING 9

Disk geometry – Buffer manager –Field-Record – File System - File Structure – Clustering -Basic concepts of file organizations, indexing – Spatial Indexing – Grid files – R Tree - Concurrency support – Spatial Join index - Database recovery techniques – Database Security.

UNIT V DESIGN AND DEVELOPMENT 9

Exploring Spatial Geometry, Organizing spatial data, Spatial data relationships and functionalities of any one commercial and one FOSS DBMS each – Application program and user Interfaces.

(L:45) TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	To introduce the concepts , classification , architectures of DBMS, SDBMS
CO2	To provide the information on Field Based, Object Based, ER , Relational and UML models.
CO3	To enable the SQL, Extended SQL for handling Spatial and Non-Spatial Queries.
CO4	To show the methods of Storing, Indexing, Database Recovery and Data Security concepts
CO5	To give the Design and Development Environment of Spatial Data

TEXTBOOKS:

1. Shashi Shekhar, Sanjay Chawla,||Spatial Databases a Tour|| Prentice Hall, 2003.
2. Philippe Rigaux, Michel Scholl, Agnès Voisard — Spatial Databases with application to GIS || Morgan Kaufmann,ISBN13: 9781558605886, ISBN10: 1558605886,2002

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth and S.Sudharshan, —Database Syste Concepts||, seventh edition, McGraw Hill, 2019.
2. Ravi Kothuri, Albert Godfrind, Euro Beinat —Pro Oracle Spatial for Oracle Database 11g||, Apress , ISBN13 : 9788181288882, 2007.
3. Regina, Leo Hsu —PostGIS in Action||, Oreilly & Associates Inc., ISBN-13: 9781935182269, ISBN-10: 1935182269, 2011.
4. Elamasri | Navathe – Fundamentals of Database Systems, Pearson Education,3rd Edition,2001, ISBN: 81-7808-137-7
5. Hussein Nasser, Learning ArcGIS Geodatabases,Packt Publishing Limited, 2014,ISBN-978-1-78398-864-8.

CO – PO Mapping – SPATIAL DATABASE MANAGEMENT SYSTEM

PO / PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2	2	2	2	2
PO2	Problem Analysis		2	2	1	2	2
PO3	Design / Development of Solutions	1	3	2	2	3	2
PO4	Investigations	2	1	1	2	3	3
PO5	Use of Modern Technology	3	3	2	3	2	3
PO6	Individual and Team Work		1			1	1
PO7	Communication						
PO8	Engineer and Society				1	2	2
PO9	Ethics				2	1	2
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	2	2	2	2	1	2
PSO1	Knowledge of Geoinformatics discipline	2	1	3	2	1	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	1	3	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	1	3	1	2	2

GI5302 SURVEYING I L T P C
3 0 0 3

OBJECTIVES:

- To introduce the rudiments of surveying and its principles to Geoinformatics Engineers.
- To learn the various methods of surveying to solve the real world problems.
- To introduce the concepts of Large Scale Mapping
- To introduce the basics of Cadastral Surveying

UNIT I FUNDAMENTALS AND CHAIN SURVEYING 9

Definition- Classifications - Plane and Geodetic Surveying - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Problems in Obstacles - Chain traversing and plotting – Conventional Symbols- applications.

UNIT II COMPASS AND PLANE TABLE SURVEYING 9

Compass – Basic principles - Types - Bearing - System and conversions- Sources of errors and Local attraction - Magnetic declination-Dip-Compass traversing and plotting – Closing error adjustment - Plane table and its accessories - Merits and demerits - Radiation – Intersection - Resection – Plane table traversing – Source of errors - applications.

UNIT III LEVELLING 9

Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling - Precise levelling - Source of errors - applications.

UNIT IV CONTOURING, AREA AND VOLUME CALCULATION 9

Contouring – Methods – Longitudinal and Cross Section – Plotting –Methods of interpolating Contours - Characteristics and uses of Contours – Areas enclosed by straight lines – Irregular figures – Planimeters - Volumes – Earthwork calculations – Capacity of Reservoirs – Mass Haul Diagrams.

UNIT V CADASTRAL SURVEYING 9

History of cadastral survey – Future of Land Records - FMB Sketch -Tax – Real Property- Legal Cadastral – Graphical and Numerical Cadastre, Legal Characteristics of Records, Torrens System. Cadastral map reproduction – Map projection for cadastral maps - Automated Cadastral map – Creation of Land Information System – Integrating LIS – Land Administration – Recent Trends.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts concepts of chain, compass, plane table, Levelling and cadastral Surveying.
CO2	Understand the procedure of conducting the various types of surveying to solve the real world problems .
CO3	Inculcate entrepreneurship skills, leadership qualities and to work in teams on surveying projects.
CO4	Develop the required skills in surveying fundamentals necessary to provide robust solutions using various surveying techniques.
CO5	Providethe knowledge in cadastral surveying and opportunity to stand first in field of surveying with professional ethics.

TEXTBOOKS :

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 24th Reprint,2015.
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition,2016.

REFERENCES:

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001
3. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
4. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice‘ Hall of India 2004
5. K.R. Arora, Surveying Vol I & II, Standard Book house , Eleventh Edition. 2013

CO – PO Mapping – SURVEYING I

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2		2	2	2
PO2	Problem Analysis	3	3	3	3		3
PO3	Design / development of Solutions						
PO4	Investigations						
PO5	Use of Modern Technology					3	3
PO6	Individual and Team work	3	3	3	3	3	3
PO7	Communication	1	1	1	1	1	1
PO8	Engineer and Society	2	2	2	2	2	2
PO9	Ethics	2	2	2	2	2	2
PO10	Environment and Sustainability						
PO11	Project Management and Finance	2	2	2	2	2	2

PO12	Life Long Learning	3	3	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline			3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	3			3	3	3

GI5303 REMOTE SENSING I L T P C
3 0 0 3

UNIT I REMOTE SENSING AND ELECTROMAGNETIC RADIATION 9

Definition – components of RS – History of Remote Sensing – Merits and demerits of data collation between conventional and remote sensing methods - Electromagnetic Spectrum – Radiation principles - Wave theory, Planck's law, Wien's Displacement Law, Stefan's Boltzmann law, Kirchoff's law – Radiation sources: active & passive - Radiation Quantities

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL 9

Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere – Scattering, absorption and refraction – Atmospheric windows - Energy balance equation – Specular and diffuse reflectors – Spectral reflectance & emittance – Spectroradiometer – Spectral Signature concepts – Typical spectral reflectance curves for vegetation, soil and water – solid surface scattering in microwave region.

UNIT III ORBITS AND PLATFORMS 9

Motions of planets and satellites – Newton's law of gravitation - Gravitational field and potential - Escape velocity - Kepler's law of planetary motion - Orbit elements and types – Orbital perturbations and maneuvers – Types of remote sensing platforms - Ground based, Airborne platforms and Space borne platforms – Classification of satellites – Sun synchronous and Geosynchronous satellites – Legrange Orbit.

UNIT IV SENSING TECHNIQUES 9

Classification of remote sensors – Resolution concept : spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners – Optical-infrared sensors – Thermal sensors – microwave sensors – Calibration of sensors - High Resolution Sensors - LIDAR , UAV –Orbital and sensor characteristics of live Indian earth observation satellites

UNIT V DATA PRODUCTS AND INTERPRETATION 9

Photographic and digital products – Types, levels and open source satellite data products –- selection and procurement of data– Visual interpretation: basic elements and interpretation keys – Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	understand the concepts and laws related to remote sensing
CO2	understand the interaction of electromagnetic radiation with atmoshphere and earth material
CO3	acquire knowledge about satellite orbits and different types of satellites
CO4	understand the different types of remote sensors
CO5	gain knowledge about the concepts of interpretation of satellite imagery

TEXTBOOKS:

1. Thomas M.Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York,2015.
2. George Joseph and C Jeganathan, Fundamentals of Remote Sensing,Third Edition Universities Press (India) Private limited, Hyderabad, 2018

REFERENCES:

- Janza, F.Z., Blue H.M. and Johnson,J.E. Manual of Remote Sensing. Vol.I, American Society of Photogrametry, Virginia, USA, 2002.
- Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995
- Paul Curran P.J. Principles of Remote Sensing. Longman, RLBS, 1988.
- Introduction to Physics and Techniques of Remote Sensing , Charles Elachi and Jacob Van Zyl, 2006 Edition II, Wiley Publication.
- Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 2011

CO – PO Mapping – REMOTE SENSING I

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3		2	2	2	2
PO2	Problem analysis					3	3
PO3	Design / development of solutions				2	2	2
PO4	Investigations					3	3
PO5	Use of Modern Technology					3	3
PO6	Individual and Team work			3		2	2
PO7	Communication			3		3	3
PO8	Engineer and Society					3	3
PO9	Ethics					1	1
PO10	Environment and Sustainability	1	3				2
PO11	Project Management and Finance				1		1
PO12	Life Long Learning				2		2
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations				2	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2	2		2	3	2

GI5304 PHOTOGRAMMETRY L T P C

3 0 0 3

OBJECTIVE :

- the objective of the course is to familiarize the undergraduate students with the principles, tools and equipment, methodology for photogrammetric mapping work and the current trends in aerial based mapping techniques like UAV.

UNIT I PRINCIPLES AND PROPERTIES OF PHOTOGRAPHY 9

History - Definition, Applications - Types of Photographs, Classification - Photographic overlaps – Film-based Aerial Cameras – Construction - Camera accessories - Camera calibration - Digital Aerial cameras- CCD – Multiple frame and Line cameras - Linear array scanner - Flight Planning – Crab and Drift - Basic horizontal and vertical control - Pre pointing and Post pointing.

UNIT II GEOMETRIC PROPERTIES OF AERIAL PHOTOGRAPHS 9

Photo coordinate measurement - Refinement of photo coordinates - Vertical photographs - geometry, scale – Stereoscopes - parallax concept - parallax equation - Tilted photograph - Geometry, Scale, Coordinate system – Relief displacement –- Photo Interpretation.

UNIT III STEREO PLOTTERS& ORIENTATION 9

Projection system, Viewing, Measuring and Tracing system - Stereo plotters – Classification – Analog, semi analytical, Analytical and Digital plotting concepts – cross ratio- Two dimensional coordinate transformations – ray tracing- Interior orientation - dependent and independent RO- – Collinearity condition and Coplanarity condition - Three dimensional conformal coordinate transformation - Absolute orientation – GPS/INS based orientation

UNIT IV AEROTRIANGULATION, TERRAIN MODELING, ORTHOPHOTO 9

Neat model - blocks of photographs- – Aerotriangulation: – strip adjustment – independent model triangulation - Bundle block Adjustment– precision, accuracy and reliability- DTM, DEM and DSM, Orthophoto – mono plotting – stereo plotting - feature collection

UNIT V DIGITAL PHOTOGRAMMETRY 9

Photogrammetric Scanner – Digital Photogrammetry Work Station - requirement of functionalities Stereoscopic Viewing and Measuring System - Photogrammetry project Planning image properties- image matching: template matching , feature based matching - satellite photogrammery principles- UAS technology- regulatory – technical challenges – tools.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand and appreciate the importance of photography as means of mapping, functional and physical elements of photography.
CO2	Understand and reflect on the history and need of the photogrammetric mapping and the relevants of the accuracy standards and means to achieve them for precise large scale maps with scientific methods.
CO3	Evaluate the standards of map based on the state of the art tool and techniques and assers the production standards for photogrammetric map making.
CO4	Acquire knowledge on the current development, issues methods and solutions in map making and evaluate methods of production.
CO5	Analyze critically and evaluate methods by applying the knowledge so gained and to be a part of innovation and integration of mapping technology.

TEXTBOOKS:

1. Paul. R Wolf., Bon A.DeWitt, Elements of Photogrammetry with Application in GIS McGraw Hill International Book Co., 4th Edition, 2014.
2. E.M.Mikhail, J.S.Bethel, J.C.McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2001

REFERENCES:

1. GollfriedKonecny, Geoinformation: RemoteSensing, Photogrammetry and Geographical Information Systems, CRC Press, 1st Edition, 2002.
2. Karl Kraus, Photogrammetry: Geometry from Images and Laser Scans, Walter de Gruyter GmbH & Co. 2nd Edition, 2007
3. Manual of Photogrammetry – American society of Photogrammetry & R.S by Albert.D, 1952.
4. Digital Photogrammetry – A practical course by Wilfried Linder, 3rd edition, Springer, 2009.
5. Digital Photogrammetry by – Y. Egels & Michel Kasser, Taylor & Francis group, 2002.

CO – PO Mapping – PHOTOGRAMMETRY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	2	3	2	3
PO2	Problem Analysis	2	2	3	3	3	3
PO3	Design / development of solutions	2	2	2	3	3	3
PO4	Investigations	2	2	3	3	3	3
PO5	Use of Modern Technology	2	2	2	3	3	3
PO6	Individual and Team work	3	3	2	3	3	3
PO7	Communication	2	2	2	2	3	2
PO8	Engineer and Society	2	2	2	3	3	2
PO9	Ethics	2	2	H	3	3	3
PO10	Environment and Sustainability	1	1	1	3	3	2
PO11	Project Management and Finance	1	1	1	2	3	2
PO12	Life Long Learning	3	3	2	2	3	3
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	1	2	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	1	1	2	3	3

GI5311 SURVEYING LABORATORY I L T P C
0 0 4 2

OBJECTIVE:

- To familiarize with the various surveying instruments and methods.

EXCERCISES : 4 hours each

1. Finding Pace Value of Surveyor using Chaining and Ranging
2. Mapping of Building with cross staff and without cross staff
3. Overcoming Obstacles in Chaining
4. Computation of Included Angle after adjustment of Local Attraction
5. Determination of Inaccessible Distance using compass
6. Mapping of Building with Compass including traverse adjustment
7. Planimetric Mapping of an Area using Plane Table Surveying (Radiation, Intersection)
8. Map updation using Plane Table Surveying through Resection(Graphical Method)
9. Map updation using Plane Table Surveying through Resection (Trial & Error Method)
10. Plane table surveying – Two point problem
11. Fly leveling using dumpy level
12. Fly leveling using tilting level
13. Transfer of Bench Mark using Check Levelling
14. Cut and fill volume calculation using profile levelling
15. Contour Mapping using Grid Levelling

TOTAL: 60 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts knowledge of use of chain, compass, plane table and leveling Instrument
CO2	Inculcate to prepare the Map of any Engineering Structure using chain, compass and plane table
CO3	Gain knowledge on Height determination by levelling
CO4	Solve the field problems with the help of chain, compass, plane table and leveling Instrument
CO5	Understand the Preparation of the contour map

REFERENCES:

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 24th Reprint,2015.
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition,2016.
3. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001
4. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
5. David Clark, Plane and Geodetic Surveying for Engineers, Volume I, Constable and Company Ltd, London, CBS,6th Edition,2004.
6. David Clark and James Clendinning, Plane and Geodetic Surveying for Engineers, Volume II, Constable and Company Ltd, London, CBS,6thEdition,2004.
7. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice‘ Hall of India 2004
8. K.R. Arora, Surveying Vol I& II, Standard Book house, Eleventh Edition,2013.

CO – PO Mapping – SURVEYING LABORATORY I

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences		3		3		3
PO2	Problem Analysis		2	2	2	2	2
PO3	Design / development of Solutions						
PO4	Investigations		3		3	3	3
PO5	Usage of Modern Technology		2	2	2	2	2
PO6	Individual and Team work		2	2	2	2	2
PO7	Communication						
PO8	Engineer and Society		2		2	2	2
PO9	Ethics		2	2	2	2	2
PO10	Environment and Sustainability						
PO11	Project Management and Finance		3	2		2	2
PO12	Life Long Learning		3	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline				3		3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations		3	3	3		3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		3	3	3		3

GI5312 REMOTE SENSING AND PHOTOGRAMMETRY LABORATORY L T P C
0 0 2 1

OBJECTIVE:

- To acquire practical knowledge in the field of Remote Sensing and Photogrammetry.

REMOTE SENSING EXERCISES

1. Preparation of Base Map from Survey of India Topo sheets 4
2. Introduction to various satellite data products and image interpretation keys 4
3. Preparation of Land use/land cover map using Satellite Data. 4
4. Preparation and analysis of spectral signatures using handheld spectro radiometer for
   (a) Vegetation 4
   (b) Soil 4
   (c) Water 4

PHOTOGRAMMETRY EXERCISES

1. Testing stereovision with test card 4
2. Mirror stereoscope- base lining and orientation of aerial photographs and photo interpretation. 4
3. Scale of vertical photographs. 4
4. To find the height of point using Parallax concept. 4
5. Aerial Triangulation using digital photogrammetry 4
6. Bundle Block adjustment 4
7. Generation and editing of DTM and Contour 4
8. Preparation of Planimetric map and Orthophoto generation 4
9. Preparation of planimetric map using drone images 4

OTAL: 30 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts the knowledge in preparation of base map and thematic maps.
CO2	gain knowledge on preparation and analysis of spectral signatures of various features.
CO3	Understand the basic concepts of aerial photo and orientation procedure.
CO4	Provides hands on experience on the use of stereoscopic instruments and Digital photogrammetry software.
CO5	Prepare the orthophoto and mapping by digital photogrammetry.

REFERENCES:

1. Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, VI edition of John Wiley & Sons-2015.
2. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition, 2015.
3. Paul R.Wolf, Elements of Photogrammetry, McGraw-Hill Science, 2013, ISBN 0070713464, 9780070713468
4. Karl Kraus, Photogrammetry, Fundamentals and standard processes, Dümmler, 2000, ISBN 978 3 110190076
5. Mikhail Kasser and Yves Egels, “Digital Photogrammetry”, Taylor and Francis, 2003, ISBN 0 748 40944 0
6. Francis h. Moffitt, Edward M. Mikhail, Photogrammetry, TBS The Book Service Ltd, 1980, ISBN 13: 9780700221370
7. Edward M. Mikhail, James S.Bethel, J.Chris McGlone, Introduction on “Modern Photogrammetry”, John Wiley & Sons, Inc., 2012, ISBN 0-471-30924-9
8. Wilfried Linder, “Digital Photogrammetry”-Theory and Applications, Springer-Verlag Berlin Heidelberg New York, 3rd Edition, 2014, ISBN 3-540-00810-1
9. Digital Photogrammetry – A practical course by Wilfried Linder, 3rd edition, Springer, 2009

CO – PO Mapping – REMOTE SENSING AND PHOTOGRAMMETRY LABORATORY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	1	1	1	1	1
PO2	Problem Analysis	1	1	1	1	1	1
PO3	Design / development of Solutions	1	1	2	2	2	2
PO4	Investigations	1	1	1	3	3	2
PO5	Usage of Modern Technology	2	2	2	3	3	3
PO6	Individual and Team work	1	1	2	2	2	2
PO7	Communication	1	1	1	1	1	1
PO8	Engineer and Society	1	1	1	1	1	1
PO9	Ethics	1	1	1	1	1	1
PO10	Environment and Sustainability	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	2	2	2	2
PO12	Life Long Learning	2	2	2	1	1	2
PSO1	Knowledge of Geoinformatics discipline	2	2	2	2	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	2	1	1	3	3	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	1	2	1	1	1

GE5451 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM –-Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES 9

Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning- Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation,

Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal-- Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six-sigma Process Capability- Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation-Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Ability to apply TQM concepts in a selected enterprise.
CO2: Ability to apply TQM principles in a selected enterprise.
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
CO4: Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.
CO5: Ability to apply QMS and EMS in any organization.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓										✓
CO2						✓						✓
CO3					✓				✓			
CO4		✓			✓	✓	✓	✓				✓
CO5			✓			✓	✓	✓				

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Bester field,Mary B.Sacre,Hemant Urdhware she and RashmiUrdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”,Routledge.,2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth – Heinemann Ltd, 2016.
3. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
4. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .

GI5401 **REMOTE SENSING II** **L T P C**
3 0 0 3

UNIT I THERMAL REMOTE SENSING AND ANALYSIS 9

Thermal radiation principles – Thermal interaction sensors and characters – thermal image characters – image degradation sources & correction – Land surface temperature measurement – Application: LST, emissivity mapping, SST, ET distribution, Urban heat islands, existing models

UNIT II HYPERSPECTRAL REMOTE SENSING 9

Diffraction principles - field spectrum – BDRF and spectral reflectance & imaging spectrometry-sensors - virtual dimensionality – Hughe's phenomenon - Data reduction, Calibration and normalization –Binary encoding- thresholding - library matching.

UNIT III HYPERSPECTRAL DATA ANALYSIS 9

Spectral library – response functions – MNF transformation – Kalman filters- library matching, spectral angle mapper, BBMLC-spectral mixture analysis – end member extraction – spectral unmixing- MIA analysis concepts - PCF, PCA, WPCA spectral transformation – band detection, reduction and selection principles -data compression- Applications

UNIT IV MICROWAVE REMOTE SENSING 9

Radiometry – RADAR Equation – SLAR - Resolution concepts - Synthetic Aperture RADAR - SAR image Characteristics - Topographic effect – SAR Missions – ERS, JERS, RADARSAT, ENVISAT, TerraSAR X, RISAT – Scatterometry, Altimetry, Polarimetry and Interferometry.

UNIT V LIDAR 9

LIDAR – Principles and Properties- different LiDAR System- Space Borne and airborne LiDAR missions – Typical parameters of LiDAR system. Data Processing – geometric correction-data quality enhancement – filtering - LiDAR mapping applications: Hydrology, Disaster mitigation and management, etc

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	understand the concepts of thermal remote sensing processes
CO2	Understand the basics of hyperspectral remote sensing
CO3	carryout hyperspectral data analysis
CO4	know the principles and applications of microwave remote sensing
CO5	Know the concepts and applications of LiDAR remote sensing

TEXTBOOKS

1. Richards, Remote sensing digital Image Analysis-An Introduction Springer - Verlag,2012.
2. Thomas M.Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York, 2015.
3. Ulaby, F.T., Moore, R.K, Fung, A.K, Microwave Remote Sensing; active and passive, Vol. 1,2 and 3, Addison - Wesley publication company 2001

REFERENCES

1. Janza, F.Z., Blue H.M. and Johnson,J.E. Manual of Remote Sensing. Vol.I, American Society of Photogrametry, Virginia, USA, 2002.
2. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995
3. Paul Curran P.J. Principles of Remote Sensing. Longman, RLBS, 1988.
4. Woodhouse lain.H, Introduction to Microwave Remote Sensing Taylor & Francis 2006.
5. George Joseph and C Jeganathan, Fundamentals of Remote Sensing,Third Edition, Universities Press (India) Private limited, Hyderabad, 2018

CO – PO Mapping – REMOTE SENSING – II

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3			2		3
PO2	Problem analysis	2		3			3
PO3	Design / development of solutions	2		3			3
PO4	Investigations		3	3			3
PO5	Usage of Modern Technology	3	3		3	3	3
PO6	Individual and Team work				3		3
PO7	Communication	2		3			3
PO8	Engineer and Society	3	2		2	3	3
PO9	Ethics					3	3
PO10	Environment and Sustainability	2		L		3	2
PO11	Project Management and Finance					3	3
PO12	Life Long Learning	2	2				2
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	2		3	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2		3	2	2	2

GI5402 CARTOGRAPHY AND GIS L T P C
3 0 0 3

OBJECTIVES:

- To introduce concepts of Cartography and GIS
- To expose the process of map making and production
- To introduce GIS data structures, data input and data presentation

UNIT I ELEMENTS OF CARTOGRAPHY 9

Definition of Cartography - Maps - functions - uses — Types of Maps – Map Scales and Contents – Map projections – shape, distance, area and direction properties – perspective and mathematical projections – Indian maps and projections – Map co-ordinate systems - geometric transformations – bilinear and affine transformations – UTM and UPS references

UNIT II MAP DESIGN AND PRODUCTION 9

Elements of a map - Map generalization - Map Layout principles – Map Design fundamentals – symbols and conventional signs - graded and ungraded symbols - color theory - colours and patterns in symbolization – map lettering - map production – map printing– colours and visualization.

UNIT III FUNDAMENTALS OF GIS 9

Introduction to GIS - Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN ,GRID and Network Data Models.

UNIT IV DATA INPUT AND TOPOLOGY 9

Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input– Digitiser – Datum Projection and reprojection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration - Raster to Vector and Vector to Raster Conversion – File Formats in Open/Proprietary Softwares.

UNIT V DATA QUALITY AND OUTPUT 9

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards – Interoperability – OGC Concepts and FOS (Free and Open Source Software) - Spatial Data Infrastructure - Data Output - Map Compilation – Multimedia Products – Visualization of Geographical Information Data.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	To introduce the elements of Cartography viz maps , coordinate systems and projections
CO2	To provide the components of map layout, designs and production of maps.
CO3	To give the fundamentals of GIS and Data Models.
CO4	To explain the raster, vector data input methods and the topology concepts.
CO5	To describe the GIS Data Quality, Standards and the GIS outputs.

TEXTBOOKS:

1. Arthur, H. Robinson, Elements of Cartography, Seventh Edition, John Wiley and Sons, 2004.
2. Kang-Tsung Chang, " Introduction to Geographic Information Systems", McGraw Hill Publishing, 9th Edition, 2018.

REFERENCES:

1. John Campbell, " introductory Cartography", Wm.C. Brown Publishers, 3rd Edition, 2004
2. C.P. Lo Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Pearson Publishers, 2016.
3. Ian Heywood, Sarah Cornelius, Steve Carver, ~~Srinivasa Raju,~~ "An Introduction to Geographical Information Systems, Pearson Education, 4th Edition, 2012.
4. R.P.Misra, A.Ramesh, Fundamentals of Cartography, Concept publishing company,1989,ISBN-81-7022-222-2
5. W.Cartwright,G.Gartner,A.Lehn, Cartography and Art,Springer,2009,ISBN: 978-3-540-68567-8.

CO – PO Mapping – CARTOGRAPHY AND GIS

PO / PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	2	2	1	1	2
PO2	Problem Analysis	1	2	1	2	1	1
PO3	Design / Development of Solutions		1	2			2
PO4	Investigations	1	2	1			1
PO5	Usage of Modern Technology	2	2	2	2	2	2
PO6	Individual and Team Work						
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						

PO10	Environment and Sustainability						
PO11	Project Management and Finance		1	1			1
PO12	Life Long Learning	2	2	2	2	1	2
PSO1	Knowledge of Geoinformatics discipline	2	3	3	3	2	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	2	3	3	3	2	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2	3	3	3	2	3

GI5403 OBJECT ORIENTED PROGRAMMING USING C++ L T P C
2 0 2 3

OBJECTIVES :

- To facilitate the student to develop Object Oriented Programming

UNIT I CONCEPTS OF OBJECT ORIENTED PROGRAMMING 6+6

Principles - Abstract Data types - Inheritance - Polymorphism - Object Identity - Object Modeling - Object Oriented Programming Languages - Object Oriented Databases - Object Oriented user Interfaces - Object Oriented GIS - Object Oriented Analysis - Object Oriented Design –Examples.

UNIT II C++ PROGRAMMING FUNDAMENTALS 6+6

Introduction to C++- Keywords, Identifiers- Data types- Variables – Operators`-Manipulators- Operator Overloading- Operator Precedence- Control Statements-Functions - Call by Reference - Arguments - Function Overloading – Exercises

UNIT III CLASSES AND OBJECTS 6+6

Classesand Objects -MemberFunctions – Nesting of Member Functions - Constructors Destructors -Type Conversions - Inheritance - Base class - Derived Class - Visibility modes - Single Inheritance - Multilevel Inheritance - Multiple Inheritance - Nesting - Polymorphism– Exercises

UNIT IV FILE HANDLING 6+6

Streams and Formatted I/O – I/O Manipulators – File Handling – Random Access – Object Serialization – Namespaces – STD Namespace – ANSI String Objects – Standard Template Library.

UNIT V TEMPLATES AND EXCEPTION HANDLING 6+6

Function and Class Templates- Overloading of template functions-Member function templates – Exception Handling – Try-Catch-Throw Paradigm – Exception Specification – Terminate and Unexpected Functions – Uncaught Exception- Rethrowing an Exception.

TOTAL : 60 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the basic concepts of Object oriented programming
CO2	Implement OOPS concept using C++ Language
CO3	Understand the concept of Inheritance and Polymorphism
CO4	Handle the I/O files
CO5	Effectively use template and exception handling

TEXTBOOKS:

1. Balagurusamy. E., Object Oriented Programming with C++, Tata McGraw Hill Publications, Fourth edition, 2017
2. Daniel Liang, Introduction to Java Programming, Pearson, Sixth Edition, 2012

REFERENCES:

1. Bjarne Stroustrup, Programming: Principles and Practice using C++, Addison Wesley Publications, First Edition, 2014
2. Ponnambalam. P and Tiuley Alguindigue, "A C++ Primer for Engineers: An ObjectOriented approach" , McGraw Hill, 1997.
3. Kris Hadlock, Ajax for Web applications developers, Sams Publishing, First edition,2006
4. Bhushan Trivedi: " Programming with ANSI C ++ . A Step by step approach " Oxford University Press,2010
5. http://docs.oracle.com/javaee/5/tutorial/doc
6. www.cplusplus.com/doc/tutorial

CO – PO Mapping – OBJECT ORIENTED PROGRAMMING USING C++

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2	3	1	1	3
PO2	Problem analysis		2	3			3
PO3	Design / development of solutions	2	2	2			2
PO4	Investigations			2			2
PO5	Usage of Modern Technology	3	3	3	2	2	3
PO6	Individual and Team work		2	2			2
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability			2			2
PO11	Project Management and Finance						
PO12	Life Long Learning			2			2
PSO1	Knowledge of Geoinformatics discipline			2			2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			2	2		2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		2	3			3

GI5404 **GEODESY** **L T P C**

3 0 0 3

OBJECTIVE:

- To understand the geometry of the earth, Gravity, and its relationship with nature.

UNIT I FUNDAMENTALS **9**

Definitions- Classifications, Applications, Problem and purpose of Geodesy - Historical development and Organization of Geodesy. Reference Surfaces and their relationship. Engineering, Lunar, Planetary and interferometric Synthetic aperture radar Geodesy – Local and International Spheroid.

UNIT II GEOMETRIC GEODESY 9

Geometry of ellipsoid, fundamental mathematical relationship of ellipsoid, Geodetic, Geocentric and Reduced latitudes and their relationship. Ellipsoidal Co-ordinates in terms of Reduced, Geodetic and geocentric latitude. Radius of curvature in the meridian & prime vertical and their relationship. Mean Radius of curvature in any azimuth, Length of the meridian arcs and arcs of parallel and Area of trapezium on the ellipsoid. Curves on the ellipsoid, properties of Geodesic. Deflection of Vertical, Spherical excess.

UNIT III PHYSICAL GEODESY 9

Basics - INGN -the significance of gravity measurements, Gravity field of earth, Concept of equipotential, Geopotential and Spheropotential Surface - Normal gravity and its computations, Methods of measuring Absolute and Relative gravity- Gravimeters-Reduction of gravity measurements, terrain and Isostasy corrections. Gravity networks. Gravity anomaly and Gravity disturbance-Fundamental equation of Physical Geodesy. Gravimetric determination of Geoid and Deflection of Vertical.

UNIT IV CO-ORDINATE SYSTEM AND GEODETIC CONTROL 9

Natural or Astronomical co-ordinate System, Geodetic or Geographical co-ordinate System, Rectangular or Cartesian Co-ordinate System and relationship between them. Curvilinear Co-ordinate System. Astro-Geodetic method of determining the reference Spheroid. Geodetic Control (Horizontal and Vertical) – Standards. Methods and Computations. Geo potential number - Orthometric height, Normal height, Dynamic height and their corrections – computation of orthometric height, Ellipsoidal height and its determination with a single and reciprocal observation of vertical angle - geoidal height – methods and computation.

UNIT V GEODETIC ASTRONOMY 9

Celestial Sphere – Astronomical triangle – celestial coordinates systems and its relationship with Cartesian Co-ordinates and Transformation between them -Special star positions, Major constellations- Time systems (sidereal, Universal , atomic and standard) rising and setting of Stars with respect to Declination, hour angle and Azimuth, Culmination, Prime Vertical Crossing and Elongation. Determination of Astronomical Azimuth- stars altitude and hour angle methods, astronomical latitude and longitude determination

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the Geometry of the earth, Gravity and its relationship with nature
CO2	Understand the procedure for establishing horizontal and vertical Geodetic control and its adjustment procedure.
CO3	Determination of Azimuth, Latitude, Longitude and Time by Geodetic astronomical observations.
CO4	Provide the various aspects of Geometric and Physical Geodesy.
CO5	Inculcate the different height systems used to solve the field problems.

TEXTBOOKS:

1. Wolfgang Torge, Geodesy, Walter De Gruyter Inc., Berlin, 4th Edition, 2014.
2. Guy Bomford||Geodesy|| Nabu Press,2010,ISBN 1172029091

REFERENCES:

1. Petr Vanicek and Edward J. Krakiwsky, Geodesy: The concepts, North-Holland Publications Co., Amsterdam, 1991.
2. Tom Herring, —Geodesy _ Elsevier,2009,ISBN : 0444534601
3. Schwarze, V.S. Geodesy: The challenge of the 3rd millennium, Springer verlag, and 1st Edition,2002.
4. James R.Smith, Introduction to Geodesy, John wiley & Sons Inc. 1997.
5. George l. Hosmer, Geodesy, Kessinger publishing 2007.

CO – PO Mapping – GEODESY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2	2	2	2	2
PO2	Problem Analysis	3	3	3	3	3	3
PO3	Design / development of Solutions			3		3	3
PO4	Investigations						
PO5	Usage of Modern Technology	3	3	3	3	3	3
PO6	Individual and Team work						
PO7	Communication						
PO8	Engineer and Society	2	2	2	2	2	2
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance	2	2	2		2	2
PO12	Life Long Learning	2	2	2	2	2	2
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	3	3	3	3	3	3

GI5405 SURVEYING II L T P C
3 0 0 3

OBJECTIVE

- To learn the various methods of plane and geodetic surveying to solve the real world problems.

UNIT I THEODOLITE SURVEYING 9

Theodolite – Types – Description - Horizontal and vertical angle measurements - Temporary and permanent adjustments – Trigonometric Levelling - Heights and distances – Geodectic observation - Tacheometric surveying – Stadia Tacheometry – Subtense method - Tangential Tacheometry

UNIT II CONTROL SURVEYING AND ADJUSTMENT 9

Horizontal and vertical control- Methods - Triangulation- Base line - Instruments and accessories – Corrections - Satellite station - Traversing – Coordinate computation - Gale‘s table – Omitted measurement – Trilateration - Concepts of measurements and errors – weight of an observation – law of weight - error propagation and linearization – adjustment methods – angles, lengths and levelling network – simple problems.

UNIT III ASTRONOMICAL SURVEYING 9

Astronomical terms and definitions - Celestial coordinate systems – Nautical mile – Spherical excess - Astronomical triangle - different time systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of and azimuth by altitude and hour angle method – Determination of time, longitude, latitude.

UNIT IV ROUTE SURVEYING 9

Route Surveying for Highways, Railways, Power line and Canal – Reconnaissance survey, Preliminary survey and Location survey by Conventional method and Geomatics techniques - Setting Out Simple curves, Compound curves, Reverse Curve, Transition and Vertical curves – Sight distance.

UNIT V HYDROGRAPHIC AND MINE SURVEYING 9

Introduction to Hydrographic surveying – Vertical depth measurements – Soundings – Horizontal position fixing – Methods of locating soundings – Three point problem – Tides – MSL – Chart datum – River survey – Measurement of current and discharge – Mine surveying equipment – Weisbach triangle method – Tunnel alignment and setting out – Gyro Theodolite - Shafts and Adits

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts concepts of Theodolite Surveying.
CO2	Understand the procedure for establishing horizontal and vertical control and its adjustment procedure.
CO3	Determination of Azimuth, Latitude, Longitude and Time by astronomical observations.
CO4	Do the setting out works for route surveying.
CO5	Initiate the knowledge in Hydrographic and Mine surveying.

TEXTBOOKS:

1. J. Uren and W.F. Price, Surveying for Engineers, Palgrave macmillan, Fifth Edition, 2010.
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi,17th Edition,2016.

REFERENCES:

1. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001
2. W. Schofield and M. Breach, Elesevier, Engineering Surveying, Sixth Edition, 2007.
3. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
4. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
5. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice‘ Hall of India 2004
6. K.R. Arora, Surveying Vol I & II, Standard Book house , Eleventh Edition. 2013
7. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 24th Reprint,2015.

CO – PO Mapping – Surveying II

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	3	3	1	1	3
PO2	Problem Analysis	2	3	2	2	3	2
PO3	Design / development of Solutions	1	2	1	2	2	2
PO4	Investigations	1	1	1	2	2	1
PO5	Usage of Modern Technology	2	2	3	3	3	3
PO6	Individual and Team work	2	2	1	3	2	2
PO7	Communication	1	1	1	3	1	1
PO8	Engineer and Society	2	2	1	2	2	2
PO9	Ethics	1	1	1	1	1	1
PO10	Environment and Sustainability	1	2	2	1	1	1

PO11	Project Management and Finance	1	2	2	2	2	2
PO12	Life Long Learning	1	1	2	2	2	2
PSO1	Knowledge of Geoinformatics discipline	1	1	2	2	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	2	1	2	1	1

GI5411 SURVEYING LABORATORY II L T P C
0 0 4 2

OBJECTIVE:

- To familiarize with the various surveying instruments and methods.

EXERCISES

1. Study of Theodolite and Angle Observations by Repetition (study of various components, their functions, temporary adjustments, observation of horizontal angle, vertical angle, different observation principles and care of instruments) — 4
2. Observation of Angles and Station Adjustment (observations horizontal and vertical angles to defined objects by method of reiteration, calculation of closing error and error adjustment) — 4
3. Determination of Coordinates of Inaccessible Point(s) (calculation of x,y,z coordinates of inaccessible point using single plane method with bearing observations by compass, known/assumed station coordinates) — 4
4. Computation of Area of a Triangle with one inaccessible point and Reduced Level of Inaccessible point using Double Plane Method (formation of triangle with one inaccessible point and two ground station) — 4
5. Computation of Filling Volume for a Triangular Land using Tangential Tacheometry (calculation of length, height difference of points and computation of filling volume between triangular plane and horizontal plane) — 4
6. Preparation of Planimetric Map using Stadia Tacheometry (determination of distances using stadia tacheometry of selected points and preparation of planimetric map) — 4
7. Establishment of Baseline (establishment of new baseline using angle measurements to existing baseline) — 4
8. Establishment of Horizontal Control Points by Traversing (calculation of planimetric coordinates of control points using reference station coordinates, magnetic bearing after adjustment using Gales Traverse Table) — 4
9. Mapping of Topographic Features including a complete building using control points (using control points established, various topographic features are to be mapped)
10. Preparation of Contour Map (measurement of level along radial lines using vertical angles and interpolation of contour) — 4
11. Estimation of Sun Rise/ Sun Set using Sun Observations and understanding of Nautical Almanac (observation of sun elevation and plotting best fit curve for sun's motion to estimate sun rise/ sun set) — 4

12. Computation of Coordinates of selected stations using True Bearing of Reference Line (calculation of azimuth of reference line by extra-meridian observations and computation of coordinates for selected stations using distance, angle measurements) 4
13. Determination of Magnetic Declination at a Station using True Bearing from Hour Angle Method (comparison of magnetic and true bearing of line determined using Hour Angle Method) 4
14. Setting out simple road curve by linear method (Degree of Curve : 1 - 20 degrees) 4
15. Setting out simple Railway curve by Instrument method (Degree of Curve : 1 – 5 degrees) 4

TOTAL : 60 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts knowledge in computation of Distance and Elevation using horizontal and vertical angles.
CO2	Establish horizontal and vertical control points.
CO3	Prepare a map using various mapping techniques.
CO4	Determine the Azimuth by Astronomical observation.
CO5	Do the setting out works.

REFERENCES:

1. J. Uren and W.F. Price, Surveying for Engineers, Palgrave macmillan, Fifth Edition, 2010.
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi,17th Edition,2016.
3. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001
4. W. Schofield and M. Breach, Elesevier, Engineering Surveying, Sixth Edition, 2007.
5. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
6. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
7. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice‘ Hall of India 2004
8. K.R. Arora, Surveying Vol I & II, Standard Book house , Eleventh Edition. 2013
9. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 24th Reprint,2015.

CO – PO Mapping – SURVEYING LABORATORY II

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	2	1	2	1	1
PO2	Problem Analysis	1	2	1	2	1	1
PO3	Design / development of Solutions	1	1	2	2	2	2
PO4	Investigations	1	1	1	1	1	1
PO5	Usage of Modern Technology	2	3	3	2	2	3
PO6	Individual and Team work	2	3	3	2	2	2
PO7	Communication	1	1	1	1	2	1
PO8	Engineer and Society	1	2	2	2	1	2
PO9	Ethics	1	1	1	1	1	1
PO10	Environment and Sustainability	1	1	1	1	1	1
PO11	Project Management and Finance	1	2	2	2	L	2
PO12	Life Long Learning	1	1	2	1	1	1

PSO1	Knowledge of Geoinformatics discipline	2	2	2	2	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	1	2	1	3	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	1	2	1	2	1

GI5412 CARTOGRAPHY AND GIS LABORATORY L T P C
0 0 2 1

OBJECTIVES :

- Hands on experience of basics of cartography and GIS.
- Designing the map
- Development of GIS database and populating attributes data

EXERCISES:

1. Simple conical, cylindrical and planner projection for a reduced earth (2 to 4cm reduced earth) – aspect and secant demo.
2. Graded symbolization and isopleth / choropleth map
3. Map compilation and Design
4. Data Input – Onscreen Digitisation – Creation of Point, Line and Polygon layers
5. Projection, Reprojection and Coordinate Transformation of Maps
6. Attribute data input and Measurement of Distance, Area
7. Linking External Database and Tabular Data Analysis using SQL commands
8. Generating Graphs, Charts and Diagrams from Tabular data
9. Data Conversion – Vector to Raster and Raster to Vector
10. Map Joining, Edge Matching and Layout Design

TOTAL: 30 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	To understand the concepts of Projection.
CO2	To input the data in the computer and prepare the Map Layout Design process.
CO3	To study the different types of projection properties by comparing the Distance, Area parameters and Attribute Data Input.
CO4	To add Non- Spatial data from External Database and Analyze the data using SQL commands.
CO5	To convert the Vector to Raster Data and vice versa and Edge Matching process.

REFERENCES:

1. Arthur, H. Robinson et al, Elements of Cartography, 7th Edition, John Wiley and Sons, 2004.
2. C.P. Lo Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Publishers, 2nd Edition,2006.

CO – PO Mapping – CARTOGRAPHY AND GIS LABORATORY

PO / PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	1	2	2	1	2
PO2	Problem Analysis	1	1	1	1	3	1
PO3	Design / Development of Solutions	1	2	2	2	2	2
PO4	Investigations		1	1	1	1	1
PO5	Usage of Modern Technology	1	2	2	2	3	2
PO6	Individual and Team Work						
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics discipline						
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations						
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.						

GI5501 SPATIAL DATA ADJUSTMENT L T P C
3 0 0 3

OBJECTIVE:

- To impart skills in computational adjustment for Geomatics problems

UNIT I MEASUREMENT AND ERROR 9

Concepts of measurement and Error - Types of errors - Elementary concepts in probability - Reliability of measurement - significant figures - Error Propagation - linearization - Multivariate distribution - Error ellipse- Weights of an observation - Stochastic model and Functional model.

UNIT II LEAST SQUARES ADJUSTMENT 9

Introduction - simple adjustment methods - Least squares method - Examples of least squares Problems – Techniques of least squares- concept of weight - least squares adjustment of indirect Observations - least squared adjustment of observations only.

UNIT III VARIANCE COVARIANCE PROPAGATION 9

Random events and probability - Random variables - continuous probability distributions – normal distribution - Expectation - measures of precision and accuracy - covariance and correlation - covariance, cofactor and weight matrices - Introduction to sampling - Derivation of the propagation laws - Examples - stepwise propagation.

UNIT IV PRE ANALYSIS OF SURVEY MEASUREMENTS 9

Pre analysis procedure- Horizontal angle measurement, Distance measurement and elevation difference – Survey tolerances – Database creation using GIS: Modeling- Map layout.

UNIT V GEODETIC COMPUTATIONS 9

Rectangular and Polar Co - ordinates - First and Second geodetic problem – Similarity andHelmert's transformation- methods of point determinations – problems on intersection, resection, arc section and also with over determinations, polar method and its extension.

TEXTBOOKS:

1. Mikhail, E.M. and Gracie G., Analysis and adjustment of Survey measurements, Van Nostrand Reinhold, New York, 2005
2. Paul.R.Wolf and Charles. D.Ghilani, Adjustment Computations -Statistics and least squares in surveying and GIS, John Wiley and sons inc.,6th Edition,2017.

REFERENCES:

1. P.J.G.Teunissen, Adjustment theory an introduction, VSSD. 2006.
2. OSCAR S.ADAMS, GEODESY:Application of the Theory of Least Squares to The Adjustment of Triangulation, Japnese Edition,Nabu Press, 2012.
3. Brinker Russell C Minnick Roy, The Surveying Hand Book, Volume-II,Springer,2nd Edition,1995.
4. Edward L. Ingram, Geodetic Surveying and the adjustment of observations(Method of Least Squares),Forgotten Books,2018.
5. Dr.B.C. Punmia,Ashok K.Jain and Arun K.Jain, Surveying Vol-III,Laxmi Publications Pvt Ltd.,17th Revised Edition,2005.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts concepts of error, error distribution and error adjustment procedures.
CO2	Understand the procedure involved in error adjustment using least square adjustment.
CO3	Convey an idea about the quality of infinite size data by Variance and Covariance.
CO4	Choose the suitable accuracy of instruments for their projects by pre analysis technique.
CO5	Create database by collecting quality data sets.

CO – PO Mapping – SPATIAL DATA ADJUSTMENT

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	3	3	2	1	2
PO2	Problem Analysis	3	3	3	2	1	3
PO3	Design / development of Solutions	3	2	2	2	2	2
PO4	Investigations						
PO5	Usage of Modern Technology	2	2	2	2	3	2
PO6	Individual and Team work	1	2	3	2	2	2
PO7	Communication						
PO8	Engineer and Society	1	2	2	1	1	1
PO9	Ethics	1	1	1	1	1	1
PO10	Environment and Sustainability	1	1	1	1	1	1
PO11	Project Management and Finance	1	2	2	3	2	2
PO12	Life Long Learning	2	L	2	L	2	2
PSO1	Knowledge of Geoinformatics discipline	2	2	3	2	2	2

PSO1	Critical analysis of Geoinformatics Engineering problems and innovations	2	3	3	3	2	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	3	1	2	1	2

GI5502 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVE

- To make the undergraduate Engineering Students understand the concepts, principles, processing of Satellite data in order to extract useful information from them.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Information Systems - Encoding and decoding - acquisition, storage and retrieval –data products - satellite data formats - Digital Image Processing Systems - Hardware and software design consideration Scanner, digitizer - photo write systems.

UNIT II SENSORS MODEL AND PRE PROCESSING 9

Image Fundamentals – Sensor models – spectral response – Spatial response – IFOV,GIFOV& GSI – Simplified Sensor Models – Sampling & quantization concepts – Image Representation& geometry and Radiometry – Colour concepts – Sources of Image degradation and Correction procedures- Atmospheric, Radiometric, Geometric Corrections- Image Geometry Restoration- Interpolation methods and resampling techniques.

UNIT III IMAGE ENHANCEMENT 9

Image Characteristics - Histograms - Scattergrams – Univariate and multi variate statistics- enhancement in spatial domain – global, local & colour Transformations – PC analysis, edge detections, merging - filters - convolution – LPF, HPF , HBF, directional box, cascade – Morphological and adaptive filters – Zero crossing filters – scale space transforms – power spectrum – texture analysis – frequency transformations - Fourier, wavelet and curvelet transformations.

UNIT IV IMAGE CLASSIFICATION 9

Spectral discrimination - pattern recognition concepts - Baye‘s approach - Signature and training sets – Separability test –Supervised Classification – Minimum distance to mean, Parallelepiped, MLC – Unsupervised classifiers – ISODATA,K-means-Support Vector Machine - Segmentation (Spatial, Spectral) – Tree classifiers - Accuracy assessment – Error matrix – Kappa statistics – ERGAS, RMS.

UNIT V ADVANCED CLASSIFIERS 9

Fuzzy set classification – sub- pixel classifier – hybrid classifiers, Texture based classification – Object based classifiers - Artificial Neural nets - Hebbian leaning - Expert system, types and examples - Knowledge systems.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand about Remote sensing and Image processing systems
CO2	Acquire knowledge about the source of error in satellite image and also to remove the error from satellite image.
CO3	Select appropriate image Enhancement techniques based on image characteristics

CO4	Classify the satellite image using various method and also evaluate the accuracy of classification.
CO5	Apply the advanced image classification methods and conduct lifelong research in the field of image processing.

TEXTBOOKS :

1. John, R. Jensen, Introductory Digital Image Processing, Prentice Hall, New Jersey, 4th Edition,2015.
2. Robert, A. Schowengergt, Techniques for Image Processing and classification in Remote Sensing,Academic Press, 2012.

REFERENCES:

1. Robert, G. Reeves,- Manual of Remote Sensing Vol. I & II - American Society of Photogrammetry, Falls, Church, USA, 1983.
2. Richards, Remote sensing digital Image Analysis - An Introduction 5th Edition ,2012, Springer -Verlag 1993.
3. Digital Image Processing by Rafael C. Gonzalez,Richard Eugene Woods- Pearson/ Prentice Hall,2008
4. Fundamentals of Digital Image Processing by Annadurai Pearson Education (2006)
5. Digital Image Processing: PIKS Scientific Inside by William K. Pratt 4th Edition,Wiley Interscience,2007.

CO – PO Mapping – DIGITAL IMAGE PROCESSING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	3	3	3	3	3
PO2	Problem analysis		1	2	3	3	3
PO3	Design / development of solutions		1	2	3	3	3
PO4	Investigations		3	3	3	3	3
PO5	Usage of Modern Technology	2	2	3	2	3	3
PO6	Individual and Team work				2		2
PO7	Communication				2	2	2
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	2	2	1	2	3	2
PSO1	Knowledge of Geoinformatics discipline	1	2	2	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	2	2	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	2	3	3	3	3

GI5551 TOTAL STATION AND GPS SURVEYING L T P C
3 0 0 3

OBJECTIVE :

- To understand the working of Total Station and GPS and solve the surveying problems.

UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES 9

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies

UNIT II DISTANCE AND ATMOSPHERIC CORRECTION 9

Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient conditions-Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Second velocity correction -Total atmospheric correction- Use of temperature and pressure transducers.

UNIT III ELECTRO OPTICAL AND MICRO WAVE SYSTEM 9

Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments – Traversing and Trilateration-COGO functions, offsets and stake out-land survey applications.

UNIT IV GPS SATELLITE SYSTEM 9

Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler‘s Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept –GNSS, IRNSS and GAGAN - Different segments - space, control and user segments - satellite configuration – GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT V GPS DATA PROCESSING 9

GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing – software modules -solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Learn the fundamentals of Total station.
CO2	Provides knowledge about electromagnetic waves and its usage in Total station and GPS.
CO3	Understand the measuring and working principle of electro optical and Microwave Total station and GPS
CO4	Learn the basic concepts of GPS
CO5	Gains knowledge about Total station and GPS data downloading and processing

TEXTBOOKS:

1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition,1996.
2. Satheesh Gopi, rasathishkumar, N.madhu, — Advanced Surveying , Total Station GPS and Remote Sensing — Pearson education , 2nd Edition,2017. isbn: 978-81317 00679

REFERENCES :

1. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin,3rd Edition,2016.
4. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 4th Edition, 2015.
5. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin,2nd Edition,2003

CO – PO Mapping – TOTAL STATION AND GPS SURVEYING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3		2	2	3
PO2	Problem analysis			3		3	3
PO3	Design / development of solutions			3		3	3
PO4	Investigations			1		1	1
PO5	Usage of Modern Technology			3		3	3
PO6	Individual and Team work						
PO7	Communication						
PO8	Engineer and Society			3		3	3
PO9	Ethics			3		3	3
PO10	Environment and Sustainability						
PO11	Project Management and Finance		2			2	2
PO12	Life Long Learning			3		3	3
PSO1	Knowledge of Geoinformatics discipline	3				3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations					3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.					3	3

GI5511 DIGITAL IMAGE PROCESSING LABORATORY L T P C
0 0 4 2

OBJECTIVE :

- To familiarize the undergraduate level students in the regular Image Processing Software with respect to basic processing required to generate thematic maps from Satellite data.

1. Image reading, writing and creating FCC
2. Study of image file formats and organization
3. Preprocessing techniques : radiometric correction
4. Preprocessing techniques : Ground control and Geometric rectification
5. Enhancenments – histogram, Convolution filters
6. Band ratioing and normalization – NDVI,SAVI & NDWI
7. PCA and Fourier Transform
8. Image fusion
9. Classification – supervised & unsupervised
10. Accuracy assessment – correlation, RMSE & kappa

11. Knowledge based classification
12. Classification using Artificial Neural Network
13. Sub pixel classification
14. Noise removal, Vectorisation, & map compilation

TOTAL : 60 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand about basic operations on the satellite image for better display of the image
CO2	Perform removal of unwanted information from the image and also improve the visual interpretability of the image.
CO3	Apply mathematical transform for the enhancement
CO4	Understand various classification method and also to assess accuracy of classification
CO5	Understand and use advanced and Intelligent classification methods life long to meet the requirement of technology development.

REFERENCES:

1. Richards, Remote sensing digital Image Analysis - An Introduction , 5th Edition 2012 Springer -Verlag .
2. Robert, G. Reeves,- Manual of Remote Sensing Vol. I & II - American Society of Photogrammetry, Falls, Church, USA, 1983.
3. Richards, Remote sensing digital Image Analysis - An Introduction 5th Edition ,2012, Springer -Verlag 1993.
4. Digital Image Processing by Rafael C. Gonzalez,Richard Eugene Woods- Pearson/ Prentice Hall,2008
5. Fundamentals of Digital Image Processing by Annadurai Pearson Education (2006)

CO – PO Mapping – DIGITAL IMAGE PROCESSING LABORATORY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	3	3	3	3	3
PO2	Problem analysis		2	3	3	3	3
PO3	Design / development of solutions		2	3	3	3	3
PO4	Investigations			2	3	2	3
PO5	Usage of Modern Technology	2	2	2	2	3	3
PO6	Individual and Team work				2	2	2
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	2	2	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline						
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations		1	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.			1	3	3	3

GI5512 TOTAL STATION AND GPS SURVEYING LABORATORY L T P C
0 0 2 1

OBJECTIVE :

- To train the students to acquire skill in making precise measurements and obtaining accurate results with Total Station and GPS.

EXERCISES:

1. Study of Total Station
2. Distance and Coordinate Measurement
3. Missing Line Measurement
4. Remote Elevation Measurement
5. Resection
6. Setting out : Point and Line
7. Taking Offsets
8. Area Measurement
9. Total Station Traversing
10. Study of Hand held GPS
11. Study of Geodetic GPS
12. Static and semi kinematics survey
13. Differential Positioning
14. Precise Positioning
15. GPS Traversing

TOTAL : 30 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1 Gives basic idea about Total station and GPS
CO2 Acquire knowledge about electromagnetic waves and its usage in Total station.
CO3 Getting idea about working principle of electro optical and Microwave Total station
CO4 Understand the working of GPS
CO5 Understand the Geometry of the earth, Gravity and its relationship with nature

REFERENCE:

1. Satheesh Gopi, rasathishkumar, N.madhu, — Advanced Surveying , Total Station GPS and Remote Sensing — Pearson education , 2nd Edition,2017. isbn: 978-81317 00679.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition,1996.
3. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
4. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
5. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin,3rd Edition,2016.
6. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 4th Edition, 2015.
7. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 2nd Edition,2003.

CO – PO Mapping – TOTAL STATION AND GPS SURVEYING LABORATORY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	2	2		3
PO2	Problem Analysis		3	3			3
PO3	Design / development of Solutions		3	3		3	3
PO4	Investigations	1	1	1	1	1	1
PO5	Usage of Modern Technology			3		3	3
PO6	Individual and Team work						
PO7	Communication			3		3	3

PO8	Engineer and Society			3		3	3
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	3	3	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline	3				3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations					3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.					3	3

GI5513 **SUMMER INTERNSHIP (2 WEEKS)** **LT P C**
0 0 0 1

OBJECTIVES:

- To train the Geoinformatics Students for the Industry so that the Students shall gain confidence in handling Practical Problems in Geoinformatics Engineering Task.
- To gain skills in the related training institute both by observation and acquiring Practical work experience.

STRATEGY:

a) The Student individually contact the organizations involved in Geoinformatics Activities with the help of the Coordinator for fixing the training period andType of Training.
b) The Students shall be evaluate donthe basis of1) Dairy2)TrainingReport3)Viva-Voce Examination. The evaluation committee consists of(1)Coordinator and (2)Expert Member
c) The Student maintain the day wisework diary while undergoing the training and get it endorsed by the supervising officer : it shall be submitted for evaluation

THE REPORT:

a) TheStudentpreparesthedocumentfortheindividualtrainingfollowingtheprinciplesof documentationstandardswithnecessaryflowcharts,diagrams,photographsand other details as the case may be.These documents will be partial fulfillment of the evaluation.
b) The Student shall enclose a certificate duly signed from the Supervising Officer of the Place ofTraining and Coordinating Faculty
c) The Viva-Voce Examination shall be part of evaluation

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Train the Students for the Industry so that the Students shall gain confidence in handling Practical Problems in Geoinformatics Engineering Task.
CO2	Gain skills in the related training institute both by observation and acquiring Practical work experience.
CO3	Inculcate leadership qualities.
CO4	Capable of solving the real world problems.
CO5	Imparts the human relationship.

CO – PO Mapping – SUMMER INTERNSHIP (2 WEEKS)

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3		3		3
PO2	Problem Analysis	2	2		2		2
PO3	Design / development of Solutions	2	2		2		2
PO4	Investigations						
PO5	Usage of Modern Technology	3	3		3		3
PO6	Individual and Team work	2	2	2	2	2	2
PO7	Communication	2	2	2	2	2	2
PO8	Engineer and Society	2	2	2	2	2	2
PO9	Ethics	2	2	2	2	2	2
PO10	Environment and Sustainability	2	2		2		2
PO11	Project Management and Finance	2	2		2		2
PO12	Life Long Learning	3	3		3		3
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	3	3		3		3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	3	3		3		3

GI5601 SPATIAL ANALYSIS AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVE:

- To provide exposure to Raster, Vector, Network and Geo-statistical Analysis Capabilities of GIS.

UNIT I RASTER ANALYSIS 9

Raster Data Exploration: Query Analysis - Local operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay operations-–Neighbourhood operations: Aggregation, Filtering – Extended Neighbourhood operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

UNIT II VECTOR ANALYSIS 9

Non-topological analysis: Attribute database query, Structured Query Language, Co-ordinate transformation, Summary Statistics, Calculation of Area, Perimeter and distance – Topological Analysis: Reclassification, Aggregation, Overlay analysis: Point-in-polygon, Line-in-Polygon, Polygon-on-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

UNIT III NETWORK ANALYSIS 9

Network – Introduction - Network Data Model – Elements of Network - Building a Network database - Geocoding – Address Matching - Shortest Path in a Network – Time and Distance Based shortest path analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis.

UNIT IV SURFACE AND GEOSTATISTICAL ANALYSIS 9

Surface Data – Sources of X,Y, Z data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

UNIT V CUSTOMISATION, WEB GIS, MOBILE MAPPING 9

Customisation of GIS: Need, Uses, Scripting Languages –Embedded scripts – Use of Python script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web applications- Location Based Services: emergency and business solutions - Big data analytics.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Analyse Raster Data using various GIS Operations
CO2	Process Vector Data using SQL and other analysis tools
CO3	Understand Network data Model and its applications
CO4	perform Surface and Geostatistical analysis functions on spatial data
CO5	Understand basics of scripting, WebGIS and LBS

TEXTBOOKS:

1. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Pearson, 2nd Edition,2016.
2. Ian Heywood, Sarah Cornelius, Steve Carver, An Introduction to Geographical Information Systems, Pearson,4th Edition,2012.

REFERENCES:

1. Michael N. DeMers, Fundamentals of geographic information systems, Wiley, 4th Edition,2012
2. Kang – tsung Chang, Introduction to Geographical Information System, Tata McGraw Hill,9th Edition,2019
3. John Peter Wilson, The handbook of geographic information science, Blackwell Pub.,2008.
4. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, Geographic Information Science and Systems, John Wiley & Sons Inc, 2015, ISBN- 978111867695.

CO – PO Mapping – SPATIAL ANALYSIS AND APPLICATIONS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences			2	2	1	2
PO2	Problem Analysis	3	3				3
PO3	Design / development of Solutions				2		2
PO4	Investigations	3	3				3
PO5	Usage of Modern Technology	3		2		2	2
PO6	Individual and Team work						
PO7	Communication		1			2	1
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning			2		3	2
PSO1	Knowledge of Geoinformatics discipline	2	2	2	3	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	2	2	1	2	1	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2	2	3	1	1	2

GI5602 **SOFT COMPUTING TECHNIQUES** **L T P C**
3 0 0 3

OBJECTIVE :

- The objective of the course is to make the students to understand the concepts of Artificial Neural Network, Fuzzy logic and Genetic algorithms and also their application in Geomatics.

UNIT I SOFT COMPUTING AND ARTIFICIAL NEURAL NETWORKS 9

Soft Computing : Introduction - soft computing vs. hard computing - soft computing techniques - applications of soft computing - ANN : Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebbian learning rule/Delta rule, ADALINE, MADALINE and BPN.

UNIT II FUZZY SYSTEMS 9

Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp and fuzzy relations - introduction and features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making.

UNIT III NEURO-FUZZY MODELLING 9

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT IV GENETIC ALGORITHM 9

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional method

UNIT V APPLICATIONS OF SOFT COMPUTING IN GEOMATICS 9

image registration - Object recognition - Automated feature extraction - navigation – Integration of soft computing and GIS for flood forecasting and monitoring, Landslide susceptibility, Highway alignment, smart city planning, agriculture, solid waste disposal

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understanding the necessity of soft computing techniques and fundamentals of Artificial Neural Networks
CO2	Imparts the concepts of uncertainty and its impacts on artificial intelligence
CO3	Helps to realize the merits of hybrid computing techniques
CO4	Introduces the concepts of heuristic search methods and optimization of solutions
CO5	Gain knowledge on utility of soft computing on multidisciplinary problems

TEXTBOOKS:

1. Freeman J.A. and Skapura B.M., "Neural Networks, Algorithms Applications and Programming Techniques", Pearson , 2002.
2. Jang J.S.R.,Sun C.T and Mizutami E - Neuro Fuzzy and Soft computing ,Prentice hall New Jersey, Pearson, 2015.

REFERENCES:

1. Introduction to Artificial Neural Systems by Jacek.M Zurada, Jaico Publishing House,2004.
2. Timothy J.Ross:Fuzzy Logic Engineering Applications, 4th Edition, 2016, McGraw Hill,NewYork,1997.
3. Laurene Fauseett: Fundamentals of Neural Networks, Pearson 2004, Prentice Hall India, New Delhi,1994.
4. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall Inc., New Jersey,1995
5. Nih.J. Ndssen Artificial Intelligence, Harcourt Asia Ltd., Singapore,1998

CO – PO Mapping – SOFT COMPUTING TECHNIQUES

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	2	1	3
PO2	Problem analysis	3	2	2		3	3
PO3	Design / development of solutions	2		2		3	
PO4	Investigations		3	3		3	3
PO5	Usage of Modern Technology	3	3	3	3	1	3
PO6	Individual and Team work			2	2	3	2
PO7	Communication	2	2	2	2	3	2
PO8	Engineer and Society	2	2	2	2	3	3
PO9	Ethics					2	2
PO10	Environment and Sustainability					2	2
PO11	Project Management and Finance	3	2	2		2	2
PO12	Life Long Learning	2	2	2	2		2
PSO1	Knowledge of Geoinformatics discipline	L	L	L	2	3	
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3		3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.			3		3	3

GE5251 ENVIRONMENTAL SCIENCES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land 47 degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

- To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.
- To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
- To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.
- To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers (2018).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2016).
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).

REFERENCE BOOKS:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005).
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. (2013).

GI5611 SPATIAL ANALYSIS AND APPLICATIONS LABORATORY L T P C
0 0 4 2

OBJECTIVE

- To experience the students in various Spatial and Network analysis of Spatial Data and develop problem-solving skills using GIS

EXERCISES:

1. Raster Analysis

- Data exploration-statistics & query analysis
- Map algebra, Reclassification, arithmetic & logical overlay
- Focal and zonal operations
- Distance and shortest path analysis

2. Vector Analysis

- Attribute analysis & Data extraction
- Overlay and Cost weighted overlay
- Proximity – Buffer analysis

3. Network Analysis

- Network Conflation, Geocoding
- Short route analysis
- Service area, Closest facility analysis

4. Surface Analysis

- Slope and Aspect calculation
- Interpolation techniques
- 13.Viewshed analysis & Watershed Delineation

5. Customization

- Scripting/ embedded scripts
- Batch Processing and WebGIS demo

TOTAL: 60 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Use Raster Data Analysis Tools in GIS software
CO2	Apply Vector Analysis tools for extraction of data and spatial relationships
CO3	Generate solutions for network problems using shortest route analysis, Service Area Analysis
CO4	Create thematic Maps using Surface data
CO5	Write simple script for automation of operations in GIS

REFERENCES:

1. Michael N. DeMers, Fundamentals of geographic information systems, Wiley, 2009
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Pearson, 2nd Edition, 2016.
3. Ian Heywood, Sarah Cornelius, Steve Carver, An Introduction to Geographical Information Systems, Pearson,4th Edition,2012.
4. Michael N. DeMers, Fundamentals of geographic information systems, Wiley, 4th Edition,2012
5. Kang – tsung Chang, Introduction to Geographical Information System, Tata McGraw Hill,9th Edition,2019
6. John Peter Wilson, The handbook of geographic information science, Blackwell Pub.,2008.
7. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, Geographic Information Science and Systems, John Wiley & Sons Inc, 2015, ISBN- 978111867695.

CO – PO Mapping – SPATIAL ANALYSIS AND APPLICATIONS LABORATORY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	1		1		1
PO2	Problem Analysis	3					3
PO3	Design / development of Solutions	3	3	3		2	3
PO4	Investigations		1				1
PO5	Usage of Modern Technology	3	3		2	3	2
PO6	Individual and Team work	1	1				1
PO7	Communication				3	1	1
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability			1			1
PO11	Project Management and Finance					2	2
PO12	Life Long Learning					3	3
PSO1	Knowledge of Geoinformatics discipline	3	3	2	2	1	3

PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	2	2	2	2	1	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	3	3	3	2	1	3

GI5612 **SURVEY CAMP** **L T P C**
0 0 0 2

Two weeks Survey Camp will be conducted in the following activities at CSTAR training site in the following activities during first two weeks from the commencement of the semester.

OBJECTIVE:
- To provide practical knowledge for implementation of different survey works.

EXERCISES
1. Preparation of Topographic Map using Total Station Survey
- Reconnaissance Survey for selection of Control Framework, Observation Stations
- Establishment of Horizontal Control Network using Total Station (Traversing, Triangulation and Trilateration methods)
- Establishment of Vertical Control Network using Level Net
- Adjustment of Weighted Observations (using least square method)
- Measurement of Coordinates (X,Y and Z) of Features using Total Station
- Preparation of Topographic Map using CAD software

2. Updation of Existing Topographic Map/ Satellite Image using GNSS
- Downloading of Satellite Image or Topographic Map
- Development Control Network using GNSS (leaf-frog/trilateration static method)
- Georeferencing of Satellite Image/ Topographic Map
- Updation of New topographic features using GNSS (radial fast-static/ semi-kinematic method)
- Preparation of Updated Topographic Map (using symbols, legend etc.)

OUTCOMES:
- On completion of the course, the student is expected to be able to

CO1	Familiar with advanced survey instruments like Auto Level, Total Station and GNSS.
CO2	Apply modern surveying techniques in field to establish horizontal control using Total Station and GNSS equipment.
CO3	Understand the surveying techniques in field to establish vertical control network using Auto Level.
CO4	Exposed to different survey adjustment techniques.
CO5	Familiarized in mapping process.

CO – PO Mapping – SURVEY CAMP

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	1	3	3	1	2
PO2	Problem Analysis	1	1	2	3	1	1

PO3	Design / development of Solutions	1	1	2	2	2	2
PO4	Investigations	1	1	1	3	2	1
PO5	Usage of Modern Technology	3	3	3	2	3	3
PO6	Individual and Team work	3	3	3	2	2	2
PO7	Communication	1	1	1	1	1	1
PO8	Engineer and Society	1	1	2	1	1	1
PO9	Ethics	1	2	2	2	L	2
PO10	Environment and Sustainability	1	1	1	3	1	1
PO11	Project Management and Finance	1	3	1	1	1	1
PO12	Life Long Learning	3	1	2	1	2	2
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	3	3	3	1	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	1	2	2	2	2

GI5701 DECISION SUPPORT SYSTEM FOR RESOURCE MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:

- To impart the knowledge of Expert Systems, fuzzy logic and operation research techniques for Geoinformatics Engineering.

UNIT I STRUCTURE OF EXPERT SYSTEMS 9

Definition – Features, needs, components – characteristics – players - Structure and phases of building ES – Human vs Artificial Expertise, Conventional programming vs Expert system-Types – Rule based, Frame based & Hybrid – Activities - Design, Planning, monitoring, Controlling-Expert system - examples in geomatics.

UNIT II RULE BASED EXPERT SYSTEMS 9

Levels and sources of Knowledge-Knowledge Engineering - process - Knowledge Acquisition Methods- RGA analysis - Machine learning – Validation, Representation schemes, Rule, Semantic network, frames and logic – Types of Reasoning deductive, inductive, adductive, analogical and non-monotonic – Rule based Expert system - Evolution – Architecture - conflict resolution - types of inference: forward and backward chaining - search techniques– Examples in geomatics

UNIT III INEXACT REASONING 9

Bayesian theory, examples – Certainty theory: overview, uncertain evidence, rule inferencing - certainty factors – Fuzzy sets – Representation, hedges inference & fuzzy logic – Classification of RS data using Fuzzy logic.

UNIT IV OPERATION RESEARCH 9

Origin - Nature and significance - Models and Modeling – Applications and Scope – Linear programming - Problem formulation – structure and assumptions - standard form – Graphical solution – solution by simplex method – Sensitivity Analysis - Duality – Formulations of Dual problem – Geoinformatics problems & solutions- use of AHP.

UNIT V NETWORK AND INVENTORY MODELS 9

Shortest route - minimal spanning tree - maximum flow models - project network- CPM and PERT network-critical path scheduling - Types of Inventory- The classical EOQ model -Deterministic inventory problems - Price breaks - Stochastic inventory problems- selective inventory control techniques

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Acquire knowledge about structure of Expert system and its difference with conventional programming
CO2	Understand and develop Rule based expert system for geomatic problems.
CO3	Handle the inexact real world problems to get the solution.
CO4	Integrate Operation research and geomatic tools to design a Hybrid model to solve real world problems
CO5	Plan, control and Monitor the activities of the project properly for effective implementation.

TEXTBOOKS:

1. Peter Jackson, —Introduction to Expert systems||, Pearson Education, 1999.
2. Turban E., —Expert Systems and Applied Artificial Intelligence||, Macmillan, 2004.'

REFERENCES:

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

CO – PO Mapping – DECISION SUPPORT SYSTEM FOR RESOURCE MANAGEMENT

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences		1	2	3	2	2
PO2	Problem Analysis	1	3	3	3	2	3
PO3	Design / development of Solutions		1	2	3	3	3
PO4	Investigations			2	3	3	3
PO5	Use of Modern Technology	1	3	2	2	2	2
PO6	Individual and Team work		2	2	3	3	3
PO7	Communication			1	2		2
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability		2	3	3	2	3
PO11	Project Management and Finance	3		2	3	3	3
PO12	Life Long Learning	3	3	2	3	3	3
PSO1	Knowledge of Geoinformatics discipline	2			2		2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations		2	2	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		1	3	3	2	2

GI5702 GEOSPATIAL ANALYSIS WITH R PROGRAMMING L T P C
3 0 0 3

OBJECTIVES

- To expose the variables, expressions, control stations of R
- To use R Programming for Analysis of data and visualize outcome inform of graphs, charts
- To analysis data using various statistical tools like correlation and regression

UNIT I INTRODUCTION TO R 9

Introduction, History and overview of R, elements and data structures, Sessions and Functions, Variables, Data Types, Vectors, Scalars, Conclusion, Data Frames, Lists, Matrices, Arrays, Classes, Data input/output, Data storage formats, Subsetting objects, Vectorization

UNIT II PROGRAMMING IN R 9

R Programming, Arithmetic and Boolean Operators and values, Structures, Control Statements, Loops, Pointers in R, Recursion, Scoping Rules, Loop functions, Array and Matrices

UNIT III DATA MANIPULATION 9

Math and Simulation in R, Functions, Math Function, Probability Calculation - Cumulative Sums and Products- Minima and Maxima- Data sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation

UNIT IV DATA VISUALISATION AND PROBABILITY DISTRIBUTION 9

Graphics, Creating Graphs, Customizing Graphs, lattice library- Visualization, Box plot, Histogram, Pareto charts, Pie graph, Line chart, Scatterplot, Developing graphs, Probability Distributions: Normal, Binomial, Poisson and Other Distributions

UNIT V STATISTICAL DATA ANALYSIS 9

Basic Statistics, Outlier, regression Analysis: Linear, Multiple, Logistic, Poisson, Survival Analysis, Nonlinear Models: Splines, Decision Tree, Random Forests, Support Vector Machine, Clustering, Correlation, Covariance, Statistical simulation, T-Tests

TOTAL: 45 PERIODS

TEXT BOOKS:-

1. Norman Matloff, The Art of R Programming, Cengage Learning, ISBN: 9781593273842, No Starch Press, US-Publisher,2017
2. Larry Pace, Joshua Wiley, Beginning R -An Introduction to Statistical Programming, 2nd Edition, Apress, ISBN: 9781484203743, 2015

REFERENCES

1. Mark Gardener, Beginning R -The Statistical Programming Language, John Wiley & Sons, Inc., ISBN: 9781118164303, 2012.
2. Chris Brunsdon, Lex Comber, An Introduction to R for Spatial Analysis and Mapping, 2nd RevisedEdition, Sage Publications Ltd (UK), ISBN: 9781446272954, 2019
3. Jared P. Lander, R for Everyone Advanced Analytics and Graphics, 2nd Edition, Addison-Wesley Professional PTG, ISBN: 9780134546926, 2017
4. Hamid Reza Pourghasemi, Spatial Modeling in GIS and R for Earth and Environmental Sciences, Elsevier (S&T), ISBN: 9780128152263, 2019
5. Michael J. Crawley, The R Book, 2nd Edition, Wiley-Blackwell, ISBN: 9780470973929, 2012

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	State the capabilities of R and its data, variable types
CO2	Describe various operators, control statements and scoping rules in R
CO3	Apply R programming for manipulation of datasets
CO4	Produce various graphs and distribution plots using R
CO5	Analyse dataset using Statistical Tools available in R

CO – PO Mapping – GEOSPATIAL ANALYSIS WITH R PROGRAMMING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	1				1
PO2	Problem Analysis			3	2	3	3
PO3	Design / development of Solutions					2	2
PO4	Investigations		1			2	2
PO5	Usage of Modern Technology		3	2		3	3
PO6	Individual and Team work						
PO7	Communication				2		2
PO8	Engineer and Society					1	1
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance			1		L	1
PO12	Life Long Learning		2				2
PSO1	Knowledge of Geoinformatics discipline	1				1	1
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			2		2	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		2			1	1

GI5703 MATLAB PROGRAMMING AND APPLICATIONS L T P C
3 0 2 4

UNIT I INTRODUCTION TO MATLAB PROGRAMMING, APPROXIMATIONS AND ERRORS 9+6

Basics of MATLAB programming - Array operations in MATLAB - Loops and execution control - vector operation: Creation, dot product, work with vectors: create, topology, union and intersection, reselection, buffering, generate suitability map - Working with files:Scripts and Functions - Plotting and program output - Defining errors and precision in numerical methods - Truncation and round-off errors-Error propagation, Global and local truncation errors

UNIT II DIFFERENTIATION AND INTEGRATION 9+6

Numerical Differentiation in single variable - Numerical differentiation: Higher derivatives-Differentiation in multiple variables - Newton-Cotes integration formulae - Multi-step application of Trapezoidal rule - MATLAB functions for integration - Introduction to ODEs; Implicit and explicit Euler's methods - Second-Order Runge-Kutta Methods - MATLAB ode45 algorithm in single variable - Higher order Runge-Kutta methods - Error analysis of Runge-Kutta method

UNIT III LINEAR AND NON LINEAR EQUATIONS 9+6

Linear algebra in MATLAB - Gauss Elimination - LU decomposition and partial pivoting - Iterative methods: Gauss Siedel - Special Matrices: Tri-diagonal matrix algorithm - Nonlinear equations in single variable - MATLAB function fzero in single variable - Fixed-point iteration in single variable - Newton-Raphson in single variable - MATLAB function fsolve in single and multiple variables - Newton-Raphson in multiple variables

UNIT IV ALGEBRA AND TRANFORMS 9+6

Solving quadratic equation, factorization, calculus: exploring limits, use of octaves, Differential: solving DE, maxima and minima, exponential, logarithmic and trigonometric derivatives, Integral: finding indefinite and definite integral, Transform: Laplace and inverse Laplace transform , Fourier and inverse Fourier transform, working with lessons: derive slopemap, create watershed, find landslide vulnerability

UNIT V DATA VISUALIZATION AND MODELLING 9+6

Graph elements; color, theme, type, title and lable, drawing multiple functions, generating sub plots, drawing bar chart, contour, 3D plots, move elements, trace movement, work with plotting: regression analysis and presentation, contour map from DEM- Geospatial tool box implementation.

TOTAL: 75 PERIODS

OUTCOMES:

- On completion of the course, the student isexpected to be able to

CO1	To enable the student to understand basic MatLab functions
CO2	To enable to solve mathematical problems related to differentiation and integration
CO3	To enable to solve problems related to Liner and Non Linear equations to correct the same to geospatial algorithms
CO4	To enable to solve transformations of geospatial problems
CO5	To make to develop skills in geospatial tool box and map making

TEXTBOOKS:

1. Holly Moore, " MATLAB for Engineers" Third Edition – Pearson Publications
2. Stephen J. Chapman, "MATLAB Programming for Engineers" Fourth Edition –Thomson learning**.**

REFERENCES:

1. Fausett L.V.(2007) Applied NumericalAnalysis Using MATLAB, 2nd Ed.,Pearson Education.
2. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004
3. Hahn B., and D. Valentine, 2013. Essential Matlab for Engineers and Scientists: 5th Edition, Academic Press.
4. Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers, by Rudra Pratap,OUP USA,2005.
5. Programming and Engineering Computing with MATLAB 2018 by Huei-Huang Lee , SDC Publications, 2018.

CO – PO Mapping – MATLAB PROGRAMMING AND APPLICATIONS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences		3	3			3
PO2	Problem Analysis		3	3	2		3
PO3	Design / development of solutions		2			3	3
PO4	Investigations	3					3
PO5	Usage of Modern Technology			1		3	3
PO6	Individual and Team work		2			3	3
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability					2	2
PO11	Project Management and Finance	3	2		3		3

PO12	Life Long Learning	2		1		3	3
PSO1	Knowledge of Geoinformatics discipline		2		3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations		2	1		3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		2	1		3	3

GI5711 CUSTOMIZATION LABORATORY L T P C
0 0 2 1

Basics of scripting Python, Open layers
- File Handling (reading/writing)
- GUI based application development

Spatial Data handling using the scripts
- Reading of shape file (Point, Line and Poly)
- Displaying shapefile
- Reading of PostGIS data

Displaying of PostGIS data
Changing layer symbology
Attribute handling
Simple Query and spatial Query builder
Simple Geoprocessing (Buffer and Overlay)
Reading WMS WFS data
Displaying WMS WFS data with symbology
Building small application having the above facilities
Statistical software interface using the scripts
- Linking to R-Stat to get statistical results

TOTAL: 30 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Learning scripting Languages
CO2	Understanding GIS Data Structure
CO3	Reading and Displaying data through Scripting
CO4	Developing Geo Processing Skills
CO5	Learning Web Services and Statistics.

REFERENCES:

1. https://pro.arcgis.com/en/pro-app/arcpy/get-started/what-is-arcpy-.htm
2. http://duspviz.mit.edu/tutorials/intro-postgis/
3. https://www.rstudio.com/online-learning/#r-programming
4. https://pro.arcgis.com/en/pro-app/

CO – PO Mapping – CUSTOMIZATION LABORATORY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences		3		2	3	3
PO2	Problem Analysis				3		3
PO3	Design / development of solutions		2	2	3	3	3
PO4	Investigations					3	3
PO5	Usage of Modern Technology				2	3	3
PO6	Individual and Team work	2	2	2	2	2	2
PO7	Communication				2	3	3
PO8	Engineer and Society			2	2	3	3
PO9	Ethics						
PO10	Environment and Sustainability	1	2	2		3	2
PO11	Project Management and Finance						
PO12	Life Long Learning	3	3	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline	3	3	3	2	2	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	3	3	3			3

GI5712 **PROJECT I** **L T P C**
0 0 6 3

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

SYLLABUS:

The student works on a topic relevant to Geoinformatics under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 90 PERIODS

OUTCOME:

At the end of the course, students are able to;

CO1	Identify civil engineering problems reviewing available literature.
CO2	Identify appropriate techniques to analyze complex civil engineering problems.
CO3	Apply engineering and management principles through efficient handling of project have a clear idea of his/her area of work and they are in a position to carry out the work in a systematic way.

CO – PO Mapping – PROJECT I

PO/PSO		Course Outcome			Overall Correlation of CO s to POs
		CO1	CO2	CO3	
PO1	Knowledge of Engineering Sciences	3	3	2	3
PO2	Problem analysis	1	3	2	2
PO3	Design / development of solutions	1	1	2	1
PO4	Investigation	3	3		3
PO5	Modern Tool Usage				
PO6	Individual and Team work	3	3	2	3
PO7	Communication	2		2	2
PO8	Engineer and Society	2		2	2
PO9	Ethics	2		2	2
PO10	Environment and Sustainability	1	1	1	1
PO11	Project Management and Finance	1	1	1	1
PO12	Life Long Learning	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline	3	3	1	3
PSO2	Critical analysis of Geoinformatics problems and innovation	3	3	1	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics issues	3	3	1	3

GI5811 **PROJECT II** **L T P C**
0 0 16 8

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

SYLLABUS:

The student works on a topic relevant to Geoinformatics under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 240 PERIODS

OUTCOME:

At the end of the course, students are able to;

CO1	Identify civil engineering problems reviewing available literature.
CO2	Identify appropriate techniques to analyze complex civil engineering problems.
CO3	Apply engineering and management principles through efficient handling of project have a clear idea of his/her area of work and they are in a position to carry out the work in a systematic way.

CO – PO Mapping – PROJECT II

PO/PSO		Course Outcome			Overall Correlation of CO s to POs
		CO1	CO2	CO3	
PO1	Knowledge of Engineering Sciences	3	3	2	3
PO2	Problem analysis	1	3	2	2
PO3	Design / development of solutions	1	L	2	2
PO4	Investigation	3	3		3
PO5	Modern Tool Usage				
PO6	Individual and Team work	3	3	2	3
PO7	Communication	2		2	2
PO8	Engineer and Society	2		2	2
PO9	Ethics	2		2	2
PO10	Environment and Sustainability	1	1	1	1
PO11	Project Management and Finance	1	1	1	1
PO12	Life Long Learning	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline	3	3	1	3
PSO2	Critical analysis of Geoinformatics problems and innovation	3	3	1	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics issues	H	H	L	H

GI5001 CLIMATE CHANGE STUDIES L T P C
3 0 0 3

OBJECTIVES:

- To address the climate as dynamical systems is the main objective of the course.
- To focus both historical, archaeological and anthropogenic evidences of climatic change.
- Special emphasis is given for hazard assessment and climatic change models

UNIT I BASICS OF CLIMATIC CHANGE 9

Concepts of climatic cycles and long term changes – earth orbital variations – solar flares and outputs – magnetic and force fields – earth movements and energy release – ocean variability and periodic cycles –impacts of earthquakes and volcanoes.

UNIT II ANTHROPOGENIC IMPACTS 9

Anthropogenic impacts- agriculture and impacts - industries and pollutions – urbanization – vehicles, transport and fossil fuels - chemicals, synthetics, solid wastes and gas outputs – municipal wastes

UNIT III CHANGE ASSESSMENT 9

Historical evidences – archeological evidences – indicators of vegetation: species limits, pollens, tree rings and fossils – temperature and precipitation trends – evidences from terrain evaluation – ice and glacier changes – sea- level assessments – under water assessments – sediment analysis

UNIT IV CLIMATE CHANGE HAZARDS 9

Global warming and impacts – carbon gas build up – possible land use changes – land productivity and livelihood changes – forest fires and wild life – impacts on water bodies – floods and droughts – human health impacts-Change Management: Use of renewable energy– land use adaptation - planning disaster mitigation

UNIT V CLIMATE CHANGE MODELS 9

Climate change Models – RCM –GCM-Ozone depletion – greenhouse gas carbon-sequestration-IPCC and Indian scenario.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the basic concepts of climate and climate change.
CO2	Understand the natural and human impacts on climate change.
CO3	Understand the various methods to assess the evidence for climate change
CO4	Understanding the climate change effects like Global warming, impacts on Agriculture, water body, health and their adaptations.
CO5	Understand the climate models to predict the climate and adaptation techniques for future.

TEXTBOOKS:

1. William James Burroughs , Climate change : A multi disciplinary Approach,2nd Edition,2007
2. Jane Mc Adam ,|| Climate change and Displacement Multi disciplinary Perspectines||2010

REFERENCES:

1. Richard Somerville'|| the forgiving Air: understanding Environmental change, 2nd revised Edition,2008.
2. Heidi cullen, The weather of the future; heat waves, extreme storms, and other scenes from a climate changed planet, Reprint Edition,2011.
3. Stephen H Schneider, —Science as a contact sport inside the battle to save earth's climate,National Geographic,1st Edition, 2009
4. James Hoggan Climate cover up; the crusade to Deny global warming,1st Edition,2009.
5. PK Joshi, TP Singh, Geoinformatics for climate change studies, TERI Press, 2011.
6. John.L.Brooke, Climate Change and the course of global History, A Rough Journey, Cambridge University Press,2014.

CO – PO Mapping – CLIMATE CHANGE STUDIES

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	1	3	3	2	2
PO2	Problem Analysis	1	1	3	3	3	3
PO3	Design / development of Solutions	1	2		3	3	3
PO4	Investigations		3	3	3	1	3
PO5	Usage of Modern Technology		3	1	3	3	3
PO6	Individual and Team work		2	3	3	2	2
PO7	Communication						
PO8	Engineer and Society	3					3
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	3	3	3	3		3
PSO1	Knowledge of Geoinformatics discipline						

PSO2	Critical analysis of Geoinformatics Engineering problems and innovations						
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.						

GI5002 BIG DATA ANALYTICS LT P C
3 0 0 3

OBJECTIVES

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

UNIT I INTRODUCTION TO BIG DATA 9

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

UNIT II CLUSTERING AND CLASSIFICATION 9

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes‘ Theorem - Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY 9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 9

NoSQL Databases : Schema-less Models||: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

TOTAL: 45 PERIODS

OUTCOMES:

CO1	To introduce the characteristics, value, perception, storage, High performance architectures of Big Data.
CO2	To provide the methods of clustering and classification algorithms.
CO3	To explain the Association and methods of Recommendation systems.
CO4	To give the information about Graph memory, stream memory analytics computing techniques.
CO5	To exemplify the NoSQL Data management for Big Data and Visualization process.

TEXTBOOKS:

1. Anand Rajaraman and Jeffrey David Ullman, "Mir,iina of Massive Datasets", Cambridge . University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.

REFERENCES:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

CO – PO Mapping – BIG DATA ANALYTICS

PO / PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	1	1	2	1	2
PO2	Problem Analysis	1	2	2	1	2	1
PO3	Design / Development of Solutions	1	2	1	2	1	2
PO4	Investigation	1	2	1	2	2	2
PO5	Modern Tool Usage	1	2	1	2	2	2
PO6	Individual and Team Work						
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics Discipline						
PSO2	Geoinformatics Performance Evaluation and Coordination						
PSO3	Conceptualizaton of Geoinformatics Systems						

GI5003 **URBAN GEOINFORMATICS** **L T P C**
3 0 0 3

OBJECTIVES:

- To expose students the relevance of Geoinformatics to Urban Planning and Management
- To introduce the latest developments in Remote Sensing methods useful for Urban Planning and Management
- To impart knowledge on possible applications of Geoinformatics for Urban planning and Management

UNIT I INTRODUCTION **9**

Remote Sensing – Developments - Relevance inUrban Planning - Scope and Limitations –Scale and Resolution requirements – Spectral characteristics of Urban Features– High Resolution, Thermal, Hyperspectral and Microwave Remote Sensing for Urban Analysis – Stereo Data Products – Aerial and Ground based Sensors – UAVs – Laser Scanners

UNIT II REMOTE SENSING FOR URBAN MAPPING **9**

Urban Area Definition and Characterization–Base Map Preparation – Urban Landuse Classification – Visual and Digital Techniques for Landuse Mapping - Urban Structure and Patterns– Urban LandCover Classification –Feature Extraction techniques –Change Detection – Sprawl Detection and Characterization - Mapping of Urban Morphology - Urban Heat Island –Building Typology

UNIT III GEOINFORMATICS FOR URBAN PLANNING **9**

UrbanInformation System– Master and Detailed Development Plans - Objectives and Contents of Plans – Role of Geoinformatics in Plan Formulation and Review - PopulationEstimation– Property Tax Assessment and Management - Urban Solid Waste Management Planning –Urban Renewal Planning – Utility Network Planning and Management – case studies

UNIT IV GEOINFORMATICS FOR URBAN ANALYSIS **9**

Geodemographic Analysis – Land Value Analysis -Optimisation of Facility Locations - Site suitability Analysis for Infrastructure – Optimal Route Analysis - Accident Analysis –Road Alignment Planning - Traffic and Parking Studies - case studies.

UNIT V VISUALIZATION, SIMULATION AND MODELING OF URBAN AREAS **9**

Urban Growth Modelling - Air quality indexing and mapping - Noise pollution modelling - 3D City Modelling –Flood Modeling in Urban Areas - Geoinformatics for Smart Cities –Recent Advancements - Case Studies

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course, the student is expected to be able to

CO1	Understand the relevance, scope and limitations of Remote Sensing in Urban Applications
CO2	Apply Remote Sensing for Mapping of Urban Elements and Processes
CO3	Develop Plans for Urban Management using Geoinformatics Tools
CO4	Analyse and Plan Urban Infrastructure and Facilities
CO5	Model Urban Growth, Air and Noise Pollution, Flooding through Geomatics tools

TEXTBOOKS:

1. Netzband, Maik; Stefanov, William L.; Redman, Charles (Eds.), Applied Remote Sensing for Urban Planning, Governance and Sustainability, Springer, 1st Edition, 2007
2. Rashed, Tarek; Jürgens, Carsten (Eds.), Remote Sensing of Urban and Suburban Areas, Springer, 1st Edition. 2010

REFERENCES:

1. Jean-Paul Donnay, Michael John Barnsley, Remote sensing and urban analysis, 1st Edition, Taylor & Francis e-Library, 2005
2. QihaoWeng, Dale A. Quattrochi (Eds), Urban Remote Sensing, 2nd edition, CRC Press, 2018
3. Soergel, Uwe (Eds.), Radar Remote Sensing of Urban Areas, Remote Sensing and Digital Image Processing, Vol. 15, 1st Edition, Springer, 2010
4. BasudebBhatta, Analysis of Urban Growth and Sprawl from Remote Sensing Data, 1st Edition, Springer-Verlag, 2010
5. Paolo Gamba, Martin Herold, Global Mapping of Human Settlement, Experiences, datasets & Prospects, CRC Press, 1st Edition, 2009,ISBN 978-1-4200-8339-2.

CO – PO Mapping – URBAN GEOINFORMATICS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3		2			3
PO2	Problem Analysis	1				1	1
PO3	Design / development of Solutions		3			3	3
PO4	Investigations		1	2	3		3
PO5	Usage of Modern Technology						
PO6	Individual and Team work						
PO7	Communication			1			1
PO8	Engineer and Society		1	2	2	2	2
PO9	Ethics	1					1
PO10	Environment and Sustainability			2		3	3
PO11	Project Management and Finance		1		2		2
PO12	Life Long Learning			1	2	2	2
PSO1	Knowledge of Geoinformatics discipline	2	L	1		1	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	2	2	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.			2	3	2	2

GI5004 HYDROLOGY AND WATER RESOURCES ENIGINEERING FOR GEOINFORMATICS

L T P C
3 0 0 3

OBJECTIVE :

- To impart knowledge in various applications of hydrology and water resources using Geomatic technology.

UNIT I HYDROLOGIC COMPONENTS 9

Hydrologiccycle-estimationofvariouscomponents–clouds-rainfall–runoff–evaporation –transpiration–evapo-transpiration–interception–depressionstorage-Spectralproperties of water.

UNIT II SURFACE WATER MODELLING 9

Drainage basin – Delineation and codification of watershed - Morphometric analysis – Hydrological Modelling – Rainfall – runoff modelling – USDA-SCS-CN Method – Urban Hydrology – LiDAR Mapping for Urban area – Impact of Climate change on Hydrological modeling - Water quality mapping and monitoring – Correlation model for pollution detection.

UNIT III RISKAND DAMAGEASSESSMENT 9

Mapping of snow covered area– Snow melt runoff– glacier runoff modelling– flood forecasting – Flood Risk Zoning - Flood damage assessment– Flood Modelling- Early warning system for floodmitigation–drought–types–assessmentofdroughtsandmitigation-waterharvesting structures

UNIT IV GROUND WATER MODELLING 9

Origin–classificationandpropertiesofaquifer–groundwaterpotentialidentification–surface indicators – aquifer parameters – hydrologic budgeting – different types of ground water models–mathematicalmodellingofgroundwatersystem-seawaterintrusion–interfacing GIS with ground water model - artificial recharge of ground water.

UNIT V IRRIGATIONAND WATERSHED MANAGEMENT 9

Project investigation, implementation, maintenance stage – location of storage/diversion works – capacity curve generation – hydro-economic conjunctive use model – impact of climate and land use change on drainage basin – sediment yield - modelling of reservoir siltation – prioritization of watersheds – watershed modelling for sustainable development.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1 Understand the challenges faced by the scientific community in the management of water in the past as well as present situation in the face of ever changing climate and socioeconomic condition.

CO2 Develop knowledge on the previously used scientific methods and environment development with particular reference to the environment status and scope of geospatial technology to address the WRM issues.

CO3 Comprehend the current research trends and the remote sensing data sources, products and tools that are of value along with their limitation so as to find solutions to the issue of various phenomena and domain of WRM.

CO4 Analyze the complicated and multi source and layered problems of water resources management with state of the art, tools and techniques for sustained livelihood.

CO5 Apply the knowledge in the conceptualization of extraction and implementation of the Geospatial based solutions sets and to interpret them with tools from ancillary sources for dependable policy making.

TEXT BOOKS

1. Gert A. Schultz, Edwin T. Engman, Remote Sensing in Hydrology and Water Management, Springer Berlin Heidelberg -2011.
2. S. K. Gupta, Modern Hydrology and Sustainable Water Development, John Wiley & Sons – 2010.
3. K. Ramamohan Reddy, B. Venkateswara Rao, C. Sarala, HYDROLOGY AND WATERSHED MANAGEMENT, Allied Publishers – 2014.

REFERENCES:

1. Andrew Skidmore, Environmental Modelling with GIS and Remote Sensing, CRC Press– 2017
2. Dorota Swiatek, Stefan Ignar, Modelling of Hydrological Processes in the Narew Catchment, Springer Berlin Heidelberg - 2013

3. Tim Davie, FUNDAMENTALS OF HYDROLOGY Second edition, Taylor & Francis -2018
4. Prof. Dawei Han, Concise Hydrology, Createspace Independent Pub - 2010
5. 5.L. Asawa, Irrigation and Water Resources Engineering, New Age International–2008.

CO – PO Mapping – HYDROLOGY AND WATER RESOURCES ENIGINEERING FOR GEOINFORMATICS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	2	3	3	3	3
PO2	Problem analysis	1	2	2	3	3	3
PO3	Design / development of solutions	1	1	2	2	3	3
PO4	Investigations	1	1	2	3	3	3
PO5	Usage of Modern Technology	1	1	3	3	3	3
PO6	Individual and Team work	2	2	1	1	2	2
PO7	Communication	2	2	2	2	3	2
PO8	Engineer and Society	1	1	2	2	3	3
PO9	Ethics	3	3	3	3	3	3
PO10	Environment and Sustainability	2	2	2	2	3	3
PO11	Project Management and Finance	1	1	2	3	3	2
PO12	Life Long Learning	3	3	2	3	3	3
PSO1	Knowledge of Geoinformatics discipline	1	1	3	2	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	1	2	2	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	L	L	L	3	3	3

GI5005 TRANSPORTATION GEOINFORMATICS L T P C
3 0 0 3

OBJECTIVES :

- To understand various highway geometric elements and surveys carried out for highway alignment
- To understand the factors involved urban transportation planning
- To expose the potential applications of remote sensing in transportation
- To expose the potential applications of GIS in transportation
- To impart knowledge on latest developments in transportation planning

UNIT I ENGINEERING SURVEYS AND GEOMETRIC DESIGN 9

Road ways and railways – development - necessity for planning – classification of roadsand railways – Alignment surveys and investigations using conventional and remote sensing techniques (preliminary, reconnaissance and final location surveys) – Design principles of highway geometric elements

UNIT II URBAN TRANSPORTATION SYSTEMS AND PLANNING 9

Urban transportation: policy alternatives - Transportation and the environment -Urban transport planning processes - Socio-demographic data and travel surveys - Transportation modeling - Traffic congestion - Plan evaluation and implementation - Planning and financing –Critiques of transportation modeling and forecasting

UNIT III REMOTE SENSING IN TRANSPORTATION 9

Study of geographic pattern of urban development using remote sensing data products - urban sprawl – parking studies using aerial photos – traffic analysis - accident analysis - site suitability analysis for transport infrastructure – population distribution studies - improvisation of rural road network – regional road network connectivity - vehicle tracking
– incident identification and management.

UNIT IV GIS AND TRANSPORTATION ANALYSIS 9

Transportation analysis in GIS: Introduction - network flows - shortest path algorithms -Transportation databases: creation and maintenance - facility location - vehicle routing – highway and railway alignment –highway maintenance

UNIT V MODELLING AND INTELLIGENT TRANSPORTATION SYSTEMS (ITS) 9

Modelling land use transport interaction - ITS development –architecture –integration with GIS - applications – case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	understand various highway geometric elements and surveys carried out for highway alignment
CO2	understand the factors involved urban transportation planning
CO3	apply remote sensing technique for transportation problems
CO4	apply GIS for transportation analysis
CO5	gain knowledge on latest developments in transportation planning

TEXTBOOKS:

1. Harvey J. Miller, Shih-Lung Shah, Geographic Information Systems for Transportation – Principles and Applications, Oxford University Press, 2001.
2. John Stillwell, Graham Clarke, Applied GIS and Spatial Analysis, John Wiley & Sons Ltd, 2004.

REFERENCES:

1. C.S. Papacostas, P.D. Prevedouros, Transportation Engineering and Planning, Prentice-Hall India,2005.
2. Barry Boots, Atsuyuki Okabe and Richard Thomas, Modelling Geographical Systems – Statistical and computational applications, Kluwer Academic Publishers, 2014.
3. L.R.Kadiyali, Transportation Engineering, Khanna Book publishing Co (P) Ltd, New Delhi, 2016
4. C.Jotin Khisty and B.Kent Lall, Transportation Engineering-An Introduction, Prentice Hall of India Private Limited, New Delhi, 2002
5. Igor Ivan, Itzhak Benenson, Bin Jiang, Jiri Horak and James Haworth, Geoinformatics for Intelligent transportation System, Springer International Publishing AG, 2014

CO – PO Mapping – TRANSPORTATION GEOINFORMATICS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3		1	2		2
PO2	Problem analysis				3		3
PO3	Design / development of solutions	1			3	3	3
PO4	Investigations	3			1		2
PO5	Usage of Modern Technology	2		3	3		3
PO6	Individual and Team work					2	2
PO7	Communication			3	3	3	3
PO8	Engineer and Society	2				2	2

PO9	Ethics		1				1
PO10	Environment and Sustainability	2	1			2	2
PO11	Project Management and Finance		2				2
PO12	Life Long Learning					3	3
PSO1	Knowledge of Geoinformatics discipline			3	3		3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	3		3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.			3	3	3	3

GI5006 ENVIRONMENTAL GEOINFORMATICS L T P C
3 0 0 3

OBJECTIVE:

- The objective of this course is to expose the students to the applications of Remote Sensing and GIS for water quality assessment, soil degradation assessment and monitoring pollution.

UNIT I WATER AND THE ENVIRONMENT 9

Sources and demands of water - Characteristics of water- Point and non-point sources of water pollution - Spectral responses of clear and contaminated water - chlorophyll- Remote Sensing of Water quality assessment - Classification of water quality for various purposes, Sampling procedure, quality analysis, Data base creation and quality modeling using GIS. Database Creation and designing water supply network, sewerage network using GIS. Runoff estimation flood prediction modeling.

UNIT II SOIL CONSERVATION AND MANAGEMENT 9

Formation of Soils- classification - land forms- soil erosion-factors influencing soil erosion, soil contamination- distribution and accumulation of contaminants such as toxic metals, synthetic chemicals in soil- mining pollution- methods of conservation - EMR responses with contaminated soil - modeling soil characteristics using satellite data-soil degradation assessment using Remote Sensing and GIS- Land reclamation.

UNIT III SOILID WASTE AND MANAGEMENT 9

Solid Waste management- sources and types of solid waste – waste generation rate- factors affecting waste generation- elements of solid waste management – storage- collection of solid waste- Design of collection network using GIS – disposal – site selection studies for solid waste using RS and GIS

UNIT IV AIR POLLUTION 9

Air Pollutants- classification of air pollution – sources of air pollution – sampling and analysis of air pollution - Dispersion modeling , photochemical modeling , receptor modeling – limitations in dispersion modeling - Introduction to commonly used software based models such as AERMOD, CALPUFF, ISCST3 and CALINE4 etc. - case studies

UNIT V SENSORS AND DATA FOR ENVIRONMENTAL MONITORING 9

Sensors for environmental monitoring - sensors - LIDAR- LASER Remote Sensing - EMR – absorption spectrometers - selection of ground truth sites-sea truth observation - Radar techniques for sensing ocean surface - thermal measurements- application of remote sensing for oil slicks mapping - Chlorophyll detection - Fisheries resources - Coastal marine studies - determination of temperature and sea state.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Impart knowledge about the basis of water quality testing and sampling of water and RS for water quality.
CO2	To develop skills to study about the soil characteristics with its sampling and testing of soil.
CO3	Gives idea about the characteristics of SW, collection of SW and GIS for SW collection.
CO4	Develops Knowledge about air Pollution, sampling and Prediction.
CO5	Gives idea about available sensors and platforms for Environmental Monitoring.

TEXTBOOKS:

1. Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc,3rd Edition , Vol 4, April 2004.
2. Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, Second edition, Chapman and Hall, New York, 2013

REFERENCES:

1. Lintz, J.and Simonent, D.S.Remote sensing of environment Addision Wesley, Rading mars, 1976.
2. Modelling Environmental Dynamics: Advances in Geomatic Solutions) by Martin Paegelow and María Teresa Camacho Olmedo, Springer,2008.
3. Monitoring and Modeling of Global Changes: A Geomatics Perspective (Springer Remote Sensing/Photogrammetry)" by Jonathan Li and Xiaojun Yang,2015.
4. Robert Scally, "GIS for Environmental Management", ESRI Press, 2006.
5. Andrew Skidmore, Environmental Modelling with GIS and Remote Sensing, CRC Press), 2017

CO – PO Mapping – ENVIRONMENTAL GEOINFORMATICS

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2	2	2	2	2
PO2	Problem analysis	2		3	3		3
PO3	Design / development of solutions	1		3	3		3
PO4	Investigation		2	2	2		2
PO5	Usage of Modern Technology	2	3			3	3
PO6	Individual and Team work	2	2	2	2		2
PO7	Communication		3	3	3		3
PO8	Engineer and Society	3	3	3	3		3
PO9	Ethics	2	2	1	1		2
PO10	Environment and Sustainability	3	3	3	3		3
PO11	Project Management and Finance	2	2	2	2	3	2
PO12	Life Long Learning	3	3	3	3	3	3
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	3	3	3	3	3	3

GI5007 AIRBORNE AND TERRESTRIAL LASER MAPPING L T P C
3 0 0 3

OBJECTIVE:

- To introduce the concepts of Space Borne, Air Borne, Terrestrial and Bathymetric LASER Scanners for Topographic and Bathymetric Mapping

UNIT I SPACE BORNE RADAR AND LIDAR ALTIMETER 9

Principle and Properties of LASER- Production of Laser – Components of LASER – LiDAR – Types of LiDAR :Range Finder, DIAL and Doppler LiDAR - Platforms: Terrestrial, Airborne and Space borne LiDAR – Space Borne LiDAR Missions – Space Borne Radar Altimeter for mapping Sea Surface Topography , Moon Topography - Merits of ALS in comparison to Levelling, echo sounding, GPS leveling, Photogrammetry and Interferometry

UNIT II AIRBORNE LASER SCANNERS 9

Airborne Topographic Laser Scanner – Ranging Principle – Pulse Laser and Continuous Wave Laser – First Return and Last Return – Ellipsoidal and Geoidal Height - Typical parameters of a Airborne Laser Scanner (ALS) – Specifications of Commercial ALS –- Components of ALS - GPS, IMU, LASER Scanner, Imaging Device, Hardware and Software.

UNIT III DATA ACQUISITION AND PRE PROCESSING 9

Various Scanning Mechanism – Synchronization of GPS, IMU and ALS Data - Reflectivity of terrain objects – Laser Classification – Class I to Class IV Laser – Eye Safety - Flight Planning – Determination of various data acquisition parameters – Swath Width, Point Density, No. of Strips, Area Covered, Point Spacing - Data Processing – Determination of flight trajectory

UNIT IV POST PROCESSING AND APPLICATIONS 9

Post Processing – Geo location of Laser Foot Prints – Various Co-ordinate Transformations involved - Filtering - Ground Point filtering – Digital Surface Model and Digital Elevation Model - LIDAR data formats – Post Processing Software - Overview of LIDAR Applications in various domains - 3D city models – Corridor Mapping Applications – Forestry Applications.

UNIT V TERRESTRIAL AND BATHYMETRIC LASER SCANNERS 9

Terrestrial Laser Scanners (TLS) – Working Principle – *Static TLS – Dynamic TLS – Vehicle Mounted TLS* -– Commercial TLS Specifications – Bathymetric Laser Scanners (BLS) – Working Principle of BLS – Depth of Penetration of BLS – Applications of TLS and BLS

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the components of laser and various platforms of laser scanning
CO2	Summarize the components of Airborne Laser Scanner and ranging principles
CO3	Analyse the flight planning parameters and preprocessing of acquired data
CO4	Post process the data to derive DSM and DEM and its applications
CO5	Understand the components of TLS and ABS and its applications

TEXTBOOKS:

1. Jie Shan and Charles K. Toth, Topographic Laser Ranging and Scanning – Principles and Processing,Second Edition, CRC Press, Taylor & Francis Group, 2018
2. Pinliang Dong, Qi Chen, LiDAR Remote Sensing and Applications**,** 1st Edition, CRC Press 2018

REFERNCES:

1. George Vosselman and Hans-Gerd Maas, Airborne and Terrestrial Laser Scanning, Whittles Publishing, 2010.
2. Matti Maltamo, Erik Næsset, Jari Vauhkonen, Forestry Applications of Airborne Laser Scanning-Concepts and Case Studies, Springer, Dordrecht , 2016,Reprint Edition. ISBN 978-94-017-8662-1

3. Michael Renslow, Manual of Airborne Topographic LiDAR, The American Society for Photogrammetry and Remote Sensing , 2013.
4. Zhilin Li, Qing Zhu, Chris Gold, Digital terrain modeling: principles and methodology, CRC Press, 2005
5 Roger Read and Ron Graham, Manual of Aerial Survey: Primary Data Acquisition, Whittles Publishing, 2002.

CO – PO Mapping – AIRBORNE AND TERRESTRIAL LASER MAPPING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	1	1	3	3
PO2	Problem analysis	1	1	3	3	2	2
PO3	Design / development of solutions			2	2	2	2
PO4	Investigations	1		1		1	1
PO5	Usage of Modern Technology			2	2	2	2
PO6	Individual and Team work						
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics discipline	2	2	2	2	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.			3	3	3	3

GI5008 ADVANCED GEO DATA ANALYSIS L T P C
3 0 0 3

OBJECTIVE:

- To provide exposure to Various Geospatial analysis tools available in GIS
- To introduce algorithms involved in analysis of geospatial data
- To expose variety of applications of geodata analysis for solving real world problems

UNIT I ANALYSIS OF SPATIAL DISTRIBUTIONS 9

Introduction spatial measurements and statistics - Geographic analysis with statistics Understanding spatial data distributions - Measuring geographic distributions - Finding the center - Measuring the compactness of the distribution - Measuring orientation and direction - Testing statistical significance – Case Studies

UNIT II ANALYSIS OF SPATIAL PATTERNS 9

Identifying spatial patterns - Statistical parameters to characterize patterns - Measuring the pattern of feature locations - Measuring the spatial pattern of feature values - Defining spatial neighborhoods and weights - Identifying clusters - Parameters for identification of clusters- Analysis of features clusters - clusters of similar values – Case Studies

UNIT III UNDERSTANDING SPATIAL AND TEMPORAL RELATIONSHIPS 9

Analyzing geographic relationships- statistics to analyze relationships- Identifying geographic relationships - Analyzing geographic processes – Mapping Change – Various measures for quantification of change – Time Series analysis – Track Maps -Case Studies

UNIT IV GIS MODELLING 9

Introduction – GIS Modelling Process - Suitability Analysis – Design of Boolean Suitability Model - Finding Suitable Locations by Selection, Overlay – Rating of Suitable Locations – Weighted Overlay, Fuzzy Overlay – Use of Artificial Intelligence – Case Studies.

UNIT V NETWORK MODELLING 9

Designing a Path Model – Modelling path in networks – Modelling overland path – Flow Modelling – Modelling accumulation over surface – Tracing Flow over Network – Designing Interaction Models – Allocation of Demand to facilities – Modelling Travel to facilities – Case Studies

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Characterise Spatial Distributions with Statistical Tools
CO2	Identify and Analyse Spatial Patterns
CO3	Understand the Relationship between spatial and temporal characteristics of various processes
CO4	Develop GIS based Models using various techniques
CO5	Model Networks and Flow in Networks using Network Analysis Tools

REFERENCES:

1. **Andy Mitchell (2001),** The ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns and Relationships, ESRI Press
2. **Andy Mitchell (2005),** The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics, ESRI Pres
3. **Andy Mitchell (2012),** T*he Esri Guide to GIS Analysis, Volume 3: Modeling Suitability, Movement, and Interaction,* ESRI Press.
4. **Christopher D.Lloyd, Spatial Data Analysis, Oxford University Press, 1st Edition, 2010, ISBN:** 978-0199596942.

CO – PO Mapping ADVANCED GEO DATA ANALYSIS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences						
PO2	Problem Analysis	3	3	3	3	3	3
PO3	Design / development of Solutions				3	3	3
PO4	Investigations	2	2				2
PO5	Usage of Modern Technology			3	2	2	2
PO6	Individual and Team work						
PO7	Communication	2					3
PO8	Engineer and Society				1	1	1
PO9	Ethics						
PO10	Environment and Sustainability				1		1
PO11	Project Management and Finance				2	2	2
PO12	Life Long Learning		1				1
PSO1	Knowledge of Geoinformatics discipline	2	2	2			2

PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2	2	1		3	2

GI5009 OCEANOGRAPHY AND COASTAL PROCESSES L T P C
3 0 0 3

OBJECTIVE:

- To familiarize the students about the basics and Geomatics applications in the field of Oceanography and coastal processes

UNIT I FUNDAMENTAL OCEANOGRAPY 9

Origin and Ocean basins – bottom topography - Physical properties of sea water – chemistry of sea water – Biological parameters –tectonic history-Ocean dynamics - Heat budget, Waves kinematics, Tides – coastal land forms.

UNIT II OCEAN CIRCULATIONS AND INSTRUMENTS 9

Air-Sea Interactions – Surface and Deep Sea Currents, Thermohaline and wind driven circulations, Ekman Transport and Geostrophic balance, ElNino and ENSO- Collection of water samples – Current measuring devices – deep sea coring devices – Hydrographic survey – Bathymetry – LiDAR and Sonar processing.

UNIT III OCEAN COLOR REMOTE SENSING 9

Ocean color radiometers – Radiative transfer theory - atmospheric correction -SST measurement - Cloud detection algorithms, single channel and McSST approach, Bayesian approach -Ocean primary productivity estimation–Bio-optical algorithms –- Coastal Land Use/ Landcover -– Ocean color Sensors & data products

UNIT IV COASTAL HAZARD REMOTE SENSING 9

Shoreline change mapping - Erosion and accretion estimation - Transect based and polygon based shoreline change analysis –Oil spill studies - Use of MSS and SAR images,statistical and Neural network approaches- Sea level rise - Sea surface variability from Altimeters and Scatterometers.

UNIT V DISASTER MANAGEMENT 9

Cyclones- Radars, Synthetic procedures, Dvorak Intensity and forecasting technique - Tsunami propagation and run up - Flood and storm surges –Total water level elevation measurement, HIROBM-BOOS model -mitigation strategies- Early warning systems.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the coastal processes and various physical, chemical and biological characteristics of sea water.
CO2	Gain knowledge on the methods and instruments of sea water sampling.
CO3	Helps to realize the applicability of visible remote sensing for ocean observation
CO4	Impart the knowledge about coastal dynamism and coastal hazards
CO5	Aware of various techniques for salvation and managerial skills on critical issues of ocean disasters.

TEXTBOOKS:

1. Vasilis D. Valavanis, GIS in oceanography & Fisheries, Taylor & Francis London & New York, 2002

2. Alasdair J.Edward, Remote Sensing Handbook for Tropical Coastal Management, UNESCO publishing, 2000.

REFERENCES :

1. Grant Gross,M., Oceangraphy, Merrill Publishing company, Columbus, U.S.A., 2002.
2. Karsten Manager, Shoreline Management Guidelines, DHI Water & Environment, Denmark, 2004.
3. Dean, R.G. and Dalrymple, R.A., Coastal Process with Engineering Application, Cambridge University press, Cambridge, 2004.
4. Paul D.Komar, Beach process and sedimentation. 2nd Edition , 1997,Prentice - Hall Inc., New Jersey.
5. Remote Sensing of the Changing Oceans, Dan Ling Tang, Gad Levy, Malcolm Heron, James Gower, Kristina B. Katsaros and Ramesh Singh, Springer;2011

CO – PO Mapping – OCEANOGRAPHY AND COASTAL PROCESSES

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	2	2			2
PO2	Problem analysis			3	3	3	3
PO3	Design / development of solutions				3	3	3
PO4	Investigation		3	3	3	2	3
PO5	Usage of Modern Technology			2	3	2	2
PO6	Individual and Team work		3			2	3
PO7	Communication	2	3			3	2
PO8	Engineer and Society				3	3	3
PO9	Ethics			2	3	3	3
PO10	Environment and Sustainability				3	3	2
PO11	Project Management and Finance				2	3	2
PO12	Life Long Learning		2	3		2	2
PSO1	Knowledge of Geoinformatics discipline			3	2	3	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.			3	2	2	2

GI5010 HEALTH GIS L T P C
3 0 0 3

OBJECTIVES:

- The course is on geospatial analysis methods in health and to the kinds of problems for which these methods are appropriate. The course is appropriate as an elective for those who may have no background in human sciences but who have fair knowledge in RS and GIS and interested in questions of the health of populations in geographic context.

UNIT I MAPPING DISEASE ECOLOGY 9

Disease types and causes — environmental and social factors — genetic and chronic aspects — gender and occupational bias — time and space factors in disease distribution — life cycle, statistical curves and modelling — hazards, disasters, accidents and health.

UNIT II SPATIAL DATABASES FOR PUBLIC HEALTH 9

Health Data – Birth data, Morbidity data, Disease Registries and Survey Data Health Care and Health Care Utilization Data – Health Care Provider and Health Care Facility – Geolocating Health Data and Data Security and Privacy Issues — historical records and reliability.

UNIT III DISEASE MAPPING 9

Spatial patterns of disease — mapping causal factors - endemic and epidemic zonation - tests for spatial clustering and fragmentation - applications of RS and GIS in disease mapping — deterministic stochastic and uncertainty models –Case Studies .

UNIT IV LOCATION AND ALLOCATION STRATEGIES 9

Location of health centres and service areas — P-median scenarios — Network analysis and services — emergency services and alternative locations - the allocation of health resources — allocation of service areas and optimality — services and marginal people - improving access to socioeconomic and geographical contexts.

UNIT V HEALTH AND WEB-GIS 9

Sharing disease data and web — ontology requirements and applications - open source service environments - methods of XML aid OGC services — web map context, services and processing (WMS. WMC and VVPS) — web service quality and SDI

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	To introduce the Disease types, Environmental social factors, statistical curves and Disease mapping modeling.
CO2	To provide the data about Health, Birth, morbidity, disease, Health care Facilities and Geolocating , Analyzing the Historical Records.
CO3	To map the spatial patterns of Disease , Factors using RS & GIS techniques and studying the Deterministic, Stochastic, Uncertainty models.
CO4	To give the location, allocation of Health centers, Service centers facilitates to improve access to Socio-economic contexts.
CO5	To utilize the WebGIS for sharing the Disease datas, Ontology applications and studying the WMS, WMC, WPS and WPS layers.

TEXTBOOKS :

1. Ellen K. Cromley, Sara L. McLafferty 2011 , GIS and Public Health, Second Edition, Guilford Press, ISBN 9781609187507 - CAT# Y124676, 2nd Edition
2. Massimo Craglia (Editor), Ravi Maheswaran (Editor) (2004) GIS in Public Health Practice, CRC Press, 1st Edition.

REFERENCES :

1. Anthony.C, Gatrell and Markku Loytonen, GIS & Health, Taylor & Francis, 1998, ISBN: 0-203-21281-9.
2. Omar Khan, GIS and Health Applications, Idea Group Publishing, 2003, ISBN: 1-5914-0-042-2.
3. Ricskinner, Gisp,GIS in Hospital and Health Care Emergency Management, CRC Press, 2010, ISBN- 13-978-1-4398-2131-2.
4. Juliana A. Mauntay, Sara Mchafferty, Geospatial Analysis of Environmental Health, Springer,2011, ISBN-978-94-007-0328-5.
5. Donald P. Albert, Spatial Analysis GIS and Remote Sensing Application in the Health Sciences, Taylor & Francis,2005, ISBN: 1-57504-101-4

CO – PO Mapping – HEALTH GIS

PO / PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	1	2	1	1	1
PO2	Problem Analysis	2	2	2	2	2	2
PO3	Design / Development of Solutions		1	1	2	3	1
PO4	Investigations	1		2	2	3	2
PO5	Usage of Modern Technology						
PO6	Individual and Team Work						
PO7	Communication						
PO8	Engineer and Society	1					1
PO9	Ethics						
PO10	Environment and Sustainability	1		1	1		1
PO11	Project Management and Finance			2	2		2
PO12	Life Long Learning	1	2		1		1
PSO1	Knowledge of Geoinformatics discipline	1	2		1		1
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	2	2	1		2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	2	1	2	1		2

GI5011 GIS BASED DISASTER PREPAREDNESS AND MITIGATION L T P C
3 0 0 3

COURSE OUTCOMES:

- To understand various types of disasters and infrastructural facilities available for managing disasters
- To understand disaster mitigation principles
- To gain knowledge about safety evaluation of essential social infrastructures
- To expose the applications of remote sensing in disaster management
- To explain the use of spatial science in four folds of disaster management

UNIT I INTRODUCTION TO DISASTERS 9

Disaster: Definition and Classification - Hydrological and geological disasters, characteristics crisis and consequences - Role of Government administration, University research organization and NGO's - International disaster assistance - Sharing technology and technical expertise.

UNIT II LONG TERM MITIGATION MEASURES 9

Needs and approach towards prevention - Principles and components of mitigation Disaster legislation and policy - Insurance - Cost effective analysis - Utilization of resources -Training - Education - Public awareness - Roles of media.

UNIT III SAFETY RATING OF STRUCTURES 9

Slope stability of Ghat roads -Structural safety of Dams, Bridges, Hospitals, Industrial structures, - Disaster resistant structures - Low cost housing for disaster prone areas - Cyclone shelter projects and their implications - Reconstruction after disasters: Issues of practices.

UNIT IV SPACE SCIENCE INPUT IN DISASTER MANAGEMENT 9

Remote sensing in Hazard evaluation - Zonation - Risk assessment - Damage assessment- Land use planning and regulation for sustainable development –Communication satellite application- Network- Use of Internet - Warning system - Post disaster review - Case studies.

UNIT V EMERGENCY PLANNING USING SPATIAL AND NON-SPATIAL DATA 9

Information systems management - Spatial and non-spatial data bank creation – Operational emergency management - Vulnerability analysis of infrastructure and settlements - Predisaster and post disaster planning for relief operations - Potential of GIS application in development planning - Disaster management plan - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	gain knowledge on various types of disasters and infrastructural facilities available for managing disasters
CO2	plan long term disaster mitigation measures
CO3	evaluate the safety of the various social structures
CO4	use remote sensing data products for disaster management
CO5	apply GIS concepts in disaster management

TEXTBOOKS:

1. J. P. Singhal (2010), Disaster Management, Laxmi Publications, ISBN-10:9380386427, ISBN-13:978-9380386423.
2. Tushar Bhattacharya (2012), Disaster Science and Management, McGraw Hill India Education Pvt Ltd., ISBN-10: 1259007367, ISBN-13:978-1259007361.

REFERENCES:

1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E &F.N SPON Routledge, London. 2012.
2. George G. Penelis and Andreas J. Kappos - Earthquake Resistant concrete Structures. E & F.N SPON, London, 2010.
3. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991.
4. Gupta Anil K, Sreeja S, Nair. 2013 Disaster Mangement and Risk reduction: Role of Environmental Knowledge, Narosa Publishing House, NIDM, New Delhi.
5. Kapur Anu ,Vulnerable India: A Geographical study of Disasters, IIAS and sage Publishers, New Delhi,2010.

CO – PO Mapping – GIS BASED DISASTER PREPAREDNESS AND MITIGATION

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2		2	3	2	2
PO2	Problem analysis	1		2		2	2
PO3	Design / development of solutions			3		2	2
PO4	Investigations			3			3
PO5	Usage of Modern Technology				3	3	3
PO6	Individual and Team work	3	3				3
PO7	Communication	3	3				3
PO8	Engineer and Society	3		3			3
PO9	Ethics	3	2				2

PO10	Environment and Sustainability	3		2	2		2
PO11	Project Management and Finance	2	2				2
PO12	Life Long Learning				3		3
PSO1	Knowledge of Geoinformatics discipline	3	3	3	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	2	1			2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		2		2		2

GI5012 PLANETARY REMOTE SENSING L T P C

3 0 0 3

OBJECTIVES :

- To provide an insight to the field of planetary science
- To enlighten the student on modern techniques available for remote sensing of planetary surfaces.

UNIT I UNIVERSE AND SOLAR SYSTEM 9

Origin of Universe - Big Bang and Steady state theories, Solar System - planets, satellites asteroids, meteorites and comets and internal differentiation of the planets- Planetary exploration mission and sensors

UNIT II TERRESTRIAL PLANETS 9

Geology and geophysics of terrestrial planets: earth, mars, venus and mercury; physical properties, composition, mineralogy and petrology of the planets and the Moon.

UNIT III PLANETARY ATMOSPHERE 9

Exo- and Endogenic processes associated with origin and internal evolution of planets – planetary volcanism, craters, elemental composition; mineralogy and petrology; thermal, seismic and magnetic properties

UNIT IV REMOTE SENSING FOR PLANETARY GEOLOGY 9

Approaches to Remote Sensing analysis of the planetary surfaces; applications derived from interaction of electromagnetic radiation (X-ray, gamma-ray, visible, near-IR, mid-IR, radar).

UNIT V PLANETARY EXPLORATION MISSIONS 9

Laser Altimetry and its application in Planetary science - Past, present and future missions **-** Analyses and Interpretation of data gathered through various missions: identification of morphological features.

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	To identify the components of Solar System and understand the payloads of related exploratory missions
CO2	To understand the mineralogy and petrology of terrestrial planets
CO3	To describe the exo –endogenic process of Planetary Atmosphere
CO4	To apply Remote Sensing Techniques for Planetary Surface Analysis
CO5	To describe the various past and present planetary missions

TEXTBOOKS:

1. Shuanggen Jin, Planetary Geodesy and Remote Sensing 1st Edition, CRC PRESS, 2014.
2. Bo Wu, Kaichang Di, Jürgen Oberst, Irina Karachevtseva, Planetary Remote Sensing and Mapping 1st Edition, CRC Press, 2018

REFERENCES:

1. Principles of Planetary Climate by Raymond T.Pierrehumbert, University of Chicago, Publication date: December 2011
2. Remote Sensing Apllications for Planetary Surfaces by Deepak Kumar, Lambert Academic Publishing,2014
3. Introduction to planetary remote sensing gamma ray spectroscopy, in Remote Geochemical Analysis: Elemental and Mineralogic Composition, C.M. Pieters and P.A.J. Englert, eds., Cambridge Univ. Press, pp. 167-198. Evans, L.G., R.C. Reedy, and J.I. Trombka, 1993
4. Remote Sensing for the Earth Sciences: Manual of Remote Sensing, Third Edition, Volume 3, pp. 509-564, A.N. Rencz, Editor, John Wiley & Sons, 1999.
5. Radar Remote Sensing of Planetary Surfaces Cambridge University Press 2011 by Bruce A. Campbell

CO – PO Mapping – PLANETARY REMOTE SENSING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	2		2	3
PO2	Problem analysis				2		2
PO3	Design / development of solutions				2		2
PO4	Investigations		2	2		2	2
PO5	Usage of Modern Technology		2	3	2	2	2
PO6	Individual and Team work						
PO7	Communication						
PO8	Engineer and Society						
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics discipline	3	2	2	3	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			2	2		2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.						

GI5013 SATELLITE METEOROLOGY L T P C

3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of Remote Sensing of atmosphere and satellite meteorology.
- To gain the knowledge on meteorological applications in weather forecasting aviation and trade applications.
- To familiarize the Indian Meteorological satellites and sensors.

UNIT I BASICS **9**

Basics — Concepts in Satellite Meteorology — Conventional Direct Measurements — Indirect Methods and Remote Sensing

UNIT II WEATHER SATELLITES AND SENSING SYSTEMS **9**

Weather Satellites and Sensing Systems — Orbit Types and Altitudes — View Angle and Implications — INSAT and KALPANA — TRMM and GPM and others — American and European Missions, availability of data and derived data sets.

UNIT III DATA RECORDS AND APPLICATIONS **9**

Data Records and Applications — Active and Passive Sensor Data — Microwave Sensors and Applications — Altitude. Wind.. Temperature and Wave Measurements and Sensors — AWS Global Network in Measurements

UNIT IV METEOROLOGICAL APPLICATIONS **9**

Meteorological Applications — Oceanographic Applications — Weather Forecasting — Aviation Meteorology — Agriculture and Irrigation Management — Meteorology in Transportation Industry — Business and Trade Application

UNIT V MANAGEMENT AND MONITORING **9**

Satellite Meteorology in Welfare Management — Cyclone Warning Systems — World Precipitation and Warming — Sea level Monitoring — Ice and Snow — Flood and Storm Surge Warning Systems — Storms — Wild Fires and Volcanic Ash

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Imparts the basic knowledge about the atmospheric parameters and its measurements
CO2	Understand the knowledge about platforms and sensors.
CO3	Helps to process the atmospheric visible and IR Data Products
CO4	Creates the awareness about the meteorological applications
CO5	To identify meteorological issues, give solutions and manage the critical climate scenario.

TEXTBOOKS:

1. Kidder and VonderHarr, — Satellite Meteorology: An introduction||, Academic Press, San Diego, CA, 1995
2. Cracknell, —The Advanced Very High Resolution Radiometer (AVHRR)||, Taylor and Francis Int. Ltd., Great Britain, 1997

REFERENCES:

1. Asnani, G.C —Tropical Meteorology||, Vol.I and II, 3rd Edition, 2016
2. Doviak and Zrnic, — Doppler Radar and Weather observations||, Academic press, London,2014.
3. Sauvageot, —Radar Meteorology||, Artech House Publishers, Norwood, MA, 1992
4. S.R.Kalsi, —Use of Satellite Image in Tropical Cyclone Intensity Analysis and Forecasting||, India Meteorological Department, New Delhi, Meteorological Monograph, Cyclone warning Division No.1/2002.
5.. Kelkar R.R. Satellite Meteorology, B S Publications, Hyderabad,2007

CO – PO Mapping – SATELLITE METEOROLOGY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2		3		2	2
PO2	Problem analysis		1		3	3	3

PO3	Design / development of solutions		2			3	3
PO4	Investigation	2		3		3	3
PO5	Usage of Modern Technology		2		3	3	3
PO6	Individual and Team work			2	3	3	3
PO7	Communication				3	3	3
PO8	Engineer and Society			3	2	3	3
PO9	Ethics				3	3	3
PO10	Environment and Sustainability	3	2			3	3
PO11	Project Management and Finance					3	3
PO12	Life Long Learning		2	2			2
PSO1	Knowledge of Geoinformatics discipline	1	3	2	3	3	3
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			2	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.				3	3	3

GI5014 WEB GIS L T P C
3 0 0 3

OBJECTIVE:

- This course provides skills in learning a set of scripts and their applications for providing web based services using GIS technology.

UNIT I INTRODUCTION TO WEBGIS AND MARKUP LANGUAGE 9

Internet and GIS – Web GIS Architecture and Components – OGC standards: Web Services- WMS, WFS, WCS, WPS – Open Server Standards - Protocols: HTTP, FTP, SMTP- Frontend & Backend programming –- Basic file formats (vector, raster) – JSON, GeoJSON- Real time applications.

UNIT II HTML AND CSS 9

HTML: Introduction –HTML, XML, MHTML - HTML Elements - Formatting and Fonts – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames - HTML Forms – **CSS:** Introduction to CSS – Basic syntax and styles - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Margins and Padding - Positioning using CSS.

UNIT III JAVA SCRIPT 9

Data types and Variables - Operators, Expressions, and Statements -Functions - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form handling and validations.

UNIT IV PHP 9

Introduction - Programming basics - Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML – Establishing connectivity with database.

UNIT V GEOSERVER 9

Introduction – Web Administration – Geo server data directory –loading and working with data – shape file – PostGIS file – other web format data - styling the layers – services: WMS, WFS, WCS – security – demos and case studies on Geo server.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the concept and Architecture of WebGIS and tools used for implementation
CO2	Utilise various capabilities of HTML, CSS for building Web Pages

CO3	Understand the concepts of Java such as functions, objects, events
CO4	Identify the capabilities of Phython Scripting for WebGIS development
CO5	Appreciate the use WebGIS services and Geoserver functionality for Spatial data dissemination

REFERENCES:

1. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide Web - How To Program”, Fifth Edition, Pearson Education, 2011. ISBN-13: 978-0132151009
2. Thomas Powell, "HTML & CSS: The Complete Reference" Fifth Edition, McGraw-Hill, 2010 ISBN-13: 978-0071496292
3. Thomas Powell, Fritz Schneider "JavaScript The Complete Reference" 3rd Edition, TATA McGraw Hill, 2013 ISBN-13: 9781259064685
4. Steven Holzner, "PHP: The Complete Reference" 1st Edition TATA McGraw Hill ,2008 ISBN: 9780070223622
5. Stefano Iacovella, Brian Youngblood "GeoServer Beginner’s Guide" Packt Publishing 2013, ISBN-13: 978-1849516686, 2nd Revised Edition(2017)

CO – PO Mapping – WEB GIS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences			1	1		1
PO2	Problem Analysis	1				1	1
PO3	Design / development of Solutions		2	2	2	1	2
PO4	Investigations					1	1
PO5	Usage of Modern Technology			3	3		3
PO6	Individual and Team work						
PO7	Communication	2	2			2	2
PO8	Engineer and Society					2	2
PO9	Ethics	1				1	1
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics discipline	1				2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			1	1		2
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.					M	2

GI5015 MOBILE APPLICATION DEVELOPMENT L T P C
3 0 0 3

UNIT I **9**

Android – versions – Android development environment- Eclipse Integrated Development Environment(IOS) – Android Virtual Device – Android Runtime: Dalvik Virtual Machine, Core

Libraries, Android Libraries, Application frame work, Project: Configuration, Settings, Stopping and Running modification – Directory Structure – Java SE and Dalvik Virtual machine

UNIT II **9**

Android Frame work – Graphical user Interface – Android Applications components – Android Activities, services, User interface – Broad coast Receivers: Announcements & Notifications Content Providers: Messaging for components – Design for various devices – views – layouts – Graphical layout Tool – Display: Test, Test View – Retical of data: Builders, check boxes and ratio – Indicators for developing – Progress with Seek Bar.

UNIT III **9**

Files and database : Display of files: Gallery , Grid View, Image View, Image Switcher – Displaying Text with Text View, Retrieving data from Users, Using Buttons, Check Boxes and Radio- Times from Users, Using Indicators to display Data to Users, Adjusting Progress with Seek bar

UNIT IV **9**

Saving and Loading – SQ Lite Database – Android Database Design – Access data – Content Provider: Registration – Data Provider – Internet

UNIT V **9**

Location based services (LBS)-Introduction-Crowd sourcing-configuring Android Emulator for geocoding, Geotagging: location accuracy, Map-based activities- examples-case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to
-

CO1	Understand OS and emulators for Mobile Application Development (MAD)
CO2	Know the Android Framework for GUI development
CO3	Display files, images and retrieval of data from users
CO4	Understand the intricacies of database design for MAD
CO5	Understand the concept of LBS with case studies.

CO – PO Mapping – Mobile Application Development

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	1	1	1	1	1	1
PO2	Problem analysis					2	
PO3	Design / development of solutions			2	2		2
PO4	Investigation					1	1
PO5	Modern Tool Usage				2	2	2
PO6	Individual and Team work						
PO7	Communication						
PO8	Engineer and Society					1	1
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics discipline					2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations						

PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.					2	2

GI5071 GEOINFORMATICS FOR AGRICULTURE AND FORESTRY L T P C
3 0 0 3

OBJECTIVE:

- This course enables the students to understand and apply remote sensing and GIS techniques in various fields of agriculture, soil, land and forest resources.

UNIT I CROP INVENTORY AND REMOTE SENSING 9

Introduction - leaf optical properties - identification of crops and crop inventorying – crop acreage estimation - vegetation indices - yield estimation - crop production forecasting through digital analysis - microwave and hyper spectral sensing for crop inventory - crop monitoring and condition assessment in command areas - case studies.

UNIT II REMOTE SENSING FORSOIL 9

Introduction - soil survey, types of soil surveys - soil genesis and soil classification -soil taxonomy - soil reflectance properties - soil mapping using remote sensing – problem soils -saline, alkali soil characteristics - mapping of saline alkaline soils - soil erosion and sedimentation - assessment of soil erosion - estimation of reservoir capacity.

UNIT III LAND EVALUATION AND MANAGEMENT 9

Introduction - land use / land cover definition - land use / land cover classification-concepts and approaches of land evaluation – Change dynamics – Land capability assessments - decision support system for land use planning - optimum land use planning for sustainable agriculture.

UNIT IV DAMAGE ASSESSMENT 9

Introduction - damage by pests and diseases - crop loss assessment by floods - flood hazard zone mapping - remote sensing capabilities and contributions for drought management - land degradation due to water logging and salinity - crop stress - reflectance properties of stressed crops - identification of crop stress - Agricultural insurance in India – CCIS,ECIS, FIIS and NAIS

UNIT V FOREST MANAGEMENT 9

Introduction - forest taxonomy - inventory of forests - forest type and density mapping-biomass assessment - timber volume estimation - factors for forest degradation-mapping degraded forests - deforestation and afforestation - forest fire mapping and damage assessment – species mapping - sustainable development of forests.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1 Understand the spectral properties of agricultural crops and their applications.
CO2 Understand the spectral properties of soil and applications.
CO3 Understand the RS and GIS capabilities to land management.
CO4 Understanding the RS and GIS application to damage assessment due to disaster.
CO5 Understand the spectral properties of Forest species and application to forest management.

TEXTBOOKS:

1. Srinivas, M.G., Remote Sensing Applications, Narosa Publishing House, New Delhi, 2001.
2. Andrew Rencz, Manual of Remote Sensing. Vol.3. Edn.3. Remote Sensing for the Earth Sciences, American Society for Photogrammetry and Remote Sensing, John Wiley &

Sons, New York, 1999

REFERENCES:

1. A.K.Singh &U.K. Chopra, Geoinformatics Applications in Agriculture, New India Publishing Company, 2007.
2. Peter James Eredics, Mapping Forestry, ESRI Press,2010.
3. Nicholas Baghdadi, Clement Mallet, Mehrez Zribi, QGIS & applications in Agriculture and forest, John wiley &Sons, 2018.
4. Ravi Shankar Dwivedi, Remote Sensing of Soils, Springer-Verlag GmBH Germany, 2017.
5. G.P.Obi Reddy, S.K.Singh, Geospatial Technologies in Land Resource Mapping, Monitoring and Management, Springer International Publishing,2018.

CO – PO Mapping – GEOINFORMATICS FOR AGRICULTURE AND FORESTRY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2	2	2	2	2
PO2	Problem Analysis			2			
PO3	Design / development of Solutions	3	3	3	2	2	3
PO4	Investigations	3	3	3	3	3	3
PO5	Usage of Modern Technology						
PO6	Individual and Team work						
PO7	Communication						
PO8	Engineer and Society					2	2
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning						
PSO1	Knowledge of Geoinformatics discipline	2	2	1	2	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations	1	1	1	2	1	1
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.	1	1	1	2	2	1

GE5076 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

OBJECTIVES

- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one's own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism - Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics - Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The Government Regulator's Approach to Risk - l Case Studies Chernoby and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers –Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students should be able to:

CO1: Use ethical theories in the professional life
CO2: Do social experimentation with engineering approaches
CO3: Follow safety norms in the engineering practices
CO4: Confidence in their approaches and claim their rights
CO5: Take moral leadership with the knowledge in global practices

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								✓		✓		✓
CO2						✓		✓				✓
CO3								✓				✓
CO4								✓				
CO5								✓	✓			✓

TEXT BOOKS

1. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Cengage Learning., Belmont, 2009, ISBN-13: 978-0-495-50279-1 ISBN-10: 0-495-50279-0.
2. Mike Martin and Roland Schinzinger, "Introduction To Engineering Ethics", 2nd Edition McGraw Hill., New York, 2010, ISBN 978-0-07-248311-6—ISBN 0-07-248311-3.

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", 4th edition, Prentice Hall., New Mexico, Newjersey, 1999, ISBN-13: 978-0-13-214521-3 , ISBN-10: 0-13-214521-9
2. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press,United Kingdom , 2002, ISBN: 9780195143027.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", 1st edition, Oxford University Press, United Kingdom 2000, ISBN-13: 978-0195134889, ISBN-10: 0195134885
4. John R Boatright, "Ethics and the Conduct of Business", 8th edition Pearson Education, Boston, 2017,ISBN-10:9789352862306, ISBN-13:978-9352862306
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Wiley, 2004, ISBN-10: 8177221671 ISBN -13: 9788177221671.

AG5027 GEOLOGY FOR GEOINFORMATICS L T P C
3 0 0 3

OBJECTIVES:

- To teach the students on importance of Geology in natural resource inventory.
- To introduce the rock forming minerals, ores and different rock types.
- To teach on Geophysical techniques and geological hazard mapping

UNIT I SOLID EARTH AND STRUCTURAL GEOLOGY 9

Scope and branches of Geology - Relevance to Geoinformatics - Geology for natural resources inventory - Interior of the Earth - Plate Tectonics - Introduction to geological structures.

UNIT II MINERALOGY AND PETROLOGY 9

Important rock forming minerals – physical properties and uses. Classification and description of rocks – Forms and mode of occurrence of rocks. Important ore forming minerals – physical properties and uses – Distribution of economic minerals in India. Geology of coal and hydrocarbons.

UNIT III GEOMORPHOLOGY 9

Geomorphic processes and Landforms – Classification and Description. Weathering; Drainage pattern and morphometry. Significance of Geomorphology in geo-resources exploration and natural hazard studies.

UNIT IV GEOLOGIC HAZARDS 9

Classification of natural hazards – Geologic hazards – Earthquakes – Landslides – Volcanism and Tsunami. Earthquake and volcanic belts of the world; Seismicity and landslides in India. Mitigation of Geologic hazards.

UNIT V GEOPHYSICS AND REMOTE SENSING FOR GEOLOGY 9

Introduction to geophysical methods for ground truth verification and resource exploration – Seismic, Electrical, Gravity, Magnetic and Radiometric methods – Spectra of Minerals and rocks- Remote Sensing for geologic mapping, ground water, minerals and hydrocarbon exploration- Remote Sensing for study of geologic Hazards-Introduction to planetary geology.

TOTAL : 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	Understand the internal structure of earth, plate tectonics and various geological structures
CO2	Have better understanding on rocks and minerals and their distribution in India.
CO3	Appreciate the role of geomorphology in geo-resource exploration and hazard mapping
CO4	Gain knowledge on geological hazards such as earthquakes, landslides, volcanoes, and Tsunami and their mitigation measures.
CO5	Appreciate the role of geology in the interpretation of geophysical anomalies and in remote sensing studies for various geo-resources

TEXTBOOKS:

1. Parbin Singh. A Text book of Engineering and General Geology, S.K. Kataria & Sons, 2013.
2. Andrew Goudie and Heather Viles. Landscapes and Geomorphology: A Very Short Introduction, Oxford Publishers, 2010.
3. William Lowrie. Fundamentals of Geophysics, Cambridge University press, 2007.

REFERENCES:

1. George H. Davis, Stephen J. Reynolds and Charles F. Kluth, Structural Geology of Rocks and Regions. John Wiley and Sons, Inc., 2012.
2. Ravi P. Gupta. Remote Sensing Geology, Springer Verlag, 2003.
3. Varghese, P.C., Engineering Geology for Civil Engineering PHI Learning Private Limited, New Delhi, 2012.

4. Edward A. Keller, DeVecchio. Natural Disasters: Earth's Processes as Hazards, Disasters and Catastophes, Routledge, 3rd Edition, 2011.
5. F.G.Bell. Fundamentals of Engineering Geology, B.S. Publications. Hyderabad 2011.

CO – PO Mapping – GEOLOGY FOR GEOINFORMATICS

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2		2	2	3	2
PO2	Problem analysis			2	2	3	2
PO3	Design / development of solutions			2	2	3	2
PO4	Investigation		2	3	3	3	3
PO5	Modern Tool Usage		2		2	3	2
PO6	Individual and Team work		2	2		2	2
PO7	Communication					1	1
PO8	Engineer and Society	2			2	2	2
PO9	Ethics				2	2	2
PO10	Environment and Sustainability	2			2	2	2
PO11	Project Management and Finance				2	2	2
PO12	Life Long Learning				2	2	2
PSO1	Knowledge of Geoinformatics discipline	2		2	2	2	2
PSO2	Critical analysis of Geoinformatics Engineering problems and innovations			3	2	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Geoinformatics engineering issues.		2	2	2	3	2

AUDIT COURSES

AD5091 CONSTITUTION OF INDIA L T P C
3 0 0 0

OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I INTRODUCTION 9

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES 9

Fundamental Rights-Right to Equality-Right to Freedom-Right against Exploitation Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies Directive Principles of State Policy-Fundamental Duties

UNIT III ORGANS OF GOVERNANCE 9

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS 9

Emergency Provisions - National Emergency, President Rule, Financial Emergency

UNIT V LOCAL ADMINISTRATION 9

District's Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level-Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									✓			✓
CO2									✓			✓
CO3									✓			✓
CO4									✓			✓
CO5									✓			✓

TEXTBOOKS:

1. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.
3. Jain M P, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. The Constitution of India (Bare Act), Government Publication,1950

AD5092 **VALUE EDUCATION** **L T P C**
3 0 0 0

OBJECTIVES:

- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self-destructive habits with value education
- Interpret social empowerment with value education

UNIT I INTRODUCTION TO VALUE EDUCATION 9

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgements

UNIT II IMPORTANCE OF VALUES 9

Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III INFLUENCE OF VALUE EDUCATION 9

Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV REINCARNATION THROUGH VALUE EDUCATION 9

Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation

UNIT V VALUE EDUCATION IN SOCIAL EMPOWERMENT 9

Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45PERIODS

OUTCOMES:

CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self destructive habits with value education
CO5 – Interpret social empowerment with value education

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							✓	✓				✓
CO2							✓	✓	✓			✓
CO3							✓	✓	✓			✓
CO4							✓	✓				✓
CO5							✓	✓				✓

REFERENCES:

1. Chakroborty , S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press ,New Delhi

AD5093 **PEDAGOGY STUDIES** **L T P C**
3 0 0 0

OBJECTIVES:

- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY: 9

Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions **-** Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW 9

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 9

Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 9

Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 9

Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 45PERIODS

OUTCOMES:

- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												✓
CO2												✓
CO3												✓
CO4												✓
CO5												✓

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

AD5094 STRESS MANAGEMENT BY YOGA L T P C
3 0 0 0

OBJECTIVES:

- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do's and Don't's in life through Yam
- Categorize Do's and Don't's in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA 9

Definitions of Eight parts of yog. (Ashtanga)

UNIT II YAM 9

Do`s and Don't's in life.
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III NIYAM 9

Do`s and Don't's in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV ASAN 9

Various yog poses and their benefits for mind & body

UNIT V PRANAYAM 9

Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45PERIODS

OUTCOMES:

CO1 – Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 – Learn Do's and Don't's in life through Yam
CO3 – Learn Do's and Don't's in life through Niyam
CO4 – Develop a healthy mind and body through Yog Asans
CO5 – Learn breathing techniques through Pranayam

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							✓	✓				✓
CO2							✓	✓				✓
CO3							✓	✓				✓
CO4							✓	✓				✓

CO5							✓	✓				✓

REFERENCES:

1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur

AD5095 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS **L T P C**
3 0 0 0

OBJECTIVES:

- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I 9

Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)

UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II 9

Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT III APPROACH TO DAY TO DAY WORK AND DUTIES 9

Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV STATEMENTS OF BASIC KNOWLEDGE – I 9

Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT V PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA 9

Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 45PERIODS

OUTCOMES:

CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									✓			✓
CO2									✓			✓
CO3									✓			✓
CO4									✓			✓
CO5									✓			✓

REFERENCES:

1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari's ThreeSatakam, Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016

AD5097 ESSENCE OF INDIAN KNOWLEDGE TRADITION L T P C
3 0 0 0

COURSE OBJECTIVES

The course will introduce the students to

- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNIT I INTRODUCTION TO CULTURE 9

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II INDIAN LANGUAGES AND LITERATURE 9

Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature

UNIT III RELIGION AND PHILOSOPHY 9

Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING) 9

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V EDUCATION SYSTEM IN INDIA 9

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45PERIODS

COURSE OUTCOMES

After successful completion of the course the students will be able to

- Understand philosophy of Indian culture.
- Distinguish the Indian languages and literature.
- Learn the philosophy of ancient, medieval and modern India.
- Acquire the information about the fine arts in India.
- Know the contribution of scientists of different eras.
- Understand education systems in India

REFERENCES:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition",ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200
4. Narain, "Examinations in ancient India", Arya Book Depot, 1993
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
6. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13:

978- 8120810990, 2014

AD5098 SANGATAMIL LITERATURE APPRECIATION LT P C
3 0 0 0

COURSE OBJECTIVES:
The main learning objective of this course is to make the students an appreciation for:
1. Introduction to Sanga Tamil Literature.
2.'Agathinai' and 'Purathinai' in Sanga Tamil Literature.
3.'Attruppadai' in Sanga Tamil Literature.
4.'Puranaanuru' in Sanga Tamil Literature.
5.'Pathitru paththu' in Sanga Tamil Literature.

UNIT I SANGA TAMIL LITERATURE AN INTRODUCTION 9
Introduction to Tamil Sangam–History of Tamil Three Sangams–Introduction to Tamil Sangam Literature–Special Branches in Tamil Sangam Literature- Tamil Sangam Literature's Grammar-Tamil Sangam Literature'sparables.

UNIT II 'AGATHINAI' AND 'PURATHINAI' 9
Tholkappiyar's Meaningful Verses–Three literature materials–Agathinai's message- History of Culture from Agathinai–Purathinai–Classification–Mesaage to Society from Purathinai.

UNITIII 'ATTRUPPADAI' 9
Attruppadai Literature–Attruppadai in'Puranaanuru'-Attruppadaiin 'Pathitru paththu'- Attruppadai in 'Paththu aattu'.

UNITIV 'PURANAANURU' 9
Puranaanuru on Good Administration,Ruler and Subjects–Emotion & its Effect in Puranaanuru.

UNITV 'PATHITRU PATHTHU' 9
Pathitrupaththu in'Ettuthogai'–Pathitru paththu's Parables–Tamil dynasty:Valor, Administration, Charity in Pathitru paththu- Mesaage to Society from Pathitru paththu.

Total (L:45) = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Appreciate and apply the messages in Sanga Tamil Literature in their life.
2. Differentiate 'Agathinai' and'Purathinai'in their personal and societal life.
3. Appreciate and apply the messages in 'Attruppadai' in their personal and societal life.
4. Appreciate and apply the messages in 'Puranaanuru' in their personal and societal life.
5. Appreciate and apply the messages in 'Pathitru paththu' in their personal and societal life.

REFERENCES:

1. Sivaraja Pillai,The Chronology of the Early Tamils,Sagwan Press,2018.
2. Hank Heifetz and George L. Hart, The Purananuru, Penguin Books,2002.
3. Kamil Zvelebil,The Smile of Murugan:On Tamil Literature of South India, Brill Academic Pub,1997.
4. George L. Hart, Poets of the Tamil Anthologies: Ancient Poems of Love and War, Princeton University Press,2015.
5. Xavier S.Thani Nayagam, Land scape and poetry:a study of nature in classical Tamil poetry, sia Pub.House, 1967.

	PO												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3

1									0.9						0.6
2									0.9						0.6
3									0.9						0.6
4									0.9						0.6
5									0.9						0.6

HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171 LANGUAGE AND COMMUNICATION LT P C
3 0 0 3

COURSE DESCRIPTION

This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as non verbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

Objectives

- ✓ To familiarize students with the concept of communication using linguistic and non linguistic resources.
- ✓ To help students ask critical questions regarding facts and opinions.
- ✓ To provide students with the material to discuss issues such as language and power structures.
- ✓ To help students think critically about false propaganda and fake news.

Learning Outcomes

- ➢ Students will be able to use linguistic and non linguistic resources of language in an integrated manner for communication.
- ➢ Students will be able to analyse communication in terms of facts and opinions.
- ➢ Students will be able to discuss, analyse and argue about issues related to language and power.

UNIT I LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9

a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
d) Communicative Competency, context and situation, combination of linguistic and non-linguistic elements of communication

UNIT II STRUCTURE OF WRITING/CONVERSATION: 9

a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

UNIT III POWER STRUCTURE AND LANGUAGE USE: 9

a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV MEDIA COMMUNICATION: 9

a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9

a) Fundamentals of persuasive communication

b) Persuasive strategies
c) Communication barriers

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Austin, 1962, J.L. How to do things with words. Oxford: Clarendon Press. Grice, P.1989. Studies in the way of words. Cambridge, M.A: Harvard University Press.
2. Chomsky, N.1966. Aspects of the theory of syntax, The MIT press, Cambridge. Chomsky, N.2006. Language and Mind, Cambridge University Press.
3. Hymes. D.N. 1972, On communication competence in J.B. Pride and J.Holmes (ed), Sociolinguistics, pp 269-293, London Penguin.
4. Gilbert, H.Harman, 1976. Psychological aspect of the theory of syntax in Journal of Philosophy, page 75-87.
5. Stephen. C. Levenson, 1983, Pragmatics, Cambridge University press.
6. Stangley, J. 2007. Language in Context. Clarendon press, Oxford. 7. Shannon, 1942. A Mathematical Theory of Communication. 8. Searle, J.R. 1969. Speech acts: An essay in the philosophy of language. Cambridge: Cambridge University Press.

HU5172 VALUES AND ETHICS L T P C
3 0 0 3

OBJECTIVES:

- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I DEFINITION AND CLASSIFICATION OF VALUES 9

Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-Social-Aesthetic-Moral and Religious values

UNIT II CONCEPTS RELATED TO VALUES 9

Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III IDEOLOGY OF SARVODAYA 9

Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV SUSTENANCE OF LIFE 9

The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V VIEWS ON HIERARCHY OF VALUES 9

The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.
CO4: Able to understand sustenance of life.

CO5: Able to understand views of hierarchy of values.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								✓	✓			✓
CO2								✓	✓			✓
CO3								✓	✓			✓
CO4								✓	✓			✓
CO5								✓	✓			✓

TEXTBOOKS:

1. AwadeshPradhan :MahamanakeVichara. (B.H.U., Vanarasi-2007)
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)
3. William, K Frankena : Ethics (Prentice Hall of India, 1988)

HU5173 HUMAN RELATIONS AT WORK L T P C

3 0 0 3

OBJECTIVES:

- Illustrate human relations at work its relationship with self.
- Explain the importance of interacting with people at work to develop teamwork.
- Infer the importance of physical health in maintaining human relations at work.
- Describe the importance of staying psychologically healthy.
- Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF 9

Human Relations and You: Self-Esteem and Self-Confidence: Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE 9

Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

UNIT III STAYING PHYSICALLY HEALTHY 9

Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY 9

Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST 9

Getting Ahead in Your Career, Learning Strategies, Perception, Life Span Changes, and Developing Good Work Habits.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						✓		✓	✓			✓
CO2									✓	✓		✓
CO3						✓		✓	✓			✓
CO4								✓				✓
CO5								✓	✓	✓		✓

TEXT BOOK:

1. Dubrien, A. J. (2017). Human Relations for Career and Personal Success: Concepts, Applications, and Skills, 11th Ed. Upper Saddle River, NJ: Pearson.

REFERENCES:

1. Greenberg, J. S. (2017). Comprehensive stress management (14th edition), New York: McGraw Hill.
2. Udai, Y. (2015). Yogasanaurpranayam. New Delhi: N.S. Publications.

HU5174 PSYCHOLOGICAL PROCESSES L T P C
3 0 0 3

COURSE DESCRIPTION

Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people's psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES

The major objectives of this course is

- To develop students' awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT 1: INTRODUCTION

What is psychology? - Why study psychology? - Psychology as science – Behavior and its role in human communication – socio-cultural bases of behaviour – Biological bases of behavior - Brain and its functions – Principles of Heredity – Cognition and its functions Fields of psychology – Cognitve and Perceptual – Industrial and Organizational.

UNIT 2: SENSORY & PERCEPTUAL PROCESSES

Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal- external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT 3: COGNITION & AFFECT

Learning and memory – philosophy of mind – concepts - words – images – semantic features – Association of words – Repetition – Retrieval – Chunking - Schemata - Emotion and motivation – nature and types of motivation – Biological & Psychosocial motivation – nature and types of emotions – physiological & cognitive bases of emotions – expressions of emotions – managing negative emotions - enhancing positive emotions.

UNIT 4: THINKING, PROBLEM-SOLVING & DECISION MAKING

Thinking skills – Types of thinking skills – Concrete & Abstract thinking – Convergent & Divergent - Analytical & Creative thinking – Problem & Possibility thinking – Vertical & Lateral thinking – Problem solving skills – stages of problem solving skills – Decision making - intuition and reasoning skills - Thinking and language - The thinking process- concepts, problem solving, decision-making, creative thinking; language communication.

UNIT 5: PERSONALITY & INTELLIGENCE

Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

References

1. Morgan, C.T.and King, R.A (1994) Introduction to Psychology, Tata McGraw Hill Co Ltd, New Delhi.
2. Robert A. Baron (2002), Psychology, 5th Edition, Prentice Hall, India.
3. Michael W.Passer, Ronald E.smith (2007), Psychology: The science of mind and Behavior,3rd Edition Tata McGraw-Hill Edition.
4. Robert S.Feldman (2004) Understanding Psychology 6th Edition Tata McGraw – Hill.
5. Endler, N. S., & Summerfeldt, L. J. (1995). Intelligence. personality. psychopathology. and adjustment. In D. H. Saklofske & M. Zeidner (Eds.). International handbook of personality and intelligence (pp. 249-284). New York: Plenum Press.
6. Ford, M. E. (1994). A living systems approach to the integration of personality and intelligence. In R. J. Sternberg. & P. Ruzgis (Eds.). Personality and intelligence (pp. 188-21 7). New York: Cambridge University Press.

- De Bono, E (1990) Lateral Thinking, Harper Perennial, New York.

HU5175 EDUCATION, TECHNOLOGY AND SOCIETY L T P C
3 0 0 3

COURSE DESCRIPTION

This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

COURSE OBJECTIVES:

The course aims

- To help learners understand the basics of different types of technology utilised in the field of education
- To make them realize the impact of education in society
- To make them evolve as responsible citizen in a technologically advanced society

LEARNING OUTCOMES

By the end of the course, learners will be able to

- Understand the various apps of technology apps and use them to access, generate and present information effectively.
- Apply technology based resources and other media formats equitably, ethically and legally.
- Integrate their technical education for betterment of society as well as their personal life.

UNIT I INDIAN EDUCATION SYSTEM

Gurukul to ICT education – Teacher as facilitator – Macaulay's Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

Learning Theories – Behaviorism – Cognitivism – Social Constuctivism – Humanism Learning Styles – Multiple Intelligences – Emotional Intelligence – Blooms Taxonomy

UNIT III TECHNOLOGICAL ADVANCEMENTS

Web tools – Social media in education – elearning – MOOCs – Mobile assisted learning – Learning Apps – Blended learning - Self-directed learning

UNIT IV EDUCATIONAL TECHNOLOGY

Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS

Plagiarism – Online Copyright issues – Ethical and value implications of education and technology on individual and society.

TOTAL:45 PERIODS

TEACHING METHODS

Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION

As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)

(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)
(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others' posts. (10 marks)

REFERENCES

1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington

HU5176 PHILOSOPHY L T P C
3 0 0 3

OBJECTIVES

- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To Fosters critical thinking and imagination by dealing with inter-related concepts in literature and science.

- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one's self and others.

UNIT I KNOWLEDGE 9

Knowledge (Vidya) Versus Ignorance (Avidya)- Brihadaranyaka Upanishad. Unity and Multiplicity – Isha Upanishad. What is True Knowledge? Ways to True Knowledge. Introduction to Philosophy of Yoga, Socratic Debate, Plato's Views. Asking and Answering Questions to Stimulate Critical Thinking and to Draw Ideas. Argumentative Dialogues. Dialectical Methods to Arrive at Conclusions.

UNIT II ORIGIN 9

Origin of Universe And Creation – 'Nasidiya Sukta' in Relation With Big Bang Theory. Greek Concept of Chaos. The Concept of Space – Space as the Final Goal – Udgitha. Relationship Between Teacher And Student – The Knowledge Of Combinations, Body And Speech – Siksha Valli – Taittriya Upanishad.

UNIT III WORD 9

Aum- Speech and Breath as Pair – Chandogya Upanishad and Brihadaryanaka Upanishad. Significance of Chants, Structure of Language and Cosmic Correspondences. The Non-Dual Word – Bhartrihari's Vakyapadiyam. Sphota-Ultimate Reality Expressed Through Language. Intention. Thought 'Sabdanaor' and Speaking.

UNIT IV KNOWLEDGE AS POWER/OPPRESSION 9

Power- as Self-Realization in Gita. Krishna's Advice to Arjuna on How to Conquer Mind. Francis Bacon – Four Idols – What Prevents One From Gaining Knowledge? Michel Foucault- Knowledge as Oppression. Panopticon. Rtam (Truth) and Satyam (Eternal Truth).

UNIT V SELF KNOWLEDGE/BRAHMAN 9

Knowledge about Self, Transcendental Self. The Different Chakras and the Stages of Sublimation. Philosophy of Yoga and Siva for Union of Mind and Body. Concept of Yin/Yang. Aspects of the Feminine / Masculine.

TOTAL : 45 PERIODS

OUTCOMES:

On completion of the course, the students will be able to:

1. Think sceptically, ask questions and to arrive at deductions.
2. Connect and relate different branches of thought.
3. Comprehends the relation between language, thought and action.
4. Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:

1. Swami Nikhilananda: The Upanishads, Swami Nikhilananda, Advaita Ashrama, Kolkata.
2. Swamy Tapasyananda: Srimad Bhagavad Gita, The Scripture of Mankind, Sri Ramakrishna Math, Chennai.
3. Subrahmanyam, Korada: Vakyapadiyam of Bhartrhari Brahmakanda, Sri Garib Dass series.
4. Swami Lokeswarananda: Chandogya Upanishad, Swami Lokeswarananda, Ramakrishna Mission Institute of Culture, Kolkata.
5. Brahma, Apuruseya: The Four Vedas: Translated in English.
6. Haich, Elizabeth: Sexual Energy and Yoga.
7. Bacon, Francis: Power as Knowledge
8. Vlastos, Gregory: Socrates Ironist and Moral Philosopher.
9. Plato: The Republic, Penguin.

10. Gutting, Garry: Foucault A Very Short Introduction, Oxford.

HU5177	APPLICATIONS OF PSYCHOLOGY IN EVERYDAY LIFE	L T P C 3 0 0 3

UNIT I INTRODUCTION **7**

Nature and fields.

UNIT II PSYCHOLOGY IN INDUSTRIES AND ORGANIZATIONS **9**

Job analysis; fatigue and accidents; consumer behavior.

UNIT III PSYCHOLOGY AND MENTAL HEALTH **11**

Abnormality, symptoms and causes psychological disorders

UNIT IV PSYCHOLOGY AND COUNSELING **7**

Need of Counseling, Counselor and the Counselee, Counseling Process, Areas of Counseling.

UNIT V PSYCHOLOGY AND SOCIAL BEHAVIOUR **11**

Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

TEXTBOOKS

1. Schultz, D. & Schultz, S.E. (2009). Psychology and Work Today (10th ed.). New Jersey:Pearson/Prentice Hall
2. Butcher, J. N., Mineka, S., & Hooley, J. M. (2010). Abnormal psychology (14th ed.). New York: Pearson
3. Gladding, S. T. (2014). Counselling: A comprehensive profession. New Delhi: Pearson Education
4. Aronson, E., Wilson, T. D., & Akert, R. M. (2010). Social Psychology (7th Ed.). Upper Saddle River, NJ: Prentice Hall