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ANNA UNIVERSITY, CHENNAI

AFFLIATED INSTITUTIONS

REGULATIONS – 2017

CHOICE BASED CREDIT SYSTEM

B. E. GEOINFORMATICS ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. To prepare the students for successful careers in Geospatial Industries and Information Technology that meet the needs of India and other Countries.
II. To develop the professional ability among the students to collect various Geospatial relates from various platform, data, analysis and synthesis that create user oriented real world applications.
III. To provide an opportunity for students to work as part of teams on multidisciplinary projects.
IV. To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering and multidisciplinary problems and to prepare them for graduate studies.
V. To promote students awareness of the life-long learning and to introduce them to professional ethics and codes of professional practice.

PROGRAMME OUTCOMES (POs)

1. Graduates will acquire basic knowledge in B.E (Geoinformatics) and engineering.
2. Graduates will acquire the ability to model and development of application in Geospatial arena interprets and analyze data, and report results.
3. Graduates will acquire the ability to develop Geospatial system that meets desired specifications and requirements.
4. Graduates will acquire the ability to function on engineering and science laboratory teams, as well as on multidisciplinary problem solving teams.
5. Graduates will acquire the ability to identify, formulate and solve Geomatics related problems.
6. Graduates will acquire an understanding of their professional and ethical responsibilities.
7. Graduates will be able to communicate effectively in both verbal and written forms.
8. Graduates will gain confidence to apply Geospatial techniques in global and societal contexts.
9. Graduates will be capable of self - education and clearly understand the value of lifelong learning.
10. Graduates will be broadly educated and will have an understanding of the impact of engineering on society and demonstrate awareness of contemporary issues.
11. Graduates will be familiar with modern hardware and software tools and equipments to analyze Geospatial / Geomatics engineering problems.

PEOS & Pos

The B.E (Geoinformatics) Program outcomes leading to the achievements of the objectives are summarized in the following table.

Programme Educational Objectives	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
I	X	X	X		X	X	X	X	X	X	X
II	X	X	X		X			X			X
III		X	X	X				X			
IV	X	X	X	X	X			X			X
V			X					X	X	X	

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YEAR 1	SEM 1	Communicative English							✓	✓	✓		
		Engineering Mathematics – I		✓	✓								
		Engineering Physics	✓		✓		✓			✓			
		Engineering Chemistry	✓		✓		✓						
		Problem Solving and Python Programming	✓	✓	✓					✓			
		Engineering Graphics	✓		✓								
		Problem Solving and Python Programming Laboratory	✓	✓	✓					✓			
		Physics and Chemistry Laboratory	✓		✓	✓							
	SEM 2	Technical English						✓	✓		✓		
		Engineering Mathematics – II		✓	✓					✓			
		Physics for Geoinformatics Engineering	✓	✓	✓								
		Basic Electronics Engineering	✓	✓	✓		✓			✓			
		Geoinformatics Systems	✓	✓	✓		✓			✓			✓
		Environmental Science and Engineering	✓							✓	✓	✓	
		Engineering Practices Laboratory				✓					✓		
		Introduction to MATLAB		✓	✓	✓	✓						✓
YEAR 2													
	SEM 3	Transforms and Statistics			✓	✓	✓			✓	✓		
		Communication Theory	✓		✓	✓	✓			✓			✓
		Cartography and GIS Concepts	✓	✓	✓	✓	✓			✓			✓
		Fundamentals of Object Oriented Programming	✓	✓	✓	✓				✓	✓		
		Plane and Geodetic Surveying	✓			✓	✓			✓	✓	✓	✓
		Fundamentals of Remote Sensing	✓		✓	✓		✓				✓	✓
		Plane and Geodetic Surveying Laboratory	✓			✓	✓			✓	✓	✓	✓
		Cartography and GIS Laboratory	✓	✓	✓	✓	✓			✓			✓
		Interpersonal Skills / Listening and Speaking						✓	✓		✓		

	SEM 4	Numerical methods and Graph theory			✓	✓	✓			✓	✓		
		Geology for Geoinformatics	✓	✓			✓			✓	✓	✓	
		Elements of Photogrammetry	✓	✓		✓				✓	✓		✓
		Geo database system	✓	✓	✓		✓				✓		✓
		Total Station and GPS Surveying	✓	✓		✓	✓				✓	✓	
		Satellite Meteorology									✓	✓	
		Remote Sensing and Photogrammetry Laboratory	✓	✓	✓	✓	✓			✓			✓
		Total Station and GPS Surveying Laboratory	✓	✓		✓	✓				✓	✓	
		Advanced Reading and Writing						✓	✓		✓		
	SEM 5	Hyperspectral and Microwave Remote Sensing		✓	✓	✓	✓			✓	✓	✓	
		Satellite Image Processing											
		Open Elective I*											
		Soft Computing Techniques	✓	✓	✓	✓	✓			✓	✓	✓	✓
		Professional Elective I											
		Professional Elective II											
		Geo Database Laboratory	✓	✓	✓		✓				✓		✓
		Satellite Image Processing Laboratory	✓	✓	✓	✓	✓			✓			✓
	SEM 6	Hydrology and Water Resources Engineering for Geoinformatics		✓		✓	✓		✓	✓	✓	✓	
		Open Source GIS	✓	✓	✓	✓	✓			✓	✓	✓	✓
		Spatial Analysis and Applications		✓	✓	✓	✓			✓	✓		✓
		Urban Geoinformatics	✓	✓	✓	✓	✓			✓	✓	✓	✓
		Geodesy	✓			✓				✓			
		Professional Elective III											
		Spatial Analysis and Applications Laboratory		✓	✓	✓	✓			✓	✓		✓
		Survey Camp (2 Weeks – During V Semester)					✓	✓	✓		✓	✓	✓

		Agriculture and Forestry for Geoinformatics						✓	✓	✓	✓		
		Decision Support System for Resource Management		✓			✓			✓		✓	✓
		Environmental Geoinformatics											
	SEM 7	Professional Elective IV											
		Open Elective II*											
		Open Elective III*											
		Industrial Training (4 weeks During VI Semester - Summer)											
		Technical Seminar			✓			✓	✓	✓	✓		
		Professional Elective V											
	SEM 8	Professional Elective VI											
		Project Work	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

ANNA UNIVERSITY, CHENNAI
AFFLIATED INSTITUTIONS
B.E. GEOINFORMATICS ENGINEERING
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULA & SYLLABI

SEMESTER I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS8151	Communicative English	HS	4	4	0	0	4
2.	MA8151	Engineering Mathematics – I	BS	4	4	0	0	4
3.	PH8151	Engineering Physics	BS	3	3	0	0	3
4.	CY8151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	GE8152	Engineering Graphics	ES	6	2	0	4	4
PRACTICAL								
7.	GE8161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
			TOTAL	**31**	**19**	**0**	**12**	**25**

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS8251	Technical English	HS	4	4	0	0	4
2.	MA8251	Engineering Mathematics – II	BS	4	4	0	0	4
3.	PH8202	Physics for Geoinformatics Engineering	BS	3	3	0	0	3
4.	BE8201	Basic Electronics Engineering	ES	3	3	0	0	3
5.	GI8201	Geoinformatics Systems	PC	3	3	0	0	3
6.	GE8291	Environmental Science and Engineering	HS	3	3	0	0	3
PRACTICAL								
7.	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	GI8211	Introduction to MATLAB	PC	4	0	0	4	2
			TOTAL	**28**	**20**	**0**	**8**	**24**

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA8301	Transforms and Statistics	BS	4	4	0	0	4
2.	GI8301	Cartography and GIS Concepts	PC	3	3	0	0	3
3.	GI8302	Fundamentals of Object Oriented Programming	ES	4	2	2	0	4
4.	GI8303	Fundamentals of Remote Sensing	PC	3	3	0	0	3
5.	GI8304	Plane and Geodetic Surveying	PC	4	4	0	0	4
6.	EC8491	Communication Theory	ES	3	3	0	0	3
PRACTICAL								
7.	GI8311	Plane and Geodetic Surveying Laboratory	PC	4	0	0	4	2
8.	GI8312	Cartography and GIS Laboratory	PC	4	0	0	4	2
9.	HS8381	Interpersonal Skills / Listening and Speaking	EEC	2	0	0	2	1
			TOTAL	**31**	**19**	**2**	**10**	**26**

SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA8401	Numerical Methods and Graph Theory	BS	4	4	0	0	4
2.	GI8401	Geology for Geoinformatics	BS	3	3	0	0	3
3.	GI8402	Elements of Photogrammetry	PC	4	4	0	0	4
4.	GI8403	Geo Database System	PC	3	3	0	0	3
5.	GI8404	Satellite Meteorology	PC	3	3	0	0	3
6.	GI8491	Total Station and GPS Surveying	PC	3	3	0	0	3
PRACTICAL								
7.	GI8411	Remote Sensing and Photogrammetry Laboratory	PC	4	0	0	4	2
8.	GI8412	Total Station and GPS Surveying Laboratory	PC	4	0	0	4	2
9.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
			TOTAL	**30**	**20**	**0**	**10**	**25**

SEMESTER V

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	GI8501	Hyperspectral and Microwave Remote Sensing	PC	3	3	0	0	3
2.	GI8502	Satellite Image Processing	PC	3	3	0	0	3
3.	GI8503	Soft Computing Techniques	PC	3	3	0	0	3
4.		Professional Elective I	PE	3	3	0	0	3
5.		Professional Elective II	PE	3	3	0	0	3
6.		Open Elective I*	OE	3	3	0	0	3
PRACTICAL								
7.	GI8511	Geo Database Laboratory	PC	4	0	0	4	2
8.	GI8512	Satellite Image Processing Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER VI

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	GI8601	Hydrology and Water Resources Engineering for Geoinformatics	PC	3	3	0	0	3
2.	GI8602	Open Source GIS	PC	3	3	0	0	3
3.	GI8603	Urban Geoinformatics	PC	3	3	0	0	3
4.	GI8604	Spatial Analysis and Applications	PC	3	3	0	0	3
5.	GI8605	Geodesy	PC	4	4	0	0	4
6.		Professional Elective III	PE	3	3	0	0	3
PRACTICAL								
7.	GI8611	Spatial Analysis and Applications Laboratory	PC	4	0	0	4	2
8.	GI8612	Survey Camp (2 Weeks - During V Semester)	EEC	0	0	0	0	2
			TOTAL	**23**	**19**	**0**	**4**	**23**

SEMESTER VII

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	GI8701	Agriculture and Forestry for Geoinformatics	PC	3	3	0	0	3
2.	GI8702	Decision Support System for Resource Management	PC	3	3	0	0	3
3.	GI8703	Environmental Geoinformatics	PC	3	3	0	0	3
4.		Professional Elective IV	PE	3	3	0	0	3
5.		Open Elective II*	OE	3	3	0	0	3
6.		Open Elective III*	OE	3	3	0	0	3
PRACTICAL								
7.	GI8711	Industrial Training (4 weeks During VI Semester - summer)	EEC	0	0	0	0	2
8.	GI8712	Technical Seminar	EEC	2	0	0	2	1
			TOTAL	**20**	**18**	**0**	**2**	**21**

SEMESTER VIII

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective V	PE	3	3	0	0	3
2.		Professional Elective VI	PE	3	3	0	0	3
PRACTICAL								
3.	GI8811	Project Work	EEC	20	0	0	20	10
			TOTAL	**26**	**6**	**0**	**20**	**16**

TOTAL NO. OF CREDITS: 182

*Course from the curriculum of other UG Programmes.

HUMANITIES AND SOCIAL SCIENCES (HS)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8151	Communicative English	HS	4	4	0	0	4
2.	HS8251	Technical English	HS	4	4	0	0	4
3.	GE8291	Environmental Science and Engineering	HS	3	3	0	0	3

BASIC SCIENCES (BS)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA8151	Engineering Mathematics – I	BS	4	4	0	0	4
2.	PH8151	Engineering Physics	BS	3	3	0	0	3
3.	CY8151	Engineering Chemistry	BS	3	3	0	0	3
4.	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	MA8251	Engineering Mathematics – II	BS	4	4	0	0	4
6.	PH8202	Physics for Geoinformatics Engineering	BS	3	3	0	0	3
7.	MA8301	Transforms and Statistics	BS	4	4	0	0	4
8.	MA8401	Numerical methods and Graph theory	BS	4	4	0	0	4
9.	GI8401	Geology for Geoinformatics	BS	3	3	0	0	3

ENGINEERING SCIENCES (ES)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	BE8201	Basic Electronics Engineering	ES	3	3	0	0	3
2.	GE8152	Engineering Graphics	ES	6	2	0	4	4
3.	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
4.	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
5.	GE8161	Problem Solving and Python Programing Laboratory	ES	4	0	0	4	2
7.	GI8302	Fundamentals of Object Oriented Programming	ES	4	2	2	0	4
8.	EC8491	Communication Theory	ES	3	3	0	0	3

PROFESSIONAL CORE (PC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8201	Geoinformatics Systems	PC	3	3	0	0	3
2.	GI8211	Introduction to MATLAB	PC	4	0	0	4	2
3.	GI8301	Cartography and GIS Concepts	PC	3	3	0	0	3
4.	GI8303	Fundamentals of Remote Sensing	PC	3	3	0	0	3
5.	GI8304	Plane and Geodetic Surveying	PC	4	4	0	0	4
6.	GI8311	Plane and Geodetic Surveying laboratory	PC	4	0	0	4	2
7.	GI8312	Cartography and GIS Laboratory	PC	4	0	0	4	2
8.	GI8402	Elements of Photogrammetry	PC	4	4	0	0	4
9.	GI8403	Geo database system	PC	3	3	0	0	3
10.	GI8404	Satellite Meteorology	PC	3	3	0	0	3
11.	GI8491	Total Station and GPS Surveying	PC	3	3	0	0	3
12.	GI8411	Remote Sensing and Photogrammetry Laboratory	PC	4	0	0	4	2
13.	GI8412	Total Station and GPS Surveying Laboratory	PC	4	0	0	4	2
14.	GI8501	Hyperspectral and Microwave Remote Sensing	PC	3	3	0	0	3
15.	GI8502	Satellite Image Processing	PC	3	3	0	0	3
16.	GI8503	Soft Computing Techniques	PC	3	3	0	0	3
17.	GI8511	Geo Database Laboratory	PC	4	0	0	4	2
18.	GI8512	Satellite Image Processing Laboratory	PC	4	0	0	4	2
19.	GI8601	Hydrology and Water Resources Engineering for Geoinformatics	PC	3	3	0	0	3
20.	GI8602	Open Source GIS	PC	3	3	0	0	3
21.	GI8603	Urban Geoinformatics	PC	3	3	0	0	3
22.	GI8604	Spatial Analysis and Applications	PC	3	3	0	0	3
23.	GI8605	Geodesy	PC	4	4	0	0	4
24.	GI8611	Spatial Analysis and Applications laboratory	PC	4	0	0	4	2
25.	GI8701	Agriculture and Forestry for Geoinformatics	PC	3	3	0	0	3
26.	GI8702	Decision Support System for Resource Management	PC	3	3	0	0	3
27.	GI8703	Environmental Geoinformatics	PC	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills / Listening and Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	GI8612	Survey Camp (2 Weeks - During V Semester)	EEC	0	0	0	0	2
4.	GI8711	Industrial Training (4 weeks During VI Semester - Summer)	EEC	0	0	0	0	2
5.	GI8712	Technical Seminar	EEC	2	0	0	2	1
6.	GI8811	Project Work	EEC	20	0	0	20	10

PROFESSIONAL ELECTIVE

SEMESTER V
ELECTIVE – I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8001	Climate Change Studies	PE	3	3	0	0	3
2.	GE8071	Disaster Management	PE	3	3	0	0	3

SEMESTER V
ELECTIVE – II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8002	Digital Cartography	PE	3	3	0	0	3
2.	EC8094	Satellite Communication	PE	3	3	0	0	3
3.	GE8074	Human Rights	PE	3	3	0	0	3

SEMESTER VI
ELECTIVE – III

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8003	Adjustment Computations For Geoinformatics	PE	3	3	0	0	3
2.	GI8004	Airborne and Terrestrial Laser Mapping	PE	3	3	0	0	3
3.	GE8075	Intellectual Property Rights	PE	3	3	0	0	3

SEMESTER VII
ELECTIVE – IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8005	Oceanography and Coastal Processes	PE	3	3	0	0	3
2.	GI8006	Health GIS	PE	3	3	0	0	3
3.	GE8077	Total Quality Management	PE	3	3	0	0	3

SEMESTER VIII
ELECTIVE – V

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8007	Planetary Remote Sensing	PE	3	3	0	0	3
2.	GI8008	Satellite Weather Forecasting and Modeling	PE	3	3	0	0	3
3.	GE8076	Professional Ethics in Engineering	PE	3	3	0	0	3

SEMESTER VIII
ELECTIVE – VI

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GI8009	Advanced Geo Data Analysis	PE	3	3	0	0	3
2.	GI8010	GIS based Disaster Preparedness and Mitigation	PE	3	3	0	0	3
3.	GI8011	Web GIS	PE	3	3	0	0	3
4.	GE8073	Fundamentals of Nano Science	PE	3	3	0	0	3

SUMMARY

S.No.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	**HS**	4	7	0	0	0	0	0	0	**11**
2.	**BS**	12	7	4	7	0	0	0	0	**30**
3.	**ES**	9	7	5	0	0	0	0	0	**21**
4.	**PC**	0	3	16	17	13	18	9	0	**76**
5.	**PE**	0	0	0	0	6	3	3	6	**18**
6.	**OE**	0	0	0	0	3	0	6	0	**9**
7.	**EEC**	0	0	1	1	0	2	3	10	**17**
	Total	**25**	**24**	**26**	**25**	**22**	**23**	**21**	**16**	**182**
8.	**Non Credit / Mandatory**									

HS8151 **COMMUNICATIVE ENGLISH** **L T P C**
4 0 0 4

OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing**- completing sentences- - developing hints. **Listening**- short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development**- Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development**-- prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening**- telephonic conversations. **Speaking –** sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking**- asking about routine actions and expressing opinions. **Language development**- degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development –** single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing**- letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening**- listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development**- synonyms-antonyms- phrasal verbs.

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing**- brainstorming -writing short essays **–** developing an outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking –** participating in conversations- short group conversations-**Language development**-modal verbs- present/ past perfect tense - **Vocabulary development**-collocations- fixed and semi-fixed expressions

OUTCOMES: At the end of the course, learners will be able to:

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

1. Board of Editors. **Using English** A Coursebook for Undergarduate Engineers and Technologists**.** Orient BlackSwan Limited, Hyderabad: 2015
2. Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP, 2015.

REFERENCES

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
2. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor BusinessEnglish.** Cambridge University Press, Cambridge: Reprint 2011
3. Dutt P. Kiranmai and RajeevanGeeta. **Basic Communication Skills,** Foundation Books: 2013
4. Means,L. Thomas and Elaine Langlois. **English & Communication For Colleges.** CengageLearning ,USA: 2007
5. Redston, Chris &Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005

MA8151 ENGINEERING MATHEMATICS – I

L	T	P	C
4	0	0	4

OBJECTIVES :

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT III 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 IV 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.

UNIT V DIFFERENTIAL EQUATIONS 12

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

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.

- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

PH8151 ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER **9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS **9**

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS **9**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL :45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.

CY8151 ENGINEERING CHEMISTRY L T P C
3 0 0 3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE 9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H_2-O_2 fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, “Engineering Chemistry”, Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi, 2015.

GE8151 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.

- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

GE8152 ENGINEERING GRAPHICS L T P C
2 0 4 4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

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.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – 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- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal 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 traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12

Sectioning of above 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.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+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 - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

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. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

GE8161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data **from/to files in Python.**

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL :60 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists**,** tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

BS8161 PHYSICS AND CHEMISTRY LABORATORY L T P C
(Common to all branches of B.E. / B.Tech Programmes) 0 0 4 2

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.

5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

OUTCOMES:

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

- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.

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 polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TEXTBOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8^{TH} edition, 2014)

HS8251	**TECHNICAL ENGLISH**	**L T P C**
		4 0 0 4

OBJECTIVES:

The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations , participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newsapapers- **Writing**- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development**- technical vocabulary **Language Development** –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting cgarts, graphs- **Vocabulary Development-**vocabularyused in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talkls on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter –Résumé preparation(via email and hard copy)- analytical essays and issue based essays--**Vocabulary Development**- finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-**Vocabulary Development- verbal analogies Language Development-** reported speech

TOTAL :60 PERIODS

OUTCOMES:

At the end of the course learners will be able to:

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Booth-L. Diana**, Project Work,** Oxford University Press**,** Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English**. Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

MA8251 ENGINEERING MATHEMATICS – II

L	T	P	C
4	0	0	4

OBJECTIVES :

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

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 VECTOR CALCULUS 12

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

UNIT III ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, cz, $\frac{1}{z}$, z^2 - Bilinear transformation.

UNIT IV 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.

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 second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES :

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

PH8202 PHYSICS FOR GEOINFORMATICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand the principles of radiation mechanism, and energy interactions with atmosphere and earth features.
- To gain knowledge about the gravitational fields and its variations on earth.
- To introduce imaging and non-imaging sensors in measuring and recoding energy variations.

UNIT I ELECTROMAGNETIC RADIATION 9

Electromagnetic Spectrum - radiation quantities - spectral quantities - relationship between luminous and radiant quantities - hemispherical reflectance, transmittance and absorbance, measurement of electromagnetic radiation - responsivity - normalization, radiating structures - thermal emission - fluorescent emission - radiation principles - Planck's law, Wien's Displacement Law, Stefan's Boltzmann law, Kirchoff's law.

UNIT II INTERACTION OF EMR WITH ATMOSPHERE AND EARTH'S SURFACE 9

Introduction to atmosphere, atmospheric composition, atmospheric scattering, Rayleigh scattering, Mie scattering, non-selective scattering -atmospheric absorption - atmospheric windows, refraction - interaction of EMR earth's surface - reflection - transmission - spectral signature - reflectance characteristics of Earth's cover type: Vegetation, water, soil - Interaction of microwave with atmosphere and Earth's surface – Radar - Radar operating principle - radar equation - Side Looking Airborne Radar - Definitions: Incidence angle, look angle, depression angle, Azimuth angle – Spatial resolution in radar - Synthetic Aperture radar.

UNIT III OPTICS FOR REMOTE SENSING 9

Lenses, mirrors, prisms - Defects of lens - chromatic aberration - longitudinal chromatic aberration - achromatism of lenses - achromatism for two lenses in contact - separated by a distance - spherical aberration - minimization of Spherical aberration – coma and astigmatism - Radiative Transfer Functions, Lamella Pack, Volume scattering - Principles of photography: black and white photography - sensitivity - speed - characteristic curve - developing and printing - basic colour photography - construction of colour films - film type - types of filter - and its uses.

UNIT IV GRAVITATION AND SATELLITES 9

Newton's law of gravitation - Gravitational field and potential - Determination of gravity, variation of acceleration due to gravity of the earth with depth and with altitude - Variation of acceleration due to gravity and rotation of the earth – Refraction. Diffraction - Fresnel theory, Polarisation, double refraction - Escape velocity - Kepler's law of planetary motion - Doppler effect - Orbital Mechanics, Concept of orbits- propulsion, aero dynamics, navigation guidance and control. Satellites - Types of satellites - Earth observation satellites, Communications satellites, Navigation satellites, Weather satellites, Military satellites and Scientific satellites.

UNIT V ELECTRO-OPTIC NON-IMAGING AND IMAGING SENSORS 9

Photomultipliers, photo resistors, photodiodes, nonselective detectors - Optical receivers: PIN diode and APD - Detectors: Basic detector mechanisms, noise in detectors. Thermal and photo emissive detectors, Photoconductive and photovoltaic detectors, performance limits, Photography: 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 - CCD camera.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will have knowledge on electromagnetic radiation,
- the students will acquire knowledge on interaction of electromagnetic radiation with matter and its applications in radar,
- the students will get knowledge on geometrical optics and its applications in remote sensing,
- the students will gain knowledge on the importance of gravitation and types of satellites for different applications, and
- the students will understand the basics of optical devices and their applications in optolectronics.

TEXT BOOKS:

1. Andrews, D.G. “An Introduction to Atmospheric Physics”, Cambridge University Press, 2010.
2. Manual of Remote Sensing, Published by American Society of Photogrammetry, 1988.
3. Paul Menzel, W. “Remote sensing applications with meteorological satellites”, NOAA Satellite Information Service, 2006.

REFERENCES:

1. Anij Reddy, M. “Textbook of Remote Sensing and Geographical Information systems”, B S Publications, Hyderabad, 2008.
2. Graham Smith, F., King, T.A. & Wilkins, D. “Optics and Photonics: An Introduction”, John Wiley & Sons, 2007.
3. Lillesand, T.M., Kiefer, R.W & Chipman, J.W. “Remote Sensing & Image Interpretation”. Wiley India, 2007.
4. McLean, I.S. “Electronic Imaging in Astronomy: Detectors and Instrumentation”, Springer Science & Business Media, 2008.

BE8201 BASIC ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To provide knowledge in the basic concepts of Electronics Engineering including semiconductors, transistors, electronic devices, signal generators and digital electronics.

UNIT I SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory, Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Half and Full wave rectifiers, Zener effect, Zener diode, Zener diode Characteristics, Zener diode as a regulator.

UNIT II TRANSISTOR AND AMPLIFIERS 9

Bipolar junction transistors – CB, CE, CC configurations and characteristics, Biasing circuits – Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III FET AND POWER ELECTRONIC DEVICES 9

FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV SIGNAL GENERATORS AND LINEAR ICS 9

Positive feedback, Sinusoidal oscillators – RC phase shift, Hartley, Colpitts, Wein bridge oscillators, Operational amplifier – Adder, Inverting and Non-inverting amplifiers, integrator and differentiator, IC 555 based Astable and Monostable Multivibrators.

UNIT V DIGITAL ELECTRONICS 9

Boolean algebra, Logic Gates, , Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to identify electronics components and use of them to design circuits.

TEXT BOOK:

1. Malvino, 'Electronic Principles', McGraw Book Co., 1993.
2. Grob. B and Schultz. M.E. 'Basic Electronics', Tata Mcgraw Hill, 2003.
3.. Thomas L. Floyd, 'Electronics Devices', Pearson Education, 2002.
4. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006

REFERENCES:

1. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.
2. Millman, Halkias Jacob, Jit Christos and Satyabrata, 'Electronic devices and Circuits', Tata McGraw Hill, 2nd Edition.
3. David. A. Bell, "Electric Circuits",Oxford University Press, Seventh impression 2015
4. M.S. Sukhija, T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, Sixth impression 2015
5. Leonard.S.Bobrow, "Foundations of Electrical Engineering", Asian Edition 2013

GI8201 GEOINFORMATICS SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the information concepts and systems used in Geoinformatics
- To familiarize the role of Internet and Networks in Geoinformatics.
- To familiarize scripting languages and geo-database and Information Technology.

UNIT I COMPUTER SYSTEMS 9

Computers - types - components - CPU - memory - Input devices-Output devices - Operating Systems: Windows, Linux–fundamentals - software - system software, application software - file operations.

UNIT II DATA ACQUISITION 9

Acquisition and storage of Numeric data- Textual data - image data - Audio data - Animation and Video data - Data formats - fundamentals of image and video compression - introduction to geospatial data- remote sensing sensors, data organization

UNIT III NETWORKS AND COMMUNICATION 9

Fundamental computer network concepts - Network layers - TCP/IP model - LAN, WAN, WLAN, intranet, Internet - Applications - Essentials of internet - Ethernet - Network Routing - Switching - Data transportation through Network - protocols - Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Cell phone network technologies / architecture.

UNIT IV WEB SCRIPTING 9

Browser fundamentals - Types of servers - web site essentials - Introduction to Scripting languages - Types of scripting languages - Flow Control and Looping - online data handling - Cookies - Simple scripts for database integration - introduction to PHP and MYSQL.

UNIT V GEOINFORMATION 9

Information System - GIS - GPS - Information retrieval system - Geo-database - interactive applications - Multimedia applications - Earth resource platform - Google maps and Google earth - LBS - Introduction to Integration of Geo-database and Social networking applications

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand Computer systems and data formats
- Understand basics of Geoinformation
- Understand the role of complex network systems that handles Geo-information.
- Understand scripting languages and database.

TEXT BOOKS:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'Reilly, 2014.
2. James F. Kurose, “Computer Networking: A Top-Down Approach” Sixth Edition, Pearson, 2012.

REFERENCES:

1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
2. Peter Norton, “Introduction to Computers” Sixth edition, Tata McGraw – Hill, 2008.
3. R. Kelly Rainer, Casey G. Cegielski, Brad Prince, “Introduction to Information Systems”, Fifth Edition, Wiley Publication, 2014.

GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

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 – biogeographical 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 – solid 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 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 production 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:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

GE8261 ENGINEERING PRACTICES LABORATORY L T P C
0 0 4 2

OBJECTIVES:

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 13

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 18

Welding:

(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 13

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- fabricate carpentry components and pipe connections including plumbing works.
- use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and
- fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2. Carpentry vice (fitted to work bench)	15 Nos.
3. Standard woodworking tools	15 Sets.
4. Models of industrial trusses, door joints, furniture joints	5 each
5. Power Tools:	
(a) Rotary Hammer	2 Nos
(b) Demolition Hammer	2 Nos
(c) Circular Saw	2 Nos

(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos
(f) Jigsaw	2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

GI8211 INTRODUCTION TO MATLAB **L T P C**
0 0 4 2

OBJECTIVES:

The student should be made to:

- Be familiar with the MATLAB GUI and basic tool boxes
- Be exposed to vector and matrix operations
- Be familiar with arithmetic, logical and relational operations on matrix

LIST OF EXPERIMENTS:

1. Introduction to SDK of MATLAB
2. Basic Syntax and scalar arithmetic operations and calculations
3. Working with formulas
4. Arithmetic operations in matrix data
5. Matrix operations (Inverse, Transpose)
6. Reading an image file
7. Reading from and writing to a text file
8. Introduction to toolboxes
9. Data visualization and plotting
10. Relational operators in data
11. Logical operation in data

12. Loops in MATLAB
13. Computing Eigen value for a matrix
14. Random number generation - Montecarlo methods

TOTAL: 60 PERIODS

OUTCOMES:

Students will be able to

- Perform data handling in MATLAB environment
- Solve simple matrix problems
- Use built-in toolboxes

REFERENCES:

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Description of Equipment	Quantity
1	Desktop Computer	30 Nos
2	MATLAB 9.1	30 User license

MA8301 TRANSFORMS AND STATISTICS L T P C
4 0 0 4

OBJECTIVES:

- To acquaint the student with Fourier Series techniques used in wide variety of situations in which the functions used are not periodic and to solve boundary value problems
- To understand the Fourier transform techniques to solve boundary value problems
- To introduce the concept of Probability and random variables in Statistics which is central to many geometric applications.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.

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 VARIABLES 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull 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 TESTS OF SIGNIFICANCE 12

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – χ^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 :

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

- Apply Fourier series techniques used in wide variety of situations in which the functions used are not periodic and to solve boundary value problems
- Apply the Fourier transform techniques to solve boundary value problems
- To understand and apply the concept of Probability and random variables in Statistics which is central to many geometric applications.
- To apply the basic concepts of two dimensional random variables.
- To understand the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, New Delhi, 4th Edition, 3rd Reprint, 2008.
3. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2011.

REFERENCES:

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, New Delhi, 7th Edition, 2008.
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier, New Delhi, 3rd Edition, 2004.
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill, New Delhi, 2004.
5. Erwin kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, New Delhi, 2014.

GI8301 CARTOGRAPHY AND GIS CONCEPTS 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 – UTM and UPS references

UNIT II MAP DESIGN AND PRODUCTION 9

Elements of a map - 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 – map reproduction - Map generalization - geometric transformations – bilinear and affine transformations

UNIT III FUNDAMENTALS OF GIS 9

Introduction to GIS - Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Introduction to data quality -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 and GRID 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

UNIT V DATA QUALITY AND OUTPUT 9

Assessment of Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards – Interoperability - OGC - Spatial Data Infrastructure - -Data Output - Map Compilation – Chart/Graphs – v

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student shall

- Be familiar with appropriate map projection and co-ordinate system for production of Maps and shall be able to compile and design maps for the required purpose.
- Be familiar with co-ordinate and datum transformations
- Understand the basic concepts and components of GIS, the techniques used for storage of spatial data and data compression
- Understand the concepts of spatial data quality and data standard

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, 2nd Edition, 2011.
3. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.

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, Prentice Hall of India Publishers, 2006

GI8302 FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING L T P C
2 2 0 4

OBJECTIVES :

- To facilitate the student to develop Object Oriented Programming
- To Familiarize GIS customisation programming using Java and AJAX.

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

Classes and Objects - Member Functions - Nesting of Member Functions Constructors - Destructors -Type Conversions - Inheritance - Base class - Derived Class - Visibility modes - Single Inheritance - Multilevel Inheritance - Multiple Inheritance - Nesting - Polymorphism- File - Opening and Closing - Exercises

UNIT IV JAVA PROGRAMMING 6+6

Java – C++ comparison – Java and portability – Java beans and events – Servlet – applets package – interface – implementation – class hierarchies in Java- Polymorphism and inheritance – data hiding concepts- Java client and server side pages - Customization in GIS.

UNIT V SCRIPTS AND OOP 6+6

AJAX - Introduction – history – libraries - Struts – JSF – Hibernate – Spring – AJAX Programming – Java scripts - Python and Perl- Customization in GIS.

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Concepts of Object Oriented programming techniques
- the tools and procedure involved in programming with C++, Java
- concepts of various scripting languages and their use in GIS customization

TEXTBOOKS:

1. Balagurusamy. E., Object Oriented Programming with C++, Tata McGraw Hill Publications, Fourth edition, 2008
2. Daniel Liang, Introduction to Java Programming, Pearson, Sixth Edition, 2010

REFERENCES:

1. Bjarne Stroustrup, Programming: Principles and Practice using C++, Addison Wesley Publications, First Edition, 2008.
2. Ponnambalam. P and Tiuley Alguindigue, “A C++ Primer for Engineers: An Object Oriented 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/

GI8303 FUNDAMENTALS OF REMOTE SENSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of remote sensing processes and its components.
- To expose the various remote sensing platforms and sensors and to introduce the elements of data interpretation

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 – wave theory, particle theory, Stefan – Boltzmann Law and Wien's Law – visible and non visible spectrum – Radiation sources: active & passive; Radiation Quantities

UNIT II EMR INTERACTION WITH ATMOSPHERE 9

Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere - Scattering (Rayleigh, Mie, non-selective scattering) absorption and refraction – Atmospheric effects on visible, infrared, thermal and microwave spectrum – Atmospheric windows.

UNIT III EMR INTERACTION WITH EARTH MATERIAL 9

Energy balance equation – Specular and diffuse reflectors – Spectral reflectance & emittance – Spectroradiometer / Spectrophotometer – Spectral Signature concepts – Typical spectral reflectance curves for vegetation, soil and water body – Factors affecting spectral reflectance of vegetation, soil and water body.

UNIT IV PLATFORMS AND SENSORS 9

Ground based platforms –Airborne platforms – Space borne platforms – Classification of satellites – Sun synchronous and Geosynchronous satellites – Resolution concepts – Scanners - Along and across track scanners – Orbital and sensor characteristics of different satellites – Airborne and Space borne TIR sensors – Calibration – S/N ratio – Passive/Active microwave sensing – Airborne and satellite borne RADAR –SAR –LIDAR , UAV – High Resolution Sensors

UNIT V DATA PRODUCTS AND VISUAL INTERPRETATION 9

Photographic (film and paper) and digital products – quick look products - High Resolution data products data - ordering – interpretation – basic characteristics of image elements – interpretation keys (selective and elimination) – visual interpretation of natural resources.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- The characteristics of electromagnetic radiation and its interaction with earth features
- The types and configuration of various satellites and sensors
- The elements of data interpretation

TEXTBOOKS:

1. Richards, Remote sensing digital Image Analysis-An Introduction Springer - Verlag 1993.
2. Lillesand, T.M. and Kiefer R.W. Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York, 2002.
3. John, R. Jensen, Introductory Digital Image Processing, Prentice Hall, New Jersey, 4th edition, 2016.
4. George Joseph and Jeganathan. C, Fundamentals of Remote Sensing, Universities Press, 3rd edition, 2018

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, 2003.

GI8304 PLANE AND GEODETIC SURVEYING L T P C
4 0 0 4

OBJECTIVES:

- To introduce the rudiments of plane surveying and geodetic principles to Geoinformatics Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world problems.
- To introduce the concepts of Control Surveying
- To introduce the basics of Astronomical Surveying

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING 12

Definition- Classifications - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Chain traversing - Compass – Basic principles - Types - Bearing - System and conversions- Sources of errors and Local attraction - Magnetic declination-Dip-compass traversing - Plane table and its accessories - Merits and demerits - Radiation – Intersection - Resection – Plane table traversing.

UNIT II LEVELLING 12

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 - Contouring.

UNIT III THEODOLITE SURVEYING 12

Horizontal and vertical angle measurements - Temporary and permanent adjustments – Heights and distances–Tacheometric surveying – Trigonometric levelling – Horizontal curves in route surveying – classification, functions and requirements - methods of setting out simple curves - setting out transition curves by offsets and angles

UNIT IV CONTROL SURVEYING AND ADJUSTMENT 12

Horizontal and vertical control- Methods - Triangulation- Base line - Instruments and accessories – Corrections - Satellite station - Traversing - Gale‘s table. Concepts of measurements and errors – error propagation and linearization – adjustment methods – least square methods – angles, lengths and levelling network – simple problems.

UNIT V ASTRONOMICAL SURVEYING 12

Astronomical terms and definitions - Motion of sun and stars - Celestial coordinate systems – different time systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- The use of various surveying instruments in mapping
- The error and adjustments procedures associated with surveying and mapping
- The methods used for establishment of horizontal and vertical control
- Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth

TEXTBOOKS:

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth 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 , Twelfth Edition. 2013
6. C.Venkatramaiah, Textbook of Surveying, Universities Press, Second Edition, 2011

EC8491 COMMUNICATION THEORY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of various analog modulations and their spectral characteristics
- To understand the properties of random process
- To know the effect of noise on communication systems
- To study the limits set by Information Theory

UNIT I AMPLITUDE MODULATION 9

Amplitude Modulation- DSBSC, DSBFC, SSB, VSB - Modulation index, Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope –comparison of different AM techniques, Superheterodyne Receiver

UNIT II ANGLE MODULATION 9

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth - FM modulation –Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT III RANDOM PROCESS 9

Random variables, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT IV NOISE CHARACTERIZATION 9

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase – Noise performance analysis in AM & FM systems – Threshold effect, Pre-emphasis and de-emphasis for FM.

UNIT V SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM.

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design AM communication systems
- Design Angle modulated communication systems
- Apply the concepts of Random Process to the design of Communication systems
- Analyze the noise performance of AM and FM systems
- Gain knowledge in sampling and quantization

TEXTBOOKS:

1. J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, Pearson Education 2014. (UNIT I-IV)
2. Simon Haykin, “Communication Systems”, 4th Edition, Wiley, 2014.(UNIT I-V)

REFERENCES

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford University Press, 2007.
2. D.Roody, J.Coolen, —Electronic Communications, 4th edition PHI 2006
3. A.Papoulis, “Probability, Random variables and Stochastic Processes”, McGraw Hill, 3rd edition, 1991.
4. B.Sklar, “Digital Communications Fundamentals and Applications”, 2nd Edition Pearson Education 2007
5. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006
6. Couch.L., "Modern Communication Systems", Pearson, 2001.

GI8311 PLANE AND GEODETIC SURVEYING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVE:

- To familiarize with the various surveying instruments and methods.

EXCERCISES : **4 hours each**

1. Chain traversing
2. Compass traversing
3. Plane table surveying – Method of intersection
4. Plane table surveying – Three point problem(any one method)
5. Plane table surveying – Two point problem
6. Plane table traversing
7. Fly leveling using dumpy/tilting level
8. Check leveling using dumpy/tilting level
9. Measurement of horizontal and vertical angles using theodolite.
10. Determination of tacheometric constants using horizontal and inclined line of sight.
11. To determine the elevation of an object using single plane method when base is accessible and inaccessible
12. To determine the distance and difference in elevation between two inaccessible points using double plane method.
13. Heights and distances by stadia and tangential tacheometry
14. Theodolite traversing
15. Extra meridian observation to determine azimuth (Demonstration only).

TOTAL: 60 PERIODS

OUTCOME:

- At the end of the course the student will be able to use various surveying instruments like chain, compass, plane table, level and theodolite for mapping.

REFERENCES:

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2005

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, 1952
6. David Clark and James Clendinning, Plane and Geodetic Surveying for Engineers, Volume II, Constable and Company Ltd, London, 1958
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 , Tenth Edition,2008

INSTRUMENTS REQUIRED FOR A BATCH OF 30

1. Metric Chain – 15 Nos.
2. Cross Staff - 15 Nos.
3. Metallic tape (30 m length) – 15 Nos.
4. Steel arrows – 150 Nos.
5. Prismatic Compass – 15 Nos.
6. Plane table with accessories – 15 Nos.
7. Dumpy level – 15 Nos.
8. Tilting level – 15 Nos.
9. Levelling Staff – 15 Nos.
10. Theodolite – 15 Nos.
11. Ranging rod – 150 Nos.

GI8312 CARTOGRAPHY AND GIS LABORATORY L T P C
0 0 4 2

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: 60 PERIODS

OUTCOMES:

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

- To design and produce thematic maps with suitable projection, symbols and color codes
- To compile and develop digital maps
- To create spatial database and nonspatial databases in GIS environment
- To analyse spatial database and generate reports, maps

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, 2006

LIST OF EQUIPMENTS:

1. i7 computer system with minimum 4GB RAM, 500GB HDD - 15 nos for 30 students
2. Standard GIS Software - 15 user licenses
3. Two students can be allotted per system per session.

HS8381 INTERPERSONAL SKILLS/LISTENING AND SPEAKING L T P C
0 0 2 1

OBJECTIVES:

The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

UNIT I

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL :30 PERIODS

OUTCOMES:
At the end of the course Learners will be able to:
Listen and respond appropriately.
Participate in group discussions
Make effective presentations
Participate confidently and appropriately in conversations both formal and informal

TEXTBOOKS:
1. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards,C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:
1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

MA8401 NUMERICAL METHODS AND GRAPH THEORY L T P C
4 0 0 4

OBJECTIVES:
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of empirical laws and curve fitting which play an important role in engineering and technology disciplines.
- To introduce basic concepts of graph theory to apply in engineering disciplines.
- To understand some algorithms to apply in engineering applications.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method and by Jacobi's method.

UNIT II INTERPOLATION AND APPROXIMATION 12
Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III EMPIRICAL LAWS AND CURVE-FITTING 12
Graphical methods - Laws reducible to the linear law - Method of group averages - Laws containing three constants - Principle of least squares - Method of least squares - Fitting of other curves - Method of movements.

UNIT IV INTRODUCTION TO GRAPH THEORY 12
Definition and examples of graphs - Subgraphs - Complement of a graph - Matrix representation of a graph - Graph isomorphism - Paths and cycles in graph - Euler trails and circuits - Hamilton paths and cycles - Definition and example of trees.

UNIT V GRAPH ALGORITHMS 12

Rooted trees, trees and sorting, Dijkstra's and Prim's algorithm for minimum spanning trees, The Max-Flow Min-Cut theorem for network flows.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Apply the basic concepts of solving algebraic and transcendental equations.
- Apply the numerical techniques of interpolation in various intervals in real life situations.
- Understand the numerical techniques of empirical laws and curve fitting which play an important role in engineering and technology disciplines.
- Apply the basic concepts of graph theory in engineering disciplines.
- Appreciate the importance of some algorithms in applying in engineering applications.

TEXTBOOKS:

1. Grewal, B.S. and Grewal,J.S., “Numerical methods in Engineering and Science”, Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Ralph P. Grimaldi, "Discrete and combinatorial Mathematics", Pearson Education, Asia, 4th Edition, 2002.

REFERENCES:

1. Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 7th Edition, Special Indian edition, 2011.
3. Laurene V. Fausett, “Applied Numerical Analysis using MATLAB”, Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.
4. S. R. K. Iyengar, R. K. Jain, Mahinder Kumar Jain, "Numerical Methods for Scientific and Engineering Computation", 6th Edition, New Age International Publishers, New Delhi, 2012.
5. Tremblay J.P. and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

GI8401 GEOLOGY FOR GEOINFORMATICS L T P C
3 0 0 3

OBJECTIVES :

- To make the students realize the importance of Geology in understanding Geoinformatics.
- To familiarize the students about the various mineral and fuel resources and natural hazards.

UNIT I THE 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:

By the end of the course the student will be able to understand the structure of earth and geological structures with following

- The importance of minerals, ores and rocks will be understood.
- The concepts of geomorphology and natural hazards will also be understood.
- The role of geophysics and remote sensing for natural resources inventory and to study and understand the planetary geology

TEXTBOOKS:

1. Venkatareddy. D. Engineering Geology, Vikas Publishing House Pvt. Ltd. 2010.
2. N. Chenna Kesavulu. Textbook of Engineering Geology, Macmillan India Ltd., 2009.
3. Parbin Singh. A Text book of Engineering and General Geology, Katson publishing house, Ludhiana 2009.
4. Arnaud Gerkens, J.C. Foundation of exploration geophysics. Amsterdam; New York: Elsevier; New York, NY, USA., 2002.
5. S.N. Pandey, Principles and Applications of Photo geology: New Age International (P) Ltd., New Delhi. 1988.

REFERENCES:

1. Ravi P. Gupta, Remote Sensing Geology, Springer-Verlag New York, 2002.
2. Robert J.Twiss, Eldridge. M.Moores, Structural Geology W.H.Freeman and Co-New York 2007.
3. Bloom, A.L. Geomorphology: A systematic analysis of late Cenozoic landforms. Waveland press, INC. Long Grove, Illinois. 1998.
4. Sabins F.F. Remote Sensing, Principles and Interpretation 1996 W.H. Freeman and Co.

GI8402 ELEMENTS OF PHOTOGRAMMETRY L T P C
4 0 0 4

OBJECTIVE:

- To introduce basics and concepts of optics, Aerial photography acquisition and mapping from Aerial photographs.

UNIT I PRINCIPLES AND PROPERTIES OF PHOTOGRAPHY 12

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

UNIT II GEOMETRIC PROPERTIES OF AERIAL PHOTOGRAPHS 12

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

UNIT III STEREO PLOTTERS AND ORIENTATION 12

Projection system, Viewing, Measuring and Tracing system - parallelogram - Stereo plotters – Classification – Analog, semi analytical, Analytical and Digital; Analog Stereo Plotters - Interior orientation- Relative orientation- Absolute orientation; Analytical plotters- Interior Orientation: Two dimensional coordinate transformations – Collinearity condition and Coplanarity condition - Relative orientation - Three dimensional conformal coordinate transformation -

UNIT IV AEROTRIANGULATION, TERRAIN MODELING, ORTHOPHOTO 12

Absolute orientation – Aerotriangulation: –Bundle Adjustment– DTM, DEM and DSM, Rectified photo, Orthophoto and True Orthophoto.

UNIT V DIGITAL PHOTOGRAMMETRY 12

Photogrammetric Scanner – Digital Photogrammetry Work Station and its components – Analytical stereo plotters vs Digital Photogrammetry - Work Station Basic system function – Storage System – Stereoscopic Viewing and Measuring System–Photogrammetry project Planning - Other acquisition systems – UAV – terrestrial imaging, Oblique Photography, Close Range Photogrammetry, terrestrial and mobile LIDAR

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Photographic process and characteristics of tools used in photogrammetry
- Concepts of stereoscopy and geometry of various types of photographs
- The process of Planning photogrammetric operations
- The use of stereoplotters in map preparation and orthophoto generation

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. Gollfried Konecny, Geoinformation: Remote Sensing, 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

GI8403 GEO DATABASE 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 OF SPATIAL DATA BASE SYSTEM 9

Exploring Spatial Geometry, Organizing spatial data, Spatial data relationships and functionalities SDBMS – Customization – Big Data and Analytics – Tools.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Concepts and architecture of SDBMS
- Concepts of SQL and generation of queries
- Concepts of spatial data storage and design of SDBMS

TEXTBOOKS:

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

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth and S.Sudharshan, —Database System Concepts||, Sixth edition, McGraw Hill, 2011
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

GI8404 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

State of the atmosphere; Main constituents; Elements of radiative transfer in atmosphere- Basic quantities, Blackbody radiation – basic laws - Radiative transfer equation, Physics of Gaseous absorption, emission, Scattering, Solar radiation and surface reflection; Radiation balance;

UNIT II WEATHER SATELLITES AND SENSING SYSTEMS 9

Operational polar orbiting and geostationary satellites, weather sensors, Satellite data archives; — INSAT and KALPANA – TRMM and GPM and others; Ground based sensors: AWS, ARG, Beacons, Doppler Radar, Flux Tower.

UNIT III WEATHER SATELLITE DATA PROCESSING 9

RADAR, Visible and IR data processing; Hydrometeorological parameter retrieval; Temperature, Rainfall, water vapour, Aerosol, Wind: speed, direction;Lighting-detection

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, Cloud Burst.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Concepts of satellite meteorology and satellite sensors useful for the same
- The applications of meteorological studies in resource management, disaster management

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. Atmospheric science – An introductory Survey – John M Wallace and Peter V Hobbs. 2nd edn, 2006
2. Satellite meteorology: online remote sensing guide. Prepared by WW2010, Urbana Champaign: University of Illinois. Online access: http://ww2010.atmos.uiuc.edu/(Gh)/guides/rs/sat/home.rxml
3. Asnani, G.C – Tropical Meteorology||, Vol.I and II, 1993
4. Doviak and Zrnic, – Doppler Radar and Weather observations||, Academic press, London,1992.
5. Sauvageot, – Radar Meteorology||, Artech House Publishers, Norwood, MA, 1992
6. 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.

GI8491 TOTAL STATION AND GPS SURVEYING L T P C
3 0 0 3

OBJECTIVE :

- To understand the working of Total Station equipment 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- 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 - pressure transducers.

UNIT II ELECTRO-OPTICAL AND MICROWAVE 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 III 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 IV 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 available in the market.

UNIT V HYDROGRAPHIC, MINE AND CADASTRAL SURVEYING 9

Reconnaissance – Route surveys for highways, railways and waterways – Hydrographic survey- Tides – MSL – Sounding methods – Three point problem – River surveys – Measurement of current and discharge – Mine surveying Equipment – Weisbach triangle – Tunnel alignment and setting out – Transfer of azimuth – Gyro Theodolite – Shafts and audits - Cadastral survey- Legal – Real – Tax cadastre – Land record system – Settlement procedure – deformation studies.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Working principles of total station and GPS instruments
- Propagation of EMR through atmosphere and corrections for its effects
- The functioning various types total station and GPS equipments and their applications
- Various techniques available for surveying and mapping with total station and GPS.

TEXTBOOKS:

1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996
2. Satheesh Gopi, rasathishkumar, N.madhu, – Advanced Surveying, Total Station GPS and Remote Sensing – Pearson education , 2007 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, 1993.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.
4. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
5. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 1998

GI8411 REMOTE SENSING AND PHOTOGRAMMETRY LABORATORY L T P C
0 0 4 2

OBJECTIVE:

- This course will facilitate the students to have hands on experience on different steps of visual interpretation of satellite images & photographs and digital interpretation of photographs.

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 / Aerial Photograph. 4
4. spectral measurements using spectroradiometer and processing for
   (a) Water & Soil 4
   (b) vegetation
   (c) Various surfaces and landcover 4

PHOTOGRAMMETRY EXERCISES

1. Testing stereovision with Stereogram card 4
2. Mirror stereoscope- base line, orientation of aerial photographs and Photo Interpretation 4
3. To find the height of point using Parallax bar 4
4. Scale of vertical photographs 4
5. Aerial Triangulation using digital photogrammetry 4
6. Bundle Block adjustment 4
7. Generation and editing of DTM and Contour 4
8. Orthophoto generation and Mosaic 4
9. Preparation of Planimetric map 4

TOTAL : 60 PERIODS

OUTCOME:

- On completion of this course, the student shall be able to acquire skills to carry out the Lab Exercises independently on visual interpretation of satellite images and digital processing of aerial photographs.

The following instruments and software are required

Sl. No.	Instrument	Numbers
1.	Light Table	10
2.	Computer	10
3.	Spectroradiometer	1
4.	Pocket Mirror Stereoscope	10
5.	Mirror Stereoscpe	10
6.	Parallax bar	10
7.	Digital Photogrammetry Software (Free software also available)	5 (licenses)
8.	Anaglyphic Glass	20
9.	CAD software (Free software also available)	5 (licenses)

GI8412 TOTAL STATION AND GPS SURVEYING LABORATORY L T P C
0 0 4 2

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

TOTAL : 60 PERIODS

OUTCOMES:

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

- Work with Total Station and GPS instruments for measurement and mapping
- Use Total Station and GPS for alignment and setting out works

REFERENCE:

1. Satheesh Gopi, rasathishkumar, N.madhu, — Advanced Surveying , Total Station GPS and Remote Sensing — Pearson education , 2007 isbn: 978-81317 00679

LIST OF EQUIPMENTS

1. One Total Station equipment for every 10 students
2. One Handheld GPS equipment for every 10 students
3. One Geodectic GPS recevier for every 10 students

HS8461 ADVANCED READING AND WRITING L T P C
0 0 2 1

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph

UNIT II

Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing- State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III

Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-Writing- Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV

Reading- Genre and Organization of Ideas- Writing- Email writing- visumes – Job application-project writing-writing convincing proposals.

UNIT V

Reading- Critical reading and thinking- understanding how the text positions the reader- identify Writing- Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course Learners will be able to:

- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
2. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

REFERENCES:

1. Davis, Jason and Rhonda LIss.Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004

GI8501 HYPERSPECTRAL AND MICROWAVE REMOTE SENSING **L T P C**
3 0 0 3

OBJECTIVES :

- To introduce the concepts of remote sensing processes and its components.
- To expose the various remote sensing platform and sensors and to introduce the elements of data interpretation

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 IMAGE 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 - SLAR, Resolution concepts - Synthetic aperture RADAR - SAR image Characteristics - Topographic effect – SAR Missions – ERS, JERS, RADARSAT, ENVISAT, TerraSAR X,RISAT – Scatterometer, Altimeter.

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

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- The characteristics of electromagnetic radiation and its interaction with earth features
- The types and configuration of various satellites and sensors
- The concepts of thermal and hyperspectral remote sensing and their applications
- The concept, processing of LIDAR and its applications

TEXTBOOKS:

1. Richards, Remote sensing digital Image Analysis-An Introduction Springer - Verlag,1993.
2. Lillesand, T.M. and Kiefer R.W. Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York, 2002.
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, 2003.
4. Woodhouse lain.H, Introduction to Microwave Remote Sensing Taylor & Francis 2006.

GI8502	SATELLITE 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 SENSOR MODEL AND PRE PROCESSING 9

Image Fundamentals – Sensor model – 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:

At the end of the course the student will be able to understand

- Various components and characteristics of image processing systems
- The concepts of image geometry and radiometry and corrections
- Various types of image enhancement techniques used for satellite image processing
- The concepts of Image classification and use of various classifiers
- Various object recognisation techniques available for extraction of features

TEXT BOOKS :

1. John, R. Jensen, Introductory Digital Image Processing, Prentice Hall, New Jersey, 2005 3rd edition.
2. Robert, A. Schowengergt, Techniques for Image Processing and classification in Remote Sensing, 1983.

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 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 (2007)

GI8503 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 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

OUTCOME:

- At the end of the course, students will be able to apply the concepts of Artificial Neural Network, Fuzzy logic, Genetic algorithms and also their application in Geomatic.

TEXTBOOKS:

1. Freeman J.A. and Skapura B.M., "Neural Networks, Algorithms Applications and Programming Techniques", Addison-Wesely, 1990
2. Jang J.S.R.,Sun C.T and Mizutami E - Neuro Fuzzy and Soft computing Prentice hall New Jersey,1998

REFERENCES:

1. Timothy J.Ross:Fuzzy Logic Engineering Applications. McGraw Hill,NewYork,1997.
2. Laurene Fauseett: Fundamentals of Neural Networks. Prentice Hall India, New Delhi,1994.
3. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall Inc., New Jersey,1995
4. Nih.J. Ndssen Artificial Intelligence, Harcourt Asia Ltd.,Singapore,1998

GI8511 GEO DATABASE LABORATORY L T P C
0 0 4 2

OBJECTIVE :

- To get practical experience on the server – client setup on the database Management system and extending it to spatial data handling

EXERCISES:

1. Basics of Database
   - Field, Record, table and relationships concepts on file type database
2. Server / client operations
   - Starting / Shutdown of server
   - Client user creation
   - client connection over network
3. Data Definition of Tables
   - Creation, Deletion and Modification of definition
4. Data Manipulation
   - Insert, delete and modify table data
5. Simple Queries
   - On single table
   - Linking with multiple tables
   - With simple conditions
6. Views
   - Creation of views
   - Querying on views
7. Queries on Tables and views
   - Simple, Complex, nested queries using the tables and views
8. Data Control of Tables and Views
   - Defining different constraints
   - Handling different permissions on tables and views
9. Index on tables
10. Database triggers
11. Spatial data creation
    - Creation of simple geometries (point, line and polygon) on database
12. Indexing and viewing spatial data
13. Topological querying on spatial data
14. Geometrical functions and analysis
    - Area and length, Buffer, Union and intersection
15. Front end tool applications
    - Designing of database application with any front end tool

TOTAL : 60 PERIODS

OUTCOMES:

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

- Create database structure and populate database
- Apply geometric functions to derive spatial parameters
- Apply simple overlay and buffering tools on spatial database

REFERENCE:

1. Abraham Silberschatz, Henry F. Korth and S.Sudharshan, — Database System Concepts, Sixth edition, McGraw Hill, 2011.

LIST OF EQUIPMENTS:

1. i7 computer system with minimum 4GB RAM, 500GB HDD - 15 nos for 30 students
2. Standard DBMS software with spatial data handling (Example: PostgreSQL DBMS with postgis)
3. Two students can be allotted per system per session.

GI8512 SATELLITE 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.

EXERCISES:

Performing Following Task

1. Study of image file formats and organization
2. Preprocessing techniques : radiometric correction & alterations
3. noise removal
4. Preprocessing techniques : Ground control and rectification
5. Image reading and writing
6. Enhancements – histogram, filters
7. Band ratioing and normalization – NDVI,SAVI & NDWI
8. Data reduction
9. Image fusion
10. Classification – supervised & unsupervised
11. Sub pixel classification
12. PCA
13. Accuracy assessment – correlation, RMSE & kappa
14. Image transformations
15. Vectorisation, & map compilation

TOTAL : 60 PERIODS

OUTCOMES:

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

- Enhance satellite imagery through filtering, band ratioing, PCA etc
- Georeference and project satellite imagery
- Classify and assess accuracy of classification.

REFERENCE:

1. Richards, Remote sensing digital Image Analysis - An Introduction Springer -Verlag 1993.

LIST OF EQUIPMENTS:

1. Number of i7 Computer system - 15 for 30 students (two students per system)
2. Standard Satellite image processing software - 15 user licenses
3. Satellite data in different spatial resolution and corresponding Toposheets
4. A1 size Scanner and Color plotter

GI8601 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

Hydrologic cycle - estimation of various components – clouds - rainfall – runoff – evaporation – transpiration – evapo-transpiration – interception – depression storage - Spectral properties 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 RISK AND DAMAGE ASSESSMENT 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 flood mitigation – drought – types – assessment of droughts and mitigation - water harvesting structures

UNIT IV GROUND WATER MODELLING 9

Origin – classification and properties of aquifer – ground water potential identification – surface indicators – aquifer parameters – hydrologic budgeting – different types of ground water models – mathematical modelling of ground water system - seawater intrusion – interfacing GIS with ground water model - artificial recharge of ground water.

UNIT V IRRIGATION AND 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:

At the end of the course the student will be able to understand

- The components of hydrologic system and their measurement through remote sensing systems
- The techniques useful for assessment of Risk and Damage due to water related disasters using remote sensing and GIS
- The modeling tools for ground water flow modeling .Assess the irrigation water requirement and watershed management through intervention of remote sensing and GIS tools

TEXTBOOKS:

1. Gert A. Schultz, Edwin T. Engman, Remote Sensing in Hydrology and Water Management, Springer Berlin Heidelberg -2012.
2. S. K. Gupta, Modern Hydrology and Sustainable Water Development, John Wiley & Sons – 2011.
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– 2002.

2. Dorota Swiatek, Stefan Ignar, Modelling of Hydrological Processes in the Narew Catchment, Springer Berlin Heidelberg - 2011
3. Tim Davie, Fundamentals of Hydrology Second edition, Taylor & Francis -2008
4. Prof. Dawei Han, Concise Hydrology, Createspace Independent Pub - 2010
5. L. Asawa, Irrigation and Water Resources Engineering, New Age International - 2008

GI8602 OPEN SOURCE GIS L T P C
3 0 0 3

OBJECTIVE:

- The open source options are for research and development. It helps the candidate to think creatively and independently in Geoinformatics project implementation. It also gives complete freedom to modify the software to suit the needs. The course exposes to major avenues of open source opportunities.

UNIT I BASICS 9

Open Source Software and Free ware W3C, WWW and Protocols – Software standards and open source GIS -OGC, GDAL and OSGeo, FOSS4G - Open source software for Desktop GIS and WEB mapping - Proprietary vs Open source - OGC Standards.

UNIT II DEVELOPMENT ENVIRONMENT 9

Linux and Windows – Post-gre SQL and Data base Engines - C,C++, OOP and Java streams - GNU,Mosix – WAP and Android stack –Scripts and Macros.

UNIT III DESKTOP GIS 9

View Graphics – Data exchanges- portability and interoperability – Raster handling and Image analysis – vector data management –Rater and vector analysis - 2D/3D vectors with topology, 3D Voxel, 2D Raster.

UNIT IV DATA BASE MANAGEMENT AND USER INTERFACE 9

Files vs Database - Distributed operations and Architecture – ODBC - Open source Database management tools- Database: Spatial and Attribute queries Spatial functions and Analysis – Map Server, Application Server and Data Base server concepts.

UNIT V OPEN SOFTWARE AND WEB MAPPING 9

Open Source Software : GRASS, QGIS, OSSIM, Post-gre SQL and R Environment – WEB Mapping Architecture and components – WEB mapping servers- Thin clients in WEB mapping - WMS,WFS, WCS,WPS and Restful web services- Open Server standards, Open API.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand.

- Concepts and protocols used in Open Source GIS .
- Functionalities of Open Source GIS software in Desktop and Web based environments.
- The availability of various Open Source GIS software and their architecture.

TEXTBOOKS:

1. Mitchell T (2005) ‗Web mapping illustrated', O'Reilly Media Inc., Sebastopol, Canada
2. Neteler M, Helena M (2008) ‗Open source GIS: A GRASS GIS approach', 3rd edn, Springer, New York
3. Bill Kropla(2005) Beginning Map Server: Open Source GIS Development, A press(Springer Verlog) New york.

REFERENCE:

1. Peng, Z.R. and Tsou, M.H. Internet GIS: distributed geographic information services for the Internet and wireless networks. New York: John Wiley and Sons, New york, 2003

GI8603 **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**

GeodemographicAnalysis – 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:

At the end of the course the student will be able to understand

- The basics of Urban mapping and Plan preparation.
- The application of remote sensing in urban mapping.
- The role of remote sensing in preparation of urban plans.
- The modeling techniques for modeling and prediction of future land use scenarios

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, 1st edition, CRC Press, 2006

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

GI8604 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:

At the end of the course the student will be able to understand

- Different tools available in GIS for analysis Raster and Vector data
- GIS functionalities to analysis network and surface data set
- The possibilities of customization of GIS
- The architecture of Web GIS and its applications
- Concept of recent techniques like mobile mapping and LBS

TEXTBOOKS:

1. Kang – tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFERENCES:

1. Michael N. DeMers, Fundamentals of geographic information systems, Wiley,2009
2. John Peter Wilson, The handbook of geographic information science, Blackwell Pub.,2008

GI8605 GEODESY L T P C
4 0 0 4

OBJECTIVE:

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

UNIT I FUNDAMENTALS 12

Definitions- Classifications, Applications, Problem of Geodesy 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. Geodetic Control (Horizontal and Vertical) – Standards. Methods and Computations.

UNIT II GEOMETRIC GEODESY 12

Geomentry 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. 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. Deflection of Vertical, Spherical excess. Astro-Geodetic method of determining the reference Spheroid.

UNIT III PHYSICAL GEODESY 12

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, 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 IV GEODETIC ASTRONOMY 12

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

UNIT V GEODETIC COMPUTATIONS 12

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

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Fundamentals of Geodesy, Techniques involved in establishment of geodetic control
- Concepts of geoid, ellipsoid and their interrelationship
- Various types of coordinate systems and relationship between them
- Methods required for computation of geodetic and astronomical parameters
- The methods for measurement of gravity and gravity network

TEXTBOOKS:

1. Wolfgang Torge, Geodesy, Walter De Gruyter Inc., Berlin, 2001.
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 2002.
4. James R.Smith, Introduction to Geodesy, John wiley & Sons Inc. 1997.

GI8611 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:

A Raster Analysis

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

B Vector Analysis

5. Attribute analysis & Data extraction
6. Overlay and Cost weighted overlay
7. Proximity – Buffer analysis

C Network Analysis

8. Network Conflation, Geocoding
9. Short route analysis
10. Service area, Closest facility analysis

D Surface Analysis

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

E Customization

14. Scripting/ embedded scripts
15. Batch Processing and WebGIS demo

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to

- Analysis Raster and Vector data using various tools available in GIS
- Customize GIS environment writing simple scripts
- Appreciate use of WEB GIS in dissemination of spatial data sets.

REFERENCE:

1. Michael N. DeMers, Fundamentals of geographic information systems, Wiley, 2009

LIST OF EQUIPMENTS:
Each Batch should contain a maximum of 30 students.

Hardware Requirements: 1. Desktop Computers - 15 Nos.
2. A4 Scanner with minimum of 600 dpi resolution - 1 No
3. Printer/ Plotter - 1 No.

Software Requirements: GIS software with Spatial, Network and 3D Analysis tools - 15 Nos.
(Open source GIS software with above capabilities can also be used

GI8612 SURVEY CAMP (2 WEEKS DURING V SEMESTER WINTER) L T P C 0 0 0 2

Two weeks Survey Camp will be conducted during winter in the following activities:

1. Triangulation
2. Trilateration

OUTCOMES:

- At the end of the course the student will be able to apply the surveying techniques in field to establish horizontal and vertical control network using modern surveying equipments.
- Students will also be exposed to modern mapping techniques.

GI8701 AGRICULTURE AND FORESTRY FOR GEOINFORMATICS 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 FOR SOIL 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:

At the end of the course the student will be able to understand

- Characterization of crops using Remote Sensing tools
- The concepts of soil mapping through remote sensing
- The evaluation of land capability for better land use planning

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. Jensen, J.R., Remote Sensing of the Environment - An Earth Resource Perspective. Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2001
2. Agarwal, C.S. and P.K.Garg, Textbook on Remote Sensing in Natural Resources Monitoring and Management. Wheeler Publishing, New Delhi, 2000
3. Narayan, L.R.A., Remote Sensing and its Applications. Universities Press (India) Ltd.,Hyderabad, 2001.

GI8702 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 – Inference Techniques – Types of Reasoning deductive, inductive, adductive, analogical and non-monotonic – Rule based Expert system - Evolution – Architecture - Evolution – Architecture - conflict resolution - types of inference: forward and backward chaining - search techniques - Case studies: MYCIN, PROSPECTOR – R Environment - 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

OUTCOME:

- At the end of the course, the student will be able to understand the concept of the Expert Systems, fuzzy logic and operation research techniques and their application in Geoinformatics Engineering.

TEXTBOOKS:

1. Peter Jackson, — Introduction to Expert systems||, Pearson Education, 2004.
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, 2003.
4. Ermine.J.I, — Expert Systems: Theory and Practice||, Prentice

GI8703 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- afforestation- EMR responses with contaminated soil - modeling soil characteristics using satellite data-soil degradation assessment using Remote Sensing and GIS- Land reclamation.

UNIT III ECOLOGY AND ECOSYSTEM 9

Conservation and resource management - spectral reflectance from vegetated surface - Stress monitoring - Land cover and Land use mapping - forest conservation - Biodiversity-biomonitoring of the environment and Remote Sensing - wild life studies - Revenue management-environment and ecological concerns- Resource development in remote areas-Impacts of anthropogenic activity- Solid Waste management, Design of collection network using GIS.

UNIT IV AIR POLLUTION AND GLOBAL CLIMATOLOGY 9

Air Pollutants- Dispersion modeling -Air quality monitoring - case studies -climatology - emissivity characteristics- measurements of atmospheric temperature – composition - constituent distribution and concentration- wind flows and air circulation – Hurricane tracking - meteorological satellite systems.

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:

At the end of the course the student will be able to appreciate

- The possible applications of Remote Sensing and GIS in water quality, soil conservation and ecology
- The availability various remote sensing sensors for acquiring environmental datasets
- The use of satellite remote sensing in climatology and air pollution studies

TEXTBOOKS:

1. Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc, April 2004.
2. Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, Second edition, Chapman and Hall, New York, 1993.

REFERENCE:

1. Lintz, J.and Simonent, D.S.Remote sensing of environment Addision Wesley, Rading mars, 1976.

GI8711 **INDUSTRIAL TRAINING** **L T P C**
(4 WEEKS DURING VI SEMESTER - SUMMER) **0 0 0 2**

OBJECTIVES:

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

STRATEGY:

a) The Student individually contact the organizations involved in Geoinformatics Activities with the help of the Coordinator and fix the training period and Type of Training.
b) The Students shall be evaluated on the basis of 1) Dairy 2) Training Report 3) Viva-Voce Examination. The evaluation committee consists of (1) Coordinator (2) Staff Member (3) Expert Member
c) The Student maintain the day wise work diary while undergoing the training and get it endorsed by the supervising officer : it shall be submitted as part of evaluation

THE REPORT:

a) The Student prepares the document for the individual training following the principles of documentation standards with necessary flowcharts, diagrams, photographs and other details as the case may be. The document will be part of evaluation
b) The Student shall enclose a certificate duly signed from the Supervising Officer of the Place of Training and Coordinating Faculty
c) The Viva-Voce Examination shall be part of evaluation

GI8712 **TECHNICAL SEMINAR** **L T P C**
0 0 2 1

AIM: To work on a specific technical topic in Civil Engineering and acquire the skill of written and oral presentation. To acquire writing abilities for seminars and conferences.

TOTAL: 30 PERIODS

STRATEGY:

The students will work for two hours per week guided by a group of staff members. They will be asked to talk on any topic of their choice and to engage in dialogue with the audience. A brief copy on their talk also should be submitted. Similarly, the students will have to present a seminar of not more than fifteen minutes on the technical topic. They should also answer the queries on the topic. The students as the audience also should interact. Evaluation will be based on the general and technical presentation and the report and also on the interaction shown during the seminar.

GI8811 **PROJECT WORK** **L T P C**
0 0 20 10

OBJECTIVES:

- The focus on project work is to enable the students to work individually or as a group of not more than four members on a project involving comprehension of their skills either on experimental or application studies related to Geoinformatics implementation. If more than one student is involved, the project shall be divided into part I, Part II etc, and each student has to concentrate in one of the parts. The group project may be on (i) one problem and

segments of results or (ii) one problem solution (methodology) and different applications. Every project work shall have a guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time Table and the time shall be utilized by the students to receive directions from the guide, library reading, laboratory work, computer analysis or field work and to present the progress made in the project. The student shall maintain a weekly progress chart and attach the same in the report along with the signature of the guide. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, methodology, project work details, results and conclusions. This final report shall be typewritten form as specified in the guidelines. The report shall follow the guidelines for format, structure, text size, number of pages and other style manual standards prescribe by the University. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

TOTAL: 300 PERIODS

GI8001 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:

At the end of the course the student will be able to understand

- The concepts of climate change and effects of anthropogenic impacts
- The methods for analysis of climate change and corresponding hazards
- The methods and models available for prediction of future scenarios

TEXTBOOKS:

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

REFERENCES:

1. Richard Somerville'|| the forgiving Air: understanding Environmental change, II Edition.
2. Heidi cullen, The weather of the future; heat waves, extreme storms, and other scenes from a climate changed planet.
3. Stephen H Schneider, —Science as a contact sp
4. ort inside the battle to save earth's climate.
5. James Hoggan Climate cover up; the crusate to Deny global warming.

GE8071 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS **9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

GI8002 DIGITAL CARTOGRAPHY **L T P C**
3 0 0 3

OBJECTIVES:

- To gain knowledge and practice the art, science and technology of digital cartography for designing, visualization and communication of Maps and other Cartographic products using computing and information technology.
- To gain skills in the use of cartographic and GIS software, algorithms and hardware.

UNIT I INTRODUCTION **9**

Cartographic Products and Map automation – logics in digital map design – infra-structures, tools and functions in automated mapping – map layout, multiple maps, color and patterns in digital mapping – human perception of static, multi-media and animated maps.

UNIT II DATA CAPTURE AND REPRESENTATION **9**

Spatial data capture in raster and vector formats – texture data capture / creation – non-spatial data loggers and attributes – metadata design - data classes and graphics for metadata – graphics and maps – storage, warehousing and mining for automated mapping – graphic formats for visualization, communication and printing – 3D printing – compressions and standards.

UNIT III DIGITAL MAP DESIGN 9

Selection of point, line and pattern symbols – simple and multivariate maps – information abstraction and maps –scientific and artistic design principles – designing dynamics – time representation and animation – animated and multimedia maps – representing processes – 3D graphical designs and maps.

UNIT IV GEOVISUALIZATION 9

Flat maps and raised maps – terrain visualization – visualization of uncertainty – flow maps – virtual maps – simulated maps – mobile information and mobile maps – web mapping – widgets/dashboard

UNIT V DIGITAL MAP MODELING 9

Map generalization – geo-statistics in generalization, and quantitative mapping – digital classification – contiguity and hierarchy in mapping – map models

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- The concept of digital mapping and automated mapping
- The principles involved in data collection and cartographic design of digital maps
- The concepts of geovisulisation and map modelling

TEXTBOOKS:

1. Robert G Cromley, Principles of Digital Cartography, Prentice hall, 1992
2. Word, Clifford H and C peter kerer (Edr) 1996 Cartigraphic Designs-theoretical and practical perspective, John wiley & sones, chichester.

REFERENCES:

1. Menno Jan Kraak & Ferjan Ormeling, Cartography Visualization of Geospatial Data, 2nd Edition, Pearson Education, 2004
2. Jobst, Markus, ”Presentation in Digital Cartography 2010.
3. Ruas, dnme,” Advances in Cartography and GI Science,” Vol 1,2011
4. Lindur, Wilfried,” Digital Photogrammetry “2009 Springer

EC8094 SATELLITE COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites
- Understand the basics of satellite Networks

UNIT I SATELLITE ORBITS 9

Kepler‟s Laws, Newton‟s law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACE SEGMENT 9

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.

UNIT III SATELLITE LINK DESIGN 9

Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV SATELLITE ACCESS AND CODING METHODS 9

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.

UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, the student would be able to:

- Analyze the satellite orbits
- Analyze the earth segment and space segment
- Analyze the satellite Link design
- Design various satellite applications

TEXTBOOKS:

1. Dennis Roddy, "Satellite Communication", 4th Edition, Mc Graw Hill International, 2006.
2. Timothy, Pratt, Charles, W.Bostain, Jeremy E. Allnutt," Satellite Communication",2nd Edition, Wiley Publications,2002

REFERENCES:

1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
2. N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.
4. Tri T. Ha, "Digital Satellite Communication", II nd edition, 1990.
5. Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.
6. Robert G. Winch, "Telecommunication Trans Mission Systems", Mc Graw-Hill Book Co., 1983.
7. Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.
8. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.
9. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.

GE8074 HUMAN RIGHTS L T P C
3 0 0 3

OBJECTIVE:

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I 9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II 9

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi

GI8003 ADJUSTMENT COMPUTATIONS FOR GEOINFORMATICS 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 and cofactors - Non-linear stochastic variables.

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 and Distance measurement - elevation difference - Survey tolerances – Database creation using GIS: Modeling- Map layout.

UNIT V APPLICATION IN GEOMATICS ENGINEERING 9

Introduction- the distance condition and its linearization- azimuth condition and its linearization - angle condition and its linearization - position fixing by Distance - Two parameter similarity transformation - Four parameter similarity Transformation- adjustment of Trisection. Errors in GIS - error propagation in GIS based modeling.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- The concepts of error, error distribution and error adjustment procedures
- The procedure involved in error adjustment using least square adjustment, elementary Probability theory and variance covariance propagation
- To create GIS database by collecting quality datasets.

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., 1996.

REFERENCE:

1. Dr.B.C Punmia, Ashok. K.Jain, Arun .K. Jain, Surveying Vol III 15th Edition 2005.

GI8004 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 – 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:

At the end of the course the student will be able to understand

- Concepts of ALTM and working principle
- Available types of ATLM sensors and components of ALTM system
- Process of data acquisition, data processing and possible applications
- The fundamentals of terrestrial and bathymetric scanners and their applications

TEXTBOOKS:

1. Jie Shan and Charles K. Toth, Topographic Laser Ranging and Scanning – Principles and Processing, CRC Press, Taylor & Francis Group, 2009
2. George Vosselman and Hans-Gerd Maas, Airborne and Terrestrial Laser Scanning, Whittles Publishing, 2010.
3. Michael Renslow, Manual of Airborne Topographic LiDAR, The American Society for Photogrammetry and Remote Sensing , 2013.

GE8075 INTELLECTUAL PROPERTY RIGHTS L T P C
3 0 0 3

OBJECTIVE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL:45 PERIODS

OUTCOME:

- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXTBOOKS:

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCES:

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

GI8005 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:

At the end of the course the student will be able to understand

- The basics of Ocean processes and characteristics of Ocean parameters
- The concepts of ocean dynamics and design of appropriate structures
- The use of remote sensing sensors for mapping and modeling oceanic processes and Coastal Zone management

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. nd Dalrymple, R.A., Coastal Process with Engineering Application, Cambridge University press, Cambridge, 2006.
4. Paul D.Kumar, Beach process and sedimentation. Prentice - Hall Inc., New Jersey, 2002.

GI8006 HEALTH GIS L T P C

3 0 0 3

OBJECTIVE:

- 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:

At the end of the course the student will be able to understand

- Techniques used for disease ecology mapping and disease mapping
- The usefulness of GIS for location allocation of health resources
- The tools for development of Health GIS systems

TEXTBOOKS :

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

GE8077 TOTAL QUALITY MANAGEMENT **L T P C**
3 0 0 3

OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES **9**

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I **9**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II **9**

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

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

OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO9001-2015 standards

GI8007 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.

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

Past, present and future missions **-** Analyses and Interpretation of data gathered through various missions: identification of morphological features.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of course the students have

- Exposure to fundamentals of planetary surface and orbital mechanics.
- Understanding of principles and methods for planetary observations.
- Knowledge on Geology and Climate of various planets.
- Knowledge of remote sensing methods for mapping of planetary surfaces

TEXTBOOKS:

1. Lecture notes on the formation and early evolution of planetary systems by Philip J.Armitage - arXiv , 2010
2. Principles of Planetary Climate by Raymond T.Pierrehumbert, University of Chicago, Publication date: December 2010.

REFERENCES:

1. Radar Remote sensing of Planetary surfaces Bruce A. Campbell, Cambridge University Press, Publisher Date: 19 May 2011
2. Planetary Geology (Nicholas M. Short), 1975, Prentice-Hall Publ., New Jersey,1975
3. Introduction to planetary science _Gunter Faur.Teresa.M.Mensing, Springler 2007-05-18

GI8008 SATELLITE WEATHER FORECASTING AND MODELLING L T P C
3 0 0 3

OBJECTIVES:

- To introduce Weather Forecasting and Modeling in digital scenario applications.
- To familiarize with terms and techniques used in weather forecasting.
- To gain fair knowledge in Satellite Imaging and vertical profiling system in weather forecasting methods.
- To understand the role of Global and National level Satellites and observations in weather forecasting.

UNIT I INTRODUCTION 9

Basics: Weather Elements – Objectives of Weather Forecasting -Weather Forecasting Steps – Forecasting Variations for different applications -Short tern and long term forecasts – climatic maps and charts vs weather maps and charts.

UNIT II SATELLITE AND GROUND SENSORS 9

Data Acquisition: Surface observation and AWS - Upper level data and charts - Satellites in Weather Forecasting: GOES and POES in weather Forecasting – Satellite imagery – Sounders – Doppler Radars - WMO and Global network of weather observations – IMD and the national network of observations – Kalpana and INSAT satellites – Imaging radars and sounders in INSAT series.

UNIT III WEATHER FORECAST PROCESSING 9

Forecasting Tools and Techniques: Human-Machine mix – Forecast process – Surface Charts and Maps - Meteogram – T-Phi diagram applications – Radio Sonde and its charts – Upper level charts – Radar imagery and extraction of weather element maps – satellite sounder profiles – Advanced Weather Interactive Processes Systems (AWIPS).

UNIT IV SHORT AND LONG TERM FORECAST 9

Forecasting Methods: Nowcasting and critical parameters – Short term Forecasting – Weekly, Monthly and Seasonal Forecasts – Annual and Long Term Forecasts – Extreme Weather Forecasts – Cyclone tracking and disaster monitoring methods.

UNIT V WEATHER FORECAST MODELS 9

Forecast Models and Applications: Global Forecast Systems and Models - National Weather Forecast Systems – Simple Persistence Models – Analogue Models – Trend analysis and modeling – Statistical and Numerical Forecast Models – Probability Forecasts.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the candidate is knowledgeable in

- Weather forecasting tools, techniques and methods of weather forecasting.
- Global network of weather observation systems and integration.
- Satellites and its role in weather observations and analysis.
- Indian weather satellites and their observation tools

TEXTBOOKS:

1. Donald C. Ahrens (2009) Meteorology Today An Introduction to Weather, Climate and
2. Environment, Brooks/Cole, Cengage Learning, Australia Jeppesen GmbH (2004), Meteorology, JAA ATPL Training, Jeppesen Sanderson Inc, Germany

REFERENCES:

1. Kelkov R.R. (2007) Satellite Meteorology, BS publications, Hyderabad, India
2. Herhart Riehl (1954), Tropical Meteorology, Mcgraw hill Buole company, New York
3. WMO (2011) Guide to Climatological Practices, WMO -N0100, World Meteorology
4. Organization, Geneva.
5. WMO (2008) Guide to Meteorological Instruments and Methods of Observation, WMO-N01
6. http://www.weather.gov/
7. http://www.esa.int/Our_Activities/Observing_the_Earth/The_Living_Planet_Programme/M
8. eteorological_missions
9. http://www.bis-space.com/belgium/wp-content/uploads/2015/05/meteor.pdf
10. https://new.meteoinfo.ru/en
11. https://www.isro.gov.in/applications/meteorology
12. http://www.imd.gov.in/Welcome%20To%20IMD/Welcome.php
13. https://spaceflightnow.com/

GE8076 PROFESSIONAL ETHICS IN ENGINEERING **L T P C**
3 0 0 3

OBJECTIVE:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES **10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II 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 – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES **8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

OUTCOME:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

GI8009 ADVANCED GEO DATA ANALYSIS **L T P C**
3 0 0 3

OBJECTIVES:

- 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:

- Students will gain thorough knowledge on the concepts of spatial data modeling
- Students will be able to model the real time flow networks and its implementation.

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), The Esri Guide to GIS Analysis, Volume 3: Modeling Suitability, Movement, and Interaction, ESRI Press.

GI8010 GIS BASED DISASTER PREPAREDNESS AND MITIGATION L T P C
3 0 0 3

OBJECTIVE:

- To understand various technological options especially Remote Sensing and GIS in 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:

At the end of the course the student will be able to understand

- The concepts of disaster and disaster management
- Different techniques for analysis of disaster proneness and mitigation measures
- The use of spatial science in four folds of 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.
3. Gupta Anil K, Sreeja S, Nair. 2011 Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi.
4. Kapur Anu 2010: Vulnerable India: A Geographical study of Disasters, IIAS and sage Publishers, New Delhi.

REFERENCES:

1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E & FN SPON Routledge, London. 1999.
2. George G. Penelis and Andreas J. Kappos - Earthquake Resistant concrete Structures. E & FN SPAN, London, 1997.
3. David Alexander, Natural Disasters, UCL Press, London, Research Press, New Delhi, 1993.
4. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991.
5. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi.
6. Government of India, 2009.National Disaster Management Policy.

GI8011 **WEB GIS** **L T P C**
3 0 0 3

OBJECTIVE:

- This course provides skills in learning concepts and applications of web based services using GIS technology and web mapping

UNITI GIS AND WEB GIS **9**

Evolution of GIS – Mainframe GIS, Desktop GIS, Web GIS/Internet GIS, Mobile GIS and Cloud GIS–GIS- Web GIS : Need for Web GIS, Merits of Web GIS – Internet: Computer Network, World Wide Web, Internet Protocols, TCP/IP Connections and Functions, Internet Gateway, Web Page and Web Services -Quality of Web GIS Service and Security Issues: Performance, Security, Scalability and Interoperability - Static Web Mapping and Interactive Web Mapping

UNIT II WEB GIS ARCHITECTURE **9**

Web GIS : Components of Web GIS – Database Server, Web Server, Map Server – Thin and Thick client Architecture and its components – Advantages of Thin and Thick client Architecture – Geoportals: Concepts, Functions and Architecture – Web Traffic: Load Balancing of Map Servers- Raster and Vector data formats in internet based geoservices – Maps Application Programming Interface: - Google Maps API, Open layers Java Script API

UNIT III WEB SERVICES **9**

Open Geospatial Consortium (**OGC**),OGC collaboration with ISO, world wide web consortium (W3C) and others – Types of web service Specifications for GIS : Catalogue Services: CS Core and others, Processing Services: Sensor Planning Service(SPS), Web Processing Service(WPS) and others, Encoding : Geography markup Language(GML), City GML, Data Services : Web Coverage Service, Web Feature service, Portrayal Service: Web Map Service and other services

UNIT IV MOBILE GIS **9**

Mobile GIS: Uses and benefits – Supporting Technologies and Platforms – Hand held devices and wireless voice and data networks - General System Architecture of Mobile GIS – Operating System for Mobile GIS Applications - Mobile GIS Software Packages - Applications of Mobile GIS and Case Studies - Location-based Services for Consumers

UNIT V OPEN SOURCE WEB SERVERS AND APPLICATIONS **9**

Open Source Web Servers – Open source standalone (client side) software for map services : Geozilla, QGIS Browser, osgEarth, Marble - Proprietary standalone (client side) software for web map services: Esri ArcGIS & ArcGIS Explorer,Google Earth, Global Mapper, Geoweb3d Desktop – Geo Server – Case Studies and applications Web/Internet GIS in various application domains

TEXT BOOKS:

1. Pinde Fu and Jiulin Sun (2010), Web GIS: Principles and Applications, ESRI Press, ISBN: 9781589482456
2. Li, S. (Ed.), Dragicevic, S. (Ed.), Veenendaal, B. (Ed.). (2011). Advances in Web-based GIS, Mapping Services and Applications. London: CRC Press.
3. Zhong-Ren Peng, Ming-Hsiang Tsou (2003) Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks, ISBN: 978-0-471-35923-4

GE8073 FUNDAMENTALS OF NANOSCIENCE L T P C
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OBJECTIVE:

- To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION 8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION 9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications-Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS 7

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of course the students

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXTBOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscale Charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia,“The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.