ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

REGULATIONS – 2015

CHOICE BASED CREDIT SYSTEM

B. E. AGRICULTURAL AND IRRIGATION ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

i) To train and educate students with general knowledge and skills in agricultural water management, agricultural production process, farm machinery and farm management.

ii) To provide a sound theoretical knowledge in engineering principles applied to water resources and agricultural engineering

iii) To prepare students for successful agricultural water management carrier integrating agriculture and irrigation technology.

iv) To develop innovative capacity of students for increasing agricultural production with scarce water resources available.

v) To impart positive and responsive out-reach attitudes, initiative and creative thinking in their mission as engineers.

vi) To understand ethical issues and responsibility of serving the society and the environment at large.

PROGRAM OUTCOMES (POs)

Graduates of Agricultural and Irrigation Engineering will have

a) Ability to apply the knowledge of mathematics, science and engineering in agriculture

b) Ability to design and conduct experiments, analyze and interpret data to prepare farm specific reports

c) Ability to design an irrigation system to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, and sustainability

d) Ability to think creatively, to formulate problem statements, to communicate effectively, to synthesize information, and to evaluate agricultural systems

e) Ability to function in interdisciplinary teams within the Institute and also with other organizations at National/ International level while planning the research projects.

f) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

g) Will develop competencies in computer and automatic control systems, information systems, mechanical systems, natural resource systems to solve engineering problems

h) Graduates will be able to express themselves clearly in oral and verbal communication needs.

i) Ability to devise a strategy or action plan to utilize the acquired knowledge of irrigation engineering in increasing water-use-efficiency and farm mechanization for reducing cost of cultivation.

j) Graduates will be capable of self-education in emerging water resources problems and understand the value of lifelong learning.

Attested

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PEOs and POs – Agricultural and Irrigation Engineering

PEOs	POs									
	a)	**b)**	**c)**	**d)**	**e)**	**f)**	**g)**	**h)**	**i)**	**j)**
i)	X	X	X					X		
ii)			X	X		X	X			
iii)	X	X	X							
iv)					X			X		
v)			X		X					X
vi)								X	X	X

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			POa	POb	POc	POd	POe	POf	POg	POh	POi	POj
YEAR 1	SEM 1	Foundational English				✓				✓		
		Mathematics - I	✓									
		Engineering Physics	✓	✓	✓	✓	✓	✓				
		Engineering Chemistry	✓	✓	✓		✓	✓	✓			
		Engineering Graphics	✓	✓	✓		✓	✓	✓		✓	✓
		Principles of Agricultural and Irrigation Engineering	✓		✓	✓					✓	✓
		Engineering Practices Laboratory	✓	✓				✓	✓			
		Basic Sciences Laboratory	✓	✓			✓	✓	✓			
	SEM 2	Technical English				✓				✓		
		Mathematics – II	✓									
		Physics for Agricultural and Irrigation Engineering	✓	✓	✓	✓	✓	✓				
		Chemistry for Agricultural Engineering	✓	✓	✓	✓	✓	✓				
		Engineering Mechanics	✓	✓	✓		✓	✓	✓		✓	✓
		Computing Techniques	✓	✓	✓		✓	✓	✓			
		Applied Chemistry Laboratory for Agricultural Engineers	✓	✓	✓	✓	✓	✓				
		Computer Practices Laboratory	✓	✓			✓	✓	✓			

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YEAR 2	SEM 3	Transform Techniques and Partial Differential Equations	✓									
		Soil Science and Engineering	✓	✓		✓		✓				
		Plane and Geodetic Surveying					✓	✓				
		Mechanics of Machines				✓	✓	✓				
		Fluid Mechanics	✓	✓	✓	✓	✓	✓	✓		✓	✓
		Strength of Materials	✓	✓		✓	✓	✓				
		Plane and Geodetic Surveying Laboratory		✓			✓	✓				
	SEM 4	Numerical Methods	✓									
		Environmental Science and Engineering	✓		✓	✓	✓	✓	✓			
		Hydraulic Engineering for Agricultural Engineers	✓	✓	✓	✓	✓	✓	✓		✓	✓
		Hydrology and Water Resources Engineering	✓	✓	✓	✓		✓		✓		
		Principles and Practices of Crop Production		✓	✓	✓		✓	✓	✓		
		Soil Science and Water Quality Laboratory	✓	✓		✓	✓	✓				
		Fluid Mechanics and Machinery Laboratory		✓	✓	✓	✓	✓	✓	✓	✓	✓
YEAR 3												
	SEM 5	Design of Machine Elements		✓	✓		✓	✓	✓			
		Groundwater and Well Engineering	✓	✓	✓		✓	✓		✓		✓
		Irrigation Engineering for Agricultural Engineers			✓	✓	✓	✓	✓	✓		
		Unit Operations in Agricultural Processing and Post Harvest Technology	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Professional Elective I										
		Professional Elective II										
		Design and Drawing of Irrigation structures		✓	✓			✓				
		Irrigation Field Laboratory	✓	✓	✓	✓	✓	✓	✓			

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	SEM 6	Dairy and Food Engineering		✓		✓	✓	✓				
		Principles of Management for Agricultural engineers	✓				✓		✓			
		Farm Tractors		✓	✓		✓	✓		✓		
		Drainage Engineering and Land Management		✓	✓	✓		✓				
		Professional Elective III										
		Open Elective – I*										
		CAD for Agricultural Engineering		✓	✓	✓	✓	✓	✓			
		Agricultural Processing & Food Engineering Laboratory	✓	✓	✓	✓	✓					
		Technical seminar										
YEAR 4	**SEM 7**	Soil and Water Conservation Engineering		✓	✓	✓	✓	✓	✓			
		Farm Equipment			✓	✓	✓	✓			✓	✓
		Professional Elective IV										
		Professional Elective V										
		Open Elective - II*										
		Employability Skills				✓	✓			✓		
		Creative and Innovative Project (Activity Based –Subject Related)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Industrial Training (4 weeks During VI Semester-Summer)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	SEM 8	Professional Elective VI										
		Open Elective – III*										
		Project Work	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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PROFESSIONAL ELECTIVES

	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj
Remote Sensing and Geographical Information System		✓	✓	✓	✓	✓	✓			
Agricultural Business Management	✓			✓			✓	✓		
Agricultural Economics and Farm Management		✓			✓		✓			
Geology for Agricultural and Irrigation Engineers			✓		✓			✓		
Irrigation Water Quality and Modeling		✓	✓		✓	✓		✓	✓	
Minor Irrigation and Command Area Development	✓	✓			✓			✓	✓	
Seed Technology Applications		✓	✓		✓		✓	✓		
Systems Analysis in Irrigation Engineering	✓	✓			✓	✓		✓		
Participatory Water Resources Management			✓	✓		✓		✓		
IT in Agricultural Systems	✓	✓	✓		✓		✓	✓		
Irrigation Equipment Design	✓	✓	✓		✓	✓		✓	√	
Bio-Energy Resource Technology		✓		✓	✓		✓	✓		
Integrated Water Resources Management	✓	✓		✓		✓	✓	✓		
Sustainable Agriculture and Food Security		✓	✓	✓		✓	✓	✓		
Environment and Agriculture	✓		✓	✓			✓		✓	✓
Human Rights		✓		✓				✓		
Disaster Management		✓			✓	✓		✓		
Engineering Ethics and Human Values										
Foundation Skills In Integrated Product Development										

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ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

B. E. AGRICULTURAL AND IRRIGATION ENGINEERING

REGULATIONS – 2015

CHOICE BASED CREDIT SYSTEM

CURRICULA AND SYLLABI I - VIII SEMESTERS

SEMESTER I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	MA7151	Mathematics - I	BS	4	4	0	0	4
3.	PH7151	Engineering Physics	BS	3	3	0	0	3
4.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE7152	Engineering Graphics	ES	5	3	2	0	4
6.	AI7101	Principles of Agricultural and Irrigation Engineering	ES	3	3	0	0	3
PRACTICAL								
7.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
			TOTAL	**30**	**20**	**2**	**8**	**25**

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7251	Technical English	HS	4	4	0	0	4
2.	MA7251	Mathematics – II	BS	4	4	0	0	4
3.	PH7253	Physics for Agricultural and Irrigation Engineering	BS	3	3	0	0	3
4.	CY7252	Chemistry for Agricultural Engineering	BS	3	3	0	0	3
5.	GE7153	Engineering Mechanics	ES	4	4	0	0	4
6.	GE7151	Computing Techniques	ES	3	3	0	0	3
PRACTICAL								
7.	CY7262	Applied Chemistry Laboratory for Agricultural Engineers	BS	4	0	0	4	2
8.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**29**	**21**	**0**	**8**	**25**

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SEMESTER III

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AI7301	Soil Science and Engineering	ES	3	3	0	0	3
2.	CE7251	Strength of Materials	PC	3	3	0	0	3
3.	CE7351	Fluid Mechanics	PC	3	3	0	0	3
4.	CE7353	Plane and Geodetic Surveying	PC	4	4	0	0	4
5.	MA7358	Transform Techniques and Partial Differential Equations	BS	4	4	0	0	4
6.	ME7353	Mechanics of Machines	PC	3	3	0	0	3
PRACTICAL								
7.	CE7362	Plane and Geodetic Surveying Laboratory	PC	4	0	0	4	2
			TOTAL	**24**	**20**	**0**	**4**	**22**

SEMESTER IV

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AI7401	Hydraulic Engineering for Agricultural Engineers	PC	4	4	0	0	4
2.	AI7402	Principles and Practices of Crop Production	PC	5	3	2	0	4
3.	AI7451	Hydrology and Water Resources Engineering	PC	3	3	0	0	3
4.	GE7251	Environmental Science and Engineering	HS	3	3	0	0	3
5.	MA7354	Numerical Methods	BS	4	4	0	0	4
PRACTICAL								
6.	AI7411	Soil Science and Water Quality Laboratory	ES	4	0	0	4	2
7.	CE7361	Fluid Mechanics and Machinery Laboratory	PC	4	0	0	4	2
			TOTAL	**27**	**17**	**2**	**8**	**22**

SEMESTER V

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AI7501	Groundwater and Well Engineering	PC	3	3	0	0	3
2.	AI7502	Irrigation Engineering for Agricultural Engineers	PC	3	3	0	0	3
3.	AI7503	Unit Operations in Agricultural Processing and Post Harvest Technology	PC	3	3	0	0	3
4.	ME7552	Design of Machine Elements	PC	4	4	0	0	4
5.		Professional Elective I	PE	3	3	0	0	3
6.		Professional Elective II	PE	3	3	0	0	3
PRACTICAL								
7.	AI7511	Design and Drawing of Irrigation structures	PC	4	0	0	4	2
8.	AI7512	Irrigation Field Laboratory	PC	4	0	0	4	2
			TOTAL	**27**	**19**	**0**	**8**	**23**

SEMESTER VI

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AI7601	Dairy and Food Engineering	PC	3	3	0	0	3
2.	AI7602	Drainage Engineering and Land Management	PC	3	3	0	0	3
3.	AI7603	Farm Tractors	PC	3	3	0	0	3
4.	AI7604	Principles of Management for Agricultural Engineers	HS	3	3	0	0	3
5.		Professional Elective III	PE	3	3	0	0	3
6.		Open Elective – I*	OE	3	3	0	0	3
PRACTICAL								
7.	AI7611	Agricultural Processing and Food Engineering Laboratory	PC	4	0	0	4	2
8.	AI7612	CAD for Agricultural Engineering	ES	4	0	0	4	2
9.	AI7613	Technical seminar#	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER VII

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AI7701	Farm Equipment	PC	3	3	0	0	3
2.	AI7702	Soil and Water Conservation Engineering	PC	3	3	0	0	3
3.	HS7551	Employability Skills	HS	3	3	0	0	3
4.		Professional Elective IV	PE	3	3	0	0	3
5.		Professional Elective V	PE	3	3	0	0	3
		Open Elective - II*	OE	3	3	0	0	3
PRACTICAL								
7.	AI7711	Creative and Innovative Project (Activity Based – Subject Related)#	EEC	4	0	0	4	2
8.	AI7712	Industrial Training(4 weeks During VI Semester-Summer)	EEC	0	0	0	0	2
			TOTAL	**22**	**18**	**0**	**4**	**22**

SEMESTER VIII

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective VI	PE	3	3	0	0	3
2.		Open Elective – III*	OE	3	3	0	0	3
PRACTICAL								
3.	AI7811	Project Work#	EEC	20	0	0	20	10
			TOTAL	**26**	**6**	**0**	**20**	**16**

TOTAL NO. OF CREDITS: 178

*Course from the curriculum of other UG Programmes.

#The Contact periods will not appear in the slot time table

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HUMANITIES AND SOCIAL SCIENCES (HS)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	HS7251	Technical English	HS	4	4	0	0	4
3.	GE7251	Environmental Science and Engineering	HS	3	3	0	0	3
4.	AI7604	Principles of Management for Agricultural Engineers	HS	3	3	0	0	3
5.	HS7551	Employability Skills	HS	3	3	0	0	3

BASIC SCIENCES (BS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA7151	Mathematics - I	BS	4	4	0	0	4
2.	PH7151	Engineering Physics	BS	3	3	0	0	3
3.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
4.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
5.	MA7251	Mathematics – II	BS	4	4	0	0	4
6.	PH7253	Physics for Agricultural and Irrigation Engineering	BS	3	3	0	0	3
7.	CY7252	Chemistry for Agricultural Engineering	BS	3	3	0	0	3
8.	CY7262	Applied Chemistry Laboratory for Agricultural Engineers	BS	4	0	0	4	2
9.	MA7358	Transform Techniques and Partial Differential Equations	BS	4	4	0	0	4
10.	MA7354	Numerical Methods	BS	4	4	0	0	4

ENGINEERING SCIENCES (ES)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GE7152	Engineering Graphics	ES	5	3	2	0	4
2.	AI7101	Principles of Agricultural and Irrigation Engineering	ES	3	3	0	0	3
3.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
4.	GE7153	Engineering Mechanics	ES	4	4	0	0	4
5.	GE7151	Computing Techniques	ES	3	3	0	0	3
6.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
7.	AI7301	Soil Science and Engineering	ES	3	3	0	0	3
8.	AI7411	Soil Science and Water Quality Laboratory	ES	4	0	0	4	2
9.	AI7612	CAD for Agricultural Engineering	ES	4	0	0	4	2

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PROFESSIONAL CORE (PC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CE7353	Plane and Geodetic Surveying	PC	4	4	0	0	4
2.	CE7362	Plane and Geodetic Surveying Laboratory	PC	4	0	0	4	2
3.	ME7353	Mechanics of Machines	PC	3	3	0	0	3
4.	CE7351	Fluid Mechanics	PC	3	3	0	0	3
5.	CE7251	Strength of Materials	PC	3	3	0	0	3
6.	AI7401	Hydraulic Engineering for Agricultural Engineers	PC	4	4	0	0	4
7.	AI7451	Hydrology and Water Resources Engineering	PC	3	3	0	0	3
8.	AI7402	Principles and Practices of Crop Production	PC	5	3	2	0	4
9.	CE7361	Fluid Mechanics and Machinery Laboratory	PC	4	0	0	4	2
10.	ME7552	Design of Machine Elements	PC	4	4	0	0	4
11.	AI7501	Groundwater and Well Engineering	PC	3	3	0	0	3
12.	AI7502	Irrigation Engineering for Agricultural Engineers	PC	3	3	0	0	3
13.	AI7503	Unit Operations in Agricultural processing and Post Harvest Technology	PC	3	3	0	0	3
14.	AI7511	Design and Drawing of Irrigation Structures	PC	4	0	0	4	2
15.	AI7512	Irrigation Field Laboratory	PC	4	0	0	4	2
16.	AI7601	Dairy and Food Engineering	PC	3	3	0	0	3
17.	AI7602	Drainage Engineering and Land Management	PC	3	3	0	0	3
18.	AI7603	Farm Tractors	PC	3	3	0	0	3
19.	AI7611	Agricultural Processing and Food Engineering Laboratory	PC	4	0	0	4	2
20.	AI7702	Soil and Water Conservation Engineering	PC	3	3	0	0	3
21.	AI7701	Farm Equipment	PC	3	3	0	0	3

PROFESSIONAL ELECTIVES (PE)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	AI7001	Agricultural Business Management	PE	3	3	0	0	3
2.	AI7002	Agricultural Economics and Farm Management	PE	3	3	0	0	3
3.	AI7003	Bio-Energy Resource Technology	PE	3	3	0	0	3
4.	AI7004	Environment and Agriculture	PE	3	3	0	0	3
5.	AI7005	Geology for Agricultural and Irrigation Engineers	PE	3	3	0	0	3
6.	AI7006	Irrigation Equipment Design	PE	3	3	0	0	3
7.	AI7007	Irrigation Water Quality and Modeling	PE	3	3	0	0	3
8.	AI7008	IT in Agricultural Systems	PE	3	3	0	0	3
9.	AI7009	Minor Irrigation and Command Area Development	PE	3	3	0	0	3
10.	AI7010	Remote Sensing and Geographical Information System	PE	3	3	0	0	3
11.	AI7011	Seed Technology Applications	PE	3	3	0	0	3
12.	AI7012	Sustainable Agriculture and Food Security	PE	3	3	0	0	3
13.	AI7013	Systems Analysis in Irrigation Engineering	PE	3	3	0	0	3
14.	AI7071	Integrated Water Resources Management	PE	3	3	0	0	3
15.	AI7072	Participatory Water Resources Management	PE	3	3	0	0	3
16.	GE7071	Disaster Management	PE	3	3	0	0	3
17.	GE7074	Human Rights	PE	3	3	0	0	3
18.	GE7351	Engineering Ethics and Human Values	PE	3	3	0	0	3
19.	GE7072	Foundation Skills In Integrated Product Development	PE	3	3	0	0	3

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	AI7613	Technical Seminar	EEC	2	0	0	2	1
2.	AI7711	Creative and Innovative Project (Activity Based Subject - Related)	EEC	4	0	0	4	2
3.	AI7712	Industrial Training (4 weeks during VI Semester - Summer)	EEC	-	0	0	0	2
4.	AI7811	Project Work	EEC	20	0	0	20	10

SUMMARY

SL. NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	**HS**	4	4	0	3	0	3	3	0	**17**
2.	**BS**	12	12	4	4	0	0	0	0	**32**
3.	**ES**	9	9	3	2	0	2	0	0	**25**
4.	**PC**	0	0	15	13	17	11	6	0	**62**
5.	**PE**	0	0	0	0	6	3	6	3	**18**
6.	**OE**	0	0	0	0	0	3	3	3	**9**
7.	**EEC**	0	0	0	0	0	1	4	10	**15**
	Total	**25**	**25**	**22**	**22**	**23**	**23**	**22**	**16**	**178**
8.	**Non Credit / Mandatory**									

HS7151 **FOUNDATIONAL ENGLISH** **L T P C**
4 0 0 4

COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students' communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I GREETING AND INTRODUCING ONESELF 12
Listening- Types of listening – Listening to short talks, conversations; **Speaking** – Speaking about one's place, important festivals etc. – Introducing oneself, one's family/ friend; **Reading** – Skimming a passage– Scanning for specific information; **Writing**- Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one's leisure time activities, hometown, etc.); **Grammar** – Tenses (present and present continuous) -Question types - Regular and irregular verbs; **Vocabulary** – Synonyms and Antonyms.

UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12
Listening – Listening and responding to instructions; **Speaking** – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; **Reading** – Reading and finding key information in a given text - Critical reading - **Writing –**Process description(non-technical)- **Grammar** – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - **Vocabulary** – Compound words – Word formation – Word expansion (root words).

UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12
Listening- Listening to lectures/ talks and completing a task; **Speaking** –Role play/ Simulation – Group interaction; **Reading** – Reading and interpreting visual material; **Writing**- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative);**Grammar** – Tenses (perfect), Conditional clauses –Modal verbs; **Vocabulary** –Cause and effect words; Phrasal verbs in context.

UNIT IV CRITICAL READING AND WRITING 12
Listening- Watching videos/ documentaries and responding to questions based on them; **Speaking** Informal and formal conversation; **Reading** –Critical reading (prediction & inference); **Writing**–Essay writing (compare & contrast/ analytical) – Interpretation of visual materials; **Grammar** – Tenses (future time reference);**Vocabulary** – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V LETTER WRITING AND SENDING E-MAILS 12
Listening- Listening to programmes/broadcast/ telecast/ podcast; **Speaking** – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; **Reading** –Extensive reading; **Writing**- Poster making – Letter writing (Formal and E-mail) ;**Grammar** – Direct and Indirect speech – Combining sentences using connectives; **Vocabulary** –Collocation;

TEACHING METHODS:

Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL:60 PERIODS

OUTCOMES:

- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

1. Richards, Jack.C with Jonathan Hull and Susan Proctor **New Interchange: English for International Communication. (level2, Student's Book)** Cambridge University Press,New Delhi: 2010.

REFERENCES:

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
2. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering**. London: Garnet Publishing Limited, 2008.
3. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor Business English.** Cambridge University Press, Cambridge: Reprint 2011.

MA7151	MATHEMATICS – I (Common to all branches of B.E. / B.Tech. Programmes in I Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT 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

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

TOTAL : 60 PERIODS

OUTCOMES:

- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXTBOOKS:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, 2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.

5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7151	ENGINEERING PHYSICS (Common to all branches of B.E. / B.Tech. Programmes)	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals

UNIT I PROPERTIES OF MATTER 9

Elasticity – Poisson's ratio and relationship between moduli (qualitative) - stress-strain diagram for ductile and brittle materials, uses - factors affecting elastic modulus and tensile strength - bending of beams - cantilever - bending moment - Young's modulus determination - theory and experiment - uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - calculation of reverberation time for different types of buildings – sound absorbing materials - factors affecting acoustics of buildings : focussing, interference, echo, echelon effect, resonance - noise and their remedies. Ultrasonic: production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating – ultrasonic interferometer - industrial applications – Non-destructive testing - ultrasonic method: scan modes and practice.

UNIT III THERMAL AND MODERN PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media - Forbe's and Lee's disc method: theory and experiment- Black body radiation – Planck's theory (derivation) – Compton effect – wave model of radiation and matter – Schrödinger's wave equation – time dependent and independent equations – Physical significance of wave function – particle in a one dimensional box.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein's coefficients – CO_2 and Nd:YAG laser - semiconductor lasers: homo junction and hetro junction - construction and working – applications. Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for

a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:

- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

1. Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai Publications (2013)
2. Palanisamy P.K., "Engineering Physics", Scitech Publications (P) Ltd. (2006).
3. Arumugam M., "Engineering Physics", Anuradha Publications (2000)

REFERENCES:

1. Serway R.A. and Jewett, J.W. "Physics for Scientists and Engineers with Modern Physics". Brooks/cole Publishing Co. (2010).
2. Tipler P.A. and Mosca, G.P., "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, (2007).
3. Markert J.T.,Ohanian, H. and Ohanian, M. "Physics for Engineers and Scientists". W.W.Norton & Co. (2007).

CY7151	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRYAND CATALYSIS 9

Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions-Types of isotherms–Frendlich adsorption isotherm,Langmuir adsorption isotherm.Industrial applications of adsorption. Catalysis: Characteristics and types of catalysts-homogeneous and heterogeneous, auto catalysis. Enzyme catalysis -factors affecting enzyme catalysis, Michaelis-Menton equation,Industrial applications of catalysts.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry-Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes-internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Width and intensities of spectral lines,Spectrophotometric estimation of iron, UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV CHEMICAL THERMODYNAMICS 9

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY 9

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles – sol-gel and solvothermal. Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nano clusters, nano rods, nanotubes and nanowires.

TOTAL: 45 PERIODS

OUTCOME

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXTBOOKS

1. Jain P. C. & Monica Jain., "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd, New Delhi, 2014.
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2014

REFERENCES

1. Pahari A., Chauhan B., "Engineering Chemistry", Firewall Media, New Delhi, 2012.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. AshimaSrivastava. Janhavi N N, Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2010.
4. Vairam S., Kalyani P., Suba Ramesh., "Engineering Chemistry", Wiley India Pvt Ltd., New Delhi., 2011.

GE7152	ENGINEERING GRAPHICS	L	T	P	C
		3	2	0	4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and 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 FREE HANDSKETCHING 14

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- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14

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 trapezoidal 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 14

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

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

Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:

- On Completion of the course the student will be able to
- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, Planes and Solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXTBOOKS:

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50thEdition, 2010.

REFERENCES:

1. K.R.Gopalakrishna., "Engineering Drawing" (Vol I&II combined) Subhas Stores, Bangalore, 2007
2. 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
3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P)Limited ,2008.
5. K. V. Natarajan, "A text book of Engineering Graphics", 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill PublishingCompany Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, " Engineering Drawing", Oxford University Press, 2015

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

AI7101	PRINCIPLES OF AGRICULTURAL AND IRRIGATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To present the basic theory and practice for various areas of Agricultural Engineering, application of engineering to the problems of agricultural production.

UNIT I INTRODUCTION, SOIL & WATER CONSERVATION 6

Agricultural Engineering – Introduction – Branches - Importance in national and global scenario – Institutes & organizations – Soil & water - Land development, Soil irrigability classification - Soil erosion and control, Soil conservation methods, Watershed management.

UNIT II IRRIGATION ENGINEERING AND FARM STRUCTURES 12

Agro meteorology - Soil Water Plant relationship – Sources of water – Tanks – Wells & Reservoirs – Canal Network – Irrigation Scheduling – Irrigation methods –Micro irrigation - Participatory management of Irrigation Systems.

Farm stead, Farm Roads, Cattle sheds, Stanchion barn, Poultry shed, Hog housing, Machinery and implement shed, Storage structures for food grain, feed & forage - Structures for Plant environment - Green houses, Poly houses – Shade net.

UNIT III FARM MACHINERY & EQUIPMENTS 7

Tractor and Power Tiller – Tillage equipments – Sowing, Planting, Fertilizer, application, Spraying, Mowing Equipments, Pumps

UNIT IV AGRICULTURAL PROCESS ENGINEERING 10

Post harvest of crops, Unit operations in agricultural processing, Packing of agricultural produces – Material handling equipments – Milk processing and dairy products.

UNIT V AGRO ENERGY 10

Energy requirement in agricultural operations - Solar (Thermal and Photovoltaic), Wind mills, Bio-gas energy and their utilization in agriculture – gobar gas plant - Gasification of biomass for IC Engines - Energy efficient cooking stoves and alternative cooking fuels – agricultural waste and their utilization.

TOTAL : 45 PERIODS

OUTCOME:

- The knowledge gained on soil water conservation, irrigation engineering and farm structures provide a strong platform to understand the concepts on these subjects for further learning

TEXTBOOKS:

1. Michael, A.M. & Ojha, T.P. Principles of Agricultural Engineering Vol. I & II, Seventh Edition, Jain Brothers, New Delhi, 2011.
2. Harry L. Field, John B. Solie, Introduction to Agricultural Engineering Technology – A problem solving approach, Springer Science, NY, USA, 2007.

GE7162	ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes)	L	T	P	C
		0	0	4	2

OBJECTIVE:

- 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 & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES 15

PLUMBING

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

• Laying pipe connection to the suction side of a pump.

• Laying pipe connection to the delivery side of a pump.

• Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

- Sawing, planning and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY

- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES **15**

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICES WELDING **15**

- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations..
- Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
  c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES **15**

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL : 60 PERIODS

OUTCOME:

- Ability to fabricate carpentry components and to lay pipe connections including plumbing
- works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.

BS7161	**BASIC SCIENCES LABORATORY**	**L T P C**
	(Common to all branches of B.E. / B.Tech Programmes)	**0 0 4 2**

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:

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

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

OUTCOME:

Upon completion of the course, the students will be able

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

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)

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 poly vinyl 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.

TOTAL: 60 PERIODS

TEXTBOOKS:

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

HS7251 **TECHNICAL ENGLISH** **L T P C**
4 0 0 4

OBJECTIVES:

- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING 12

Listening- Listening to informal and formal conversations; **Speaking** – Conversation Skills(opening, turn taking, closing)-explaining how something works-describing technical functions and applications; **Reading** –Analytical reading, Deductive and inductive reasoning; **Writing**- vision statement–structuring paragraphs.

UNIT II SUMMARISING 12

Listening- Listening to lectures/ talks on Science & Technology; **Speaking** –Summarizing/ Oral Reporting, **Reading** – Reading Scientific and Technical articles; **Writing**- Extended definition –Lab Reports – Summary writing.

UNIT III DESCRIBING VISUAL MATERIAL 12

Listening- Listening to a panel discussion; **Speaking** – Speaking at formal situations; **Reading** – Reading journal articles - Speed reading;**Writing**-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION 12

Listening- Listening to/ Viewing model interviews; **Speaking** –Speaking at different types of interviews – Role play practice (mock interview); **Reading** – Reading job advertisements and profile of the company concerned; **Writing**- job application – cover letter –Résumé preparation.

UNIT V REPORT WRITING 12

Listening- Viewing a model group discussion; **Speaking** –Participating in a discussion - Presentation; **Reading** – Case study - analyse -evaluate – arrive at a solution; **Writing**– Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:

Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:

Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

OUTCOMES:

- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

1. Craig,Thaine**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012.

DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025.

REFERENCES:

1. Laws, Anne. **Presentations.** Hyderabad: Orient Blackswan, 2011.
2. Ibbotson, Mark. **Cambridge English for Engineering**. Cambridge University Press, Cambridge,New Delhi: 2008
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 2004.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Bailey, Stephen. **Academic Writing A practical Guide for Students**. Routledge, London: 2004
6. Hewings, Martin**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012.

MA7251	MATHEMATICS – II (Common to all branches of B.E. / B.Tech. Programmes in I Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I 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 – 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 FUNCTION 12

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c,\ az,\ \frac{1}{z},\ z^2$ - 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 with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem –— Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

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

- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7253 PHYSICS FOR AGRICULTURAL AND IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE :

- To make the students learn various physical properties of soil and methods for analyzing the physical properties of soil
- To make the students understand the detailed mechanism of photosynthesis in leaves
- To introduce the students about various biophysical methods employed in the field of agriculture

- To instill knowledge on the fundamentals of electromagnetic radiation and remote sensing
- To familiarize the students about preservation and processing of food with ionizing radiation

UNIT I SOIL PHYSICS 9

Soil as a dispersion three-phase system - Volume and mass relationships of soil constituents - solid phase - liquid phase - gaseous phase - soil heat flow - soil compaction and consolidation - The Field soil water regime - Solute transport in soil - Methods for analyzing spatial variations of soil properties.

UNIT II PHOTOSYNTHESIS 9

Photosynthesis - Leaves and leaf structure - The nature of light - Chlorophyll and accessory pigments - The structure of the chloroplast and photosynthetic membranes - Stages of photosynthesis - The light reactions - Dark reaction - C-4 Pathway - The carbon cycle.

UNIT III BIOPHYSICS 9

Biophysics - Biophysics methods applicable in agriculture - possibilities of application of new methods in agriculture - effects in agriculture with biophysical methods - effects of new methods applied in agriculture in protection of environment - X-ray separation of crops - electrostatic - Spraying of crops - Moisture determination in agricultural materials.

UNIT IV REMOTE SENSING IN AGRICULTURE AND IRRIGATION 9

Electromagnetic spectrum: The photon and radiometric quantities - radiant energy - radiant flux density - radiant intensity - transmittance - absorptance - reflectance - distribution of radiant energies - spectral signatures - sensor technology - sensor types - passive and active - spatial resolution - processing and classification of remote sensed data - pattern recognition - approaches to data / image interpretation - use of remote sensing in agriculture and irrigation.

UNIT V FOOD IRRADIATION AND PRESERVATION 9

Effects of ionizing radiation on biological organism - Effects of ionizing radiation on foods - applications of food irradiation - low dose - medium dose and high dose - Food irradiation using electron beams, X-rays - nuclear radiation - Processing of seeds, spices, fruits and vegetables.

TOTAL: 45 PERIODS

OUTCOME:

At the end of the course, the students will

- learn about physical properties of the soil and methods for analyzing the physical properties.
- understand the structure of the leaves and mechanism of photosynthesis in leaves
- acquire knowledge about various biophysical methods employed in the field of agriculture
- gain knowledge on the fundamentals of electromagnetic radiation and use of remote sensing in agriculture and irrigation
- familiarize with effects of ionizing radiation on foods, and processing of seeds, spices, fruits and vegetables

REFRERENCES:

1. Koorevaar P., Menelik, G. and Dirksen, C., “Elements of Soil Physics”, Elsevier Science & Technology (1999).
2. Miller R.B., “Electronic radiation of foods: An Introduction to Technology”, Springer (2005).
3. George Joseph, “Fundamentals of Remote Sensing”, University Press Pvt.Ltd. (2005).
4. H.Don Scott, “Soil Physics: Agriculture and Environmental Applications”. Wiley (2000).

5. Manoj Shukla, “Soil Physics: An Introduction”, CRC Press (2013).
6. Lawlor D.W. “Photosynthesis”, Bioscientific Publishersw Ltd. (2001).
7. Aymn Elhaddad, “Remote Sensing Applications in Agriculture”, Vom Verlag (2009).

CY7252 CHEMISTRY FOR AGRICULTURAL ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To develop an understanding about the engineering materials.
- Brief elucidation on corrosion and its control.
- To develop sound knowledge about chemical toxicology and separation techniques.
- To impart basic knowledge on pesticides and fertilizers.
- To understand the basic concepts of green chemistry.

UNIT I ENGINEERINGMATERIALS 9

Introduction- lime – types, manufacture, properties - cement – Portland cement, setting and hardening of cement. Abrasives: definition, classification, natural and artificial abrasives, abrasive paper and cloth. Lubricants – principle – Classification – Properties of lubricant oils (Flash and Fire points – Cloud and Pour points only), grease and solid lubricants.

UNIT II CORROSIONCHEMISTRY 9

Introduction – chemical and electrochemical corrosions- mechanism of electrochemical corrosion. Galvanic, concentration cell, pitting and water line corrosions– Corrosion control – material selection and design - electrochemical protection – sacrificial anodic protection and impressed current cathodic protection. Protective coatings – metallic coatings (galvanizing, tinning, electroplating, electroless plating), non-metallic inorganic coatings, organic coatings (paints).

UNIT III PLASTICS AND PESTICIDES 9

Plastics - thermoplastics (polyethylene, polyvinyl chloride, Teflon) – thermosetting plastics (Bakelite), Rubbers – vulcanisation of rubber – synthetic rubbers (Buna – S, silicone rubber).Pesticides–classification–chlorinated pesticides (Endrin, Methoxychlor), organophosphorus pesticides (Parathion, Malathion) - carbamate pesticides (corbaryl, chlorophenoxyacids).

UNIT IV IRRIGATION AND FERTILIZER CHEMISTRY 9

Salinity and alkalinity in soils – fundamentals of soil cation exchange capacity. Fertilizers - nitrogen fertilizers (urea, ammonium nitrate), phosphorus fertilizers (single super phosphate, triple super phosphate, potassium fertilizers (potassium sulphate, potassium schoenite), NPK fertilizers (diammonium phosphate, nitrophosphate) – specifications – manufacture of fertilizers – Haber’s process, Den process, Mannheim Process, Wet process.

UNIT V CHEMICAL TOXICOLOGY AND SEPARATION TECHNIQUES 9

Toxicity – types – LD_{50} and LC_{50} values –toxic chemicals in the environment - biochemical effects of arsenic, cadmium, lead, cyanide and pesticides. Green chemistry with respect to agriculture – definition – Industrial applications. Chromatographic separation techniques – adsorption chromatography, thin layer chromatography, GC/MS, high performance liquid chromatography – principle, working and applications.

TOTAL: 45 PERIODS

OUTCOME:

- Will be competent in the knowledge of engineering materials, chemical toxicology and green chemistry.
- Will be familiar with fertilizers and pesticides.
- Will develop concern for protection of metals.
- Will be conversant with the knowledge of lubricants.

TEXTBOOKS:

1. Clair N Sawyer, Perry L. Mc Carty, Gene F Parkin, 'Chemistry for Environmental Engineering and Science, Tata McGraw-Hill Edition, 2004
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009

REFERENCES:

1. A.K.De, Environmental Chemistry, New Age International (P) Limited, 7th Edition, 2010.
2. Samuel L. Tisdale, Werner L. Nelson, James D. Beaton, Soil Fertility and Fertilizers, 8th Edition, Pearson publishers, 2013.
3. Mary Jane Shultz "Engineering Chemistry",Cengage Learning India privateLimited., New Delhi., 2007.
4. Dara S.S,UmareS.S."Engineering Chemistry", S. Chand & Company Ltd., New Delhi, 2014.

GE7153 ENGINEERING MECHANICS

L	T	P	C
4	0	0	4

OBJECTIVES:

- The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I STATICS OF PARTICLES **12**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane , Resultant of Forces , Resolution of a Force into Components , Rectangular Components of a Force, Unit Vectors.

Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES **12**

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

UNIT III DISTRIBUTED FORCES **16**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center

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

UNIT IV FRICTION 8

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

UNIT V DYNAMICS OF PARTICLES 12

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

TOTAL: 60 PERIODS

OUTCOMES:

- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXTBOOKS:

1. Beer,F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", McGraw-Hill Education (India) Pvt. Ltd. 10th Edition, 2013.

REFERENCES:

1. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
2. J.L. Meriam & L.G. Karige, Engineering Mechanics: Statics (Volume I) and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
3. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
4. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
5. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

GE7151	COMPUTING TECHNIQUES	L	T	P	C
	(Common to all branches of Engineering and Technology)	3	0	0	3

OBJECTIVE:

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION 9

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS 9

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and linking processes - Constants, Variables – Data Types – Expressions - Operators –Decision Making and Branching – Looping statements – Solving Simple Scientific and Statistical Problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - Strings- String operations – String Arrays - simple programs- sorting- searching – matrix operations.

UNIT IV POINTERS 9

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion –Enumerators – Structures - Unions

TOTAL : 45 PERIODS

OUTCOME:

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

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort**.**
- Use programming language to solve problems

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Byron S Gottfried, “Programming with C”, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007

CY7262 APPLIED CHEMISTRY LABORATORY FOR AGRICULTURAL ENGINEERS

L	T	P	C
0	0	4	2

(Minimum of 8 experiments to be conducted)

OBJECTIVES:

- The students should be made to introduce different experiments to test basic understanding the applied chemistry concepts.

LIST OF EXPERIMENTS

1. Determination of Iodine value.
2. Determination of Acid value of resin
3. Estimation of aniline point.
4. Determination of Cu in Brass sample.
5. Determination of Fe in Iron Ore

6. Determination of Ca in Limestone.
7. Identification of functional groups in organic compounds
8. Identification of monomers in polymers.
9. Determination of viscosity index by Brookfield viscometer.
10. Determination of TGA of polymeric sample.

TOTAL : 60 PERIODS

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply chemistry principles to evaluate agricultural engineering properties of materials

TEXTBOOKS:

1. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New York (2001).
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., Vogel's Textbook of practical organic chemistry, (2010).

REFERENCES:

1. G.H. Jeffery, J. Bassett, J. Mendham and R. C Denny Vogel's, Text book of quantitative analysis chemical analysis, ELBS 7thEdn.Longman, Singapore publishers, Singapore, 2010.
2. I. M. Kolthoff, E. B.Sandell et.al. Quantitative chemical analysis, Macmillan, Madras 1980.

GE7161	**COMPUTER PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

OBJECTIVES:

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL : 60 PERIODS

OUTCOME:

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

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
  Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Systems with C compiler

AI7301 SOIL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To expose the students to the fundamental knowledge on Soil physical parameters, Permeability – Compaction, Bearing Capacity and types and methods of soil survey and interpretative groupings

UNIT I INTRODUCTION AND PHYSICAL PROPERTIES 9

Soil - definition - major components –Soil forming minerals and processes- soil profile -Physical properties - texture –density-porosity-consistence- colour- specific gravity - capillary and non-capillary - plasticity. Soil air - soil temperature - soil water - classification of soil water- Movement soil water. Soil colloids – organic and inorganic matter-Ion exchange- pH – Plant nutrient availability.

UNIT II SOIL CLASSIFICATION AND SURVEY 9

Soil classification -soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping - mapping units - base maps - preparation of survey reports - concepts and uses - land capability classes and subclasses - soil suitability -Problem soils – Reclamation.

UNIT III PHASE RELATIONSHIP AND SOIL COMPACTION 9

Phase relations- Gradation analysis - Atterberg Limits and Indices- Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.

UNIT IV ENGINEERING PROPERTIES OF SOIL 9

Shear strength of cohesive and cohesion less - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test-Compressibility- Assessment of seepage through flow net construction-Permeability- Coefficient of Permeability-Darcy's law-field and lab methods.

UNIT V BEARING CAPACITY AND SLOPE STABILITY 9

Bearing capacity of soils - Factors affecting Bearing Capacity- Shallow and Pile foundations- Terzaghi's formula - BIS standards - Slope stability-Analysis of infinite and finite slopes- friction circle method-slope protection measures.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Fundamental knowledge of soil physical parameters.
- The procedures involved in soil survey, soil classification.
- The phase relationship and soil compaction.
- Concepts of bearing capacity and slope stability.

TEXTBOOKS:

1. Nyle C. Brady, The nature and properties of soil (10th Edition) Macmillan Publishing Company, New York, 2008.
2. Punmia, B.C., "Soil Mechanics and Foundation "Laxmi publishers, New Delhi. 2007.
3. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2007.

REFERENCES:

1. Edward J. Plaster., "Soil Science", Cengage Learning India Ltd, New Delhi, 2009.
2. Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2007.
3. Sehgal, S.B., "Text Book of Soil Mechanics", CBS Publishers and Distributors New Delhi, 2007.

CE7251	STRENGTH OF MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumertric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION 9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS 9

Double Integration method – Macaulay's method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theory – Application of theories of failure.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

1. Bansal, R.K., Strength of Materials, Laxmi Publications (P) Ltd., 2007
2. Jindal U.C., Strength of Materials, Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Egor. P.Popov " Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Subramanian R., Strength of Materials, oxford University Press, Oxford Higher Education Series, 2007.
3. Hibbeler, R.C., Mechanics of Materials, Pearson Education, Low Price Edition, 2007
4. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole Mechanics of Materials, Tata Mcgraw Hill publishing 'co. Ltd., New Delhi.

CE7351 FLUID MECHANICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the mechanics of fluids through a thorough understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
- To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes.

UNIT I FLUIDS PROPERTIES AND FLUID STATICS 9

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - viscosity, density, perfect gas, vapour pressure and surface tension - Basic equation of fluid statics - Pressure measurements - Manometers. - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

UNIT II BASIC CONCEPTS OF FLUID FLOW 9

(a) Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; (b) Dynamics - Dimensional Concepts of System and Control volume - Application of control volume to continuity, energy and momentum - Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation and moment-of-momentum equations and their applications.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

UNIT IV INCOMPRESSIBLE VISCOUS FLOW 9

Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V BOUNDARY LAYERS AND TRANSPORT BY ADVECTION AND DIFFUSION 9

Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation – Steady molecular diffusion and conduction – Turbulent transport equations – Channel diffusion and Dispersions and Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

TEXTBOOKS :

1. Streeter, V.L. Wylie, E. B. and Bedford K.W, *Fluid Mechanics.* (9th ed) Tata McGraw Hill, New Delhi, 1998
2. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House New Delhi. 2003

REFERENCES :

1. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 1995.
2. Jain A. K. Fluid Mechanics. Khanna Publishers 1995.
3. Roberson J.A and Crowe C.T., Engineering Fluid Mechanics. Jaico Books Mumbai, 2000.

CE7353 PLANE AND GEODETIC SURVEYING L T P C
4 0 0 4

OBJECTIVES:

- To introduce the rudiments of plane surveying and geodetic principles to Geo informatics 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

Classifications and basic principles of surveying – Equipment and accessories for ranging and chaining – Methods of ranging – Chain traversing – Basic principles and applications of Plane Table and Compass - Levels and staves - Methods of levelling - Booking -Reduction - Curvature and refraction - Contouring.

UNIT II 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 III 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 IV 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

UNIT V MODERN SURVEYING 12

Total Station: Advantages - Fundamental quantities measured – Parts and accessories – working principle – On board calculations –Field procedure - Errors and Good practices in using Total Station

GPS: System components – Signal structure – Selective availability and antispoofing – receiver components – Planning and data acquisition – Data processing - Errors in GPS - Applications

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, 2005
3. S.S.Bhavikatti, Surveying Theory and Practice, I.K.International Publishing House Pvt. Ltd, New Delhi, 2010

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, Tata McGraw Hill Education Private Limited, New Delhi, 2012
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

MA7358 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
4	0	0	4

OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Classification of partial differential equations - Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT II 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 III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 12

Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in cartesian coordinates.

UNIT IV FOURIER TRANSFORM 12

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

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and final value theorems – Formation of difference equation – Solution of difference equation using Z - transform.

TOTAL : 60 PERIODS

OUTCOMES :

- The students can able to solve the partial differential equations , find the Fourier series analysis and solve the problems by using Fourier transform and Z transform techniques.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Erwin kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, , New Delhi, 2014

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 11th Reprint , 2010.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

ME7353 MECHANICS OF MACHINES L T P C
3 0 0 3

OBJECTIVE:

- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyze the forces and torque acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I KINEMATICS OF MECHANISMS 9

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons– Analytical methods – computer approach – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.

UNIT II GEARS AND GEAR TRAINS 9

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.

UNIT III FRICTION IN MACHINE ELEMENTS 9

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes– Friction in vehicle propulsion and braking.

UNIT IV FORCE ANALYSIS 9

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members

UNIT V BALANCING AND VIBRATION 9

Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration isolation.

TOTAL: 45 PERIODS

OUTCOME:

- The course will enable the student to understand the forces and torque acting on simple mechanical systems and also the importance of balancing and vibration and the effect of friction in different machine parts of practical significance.

TEXTBOOK:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 3rd Edition, Oxford University Press, 2009.

REFERENCES:

1. Rattan, S.S, "Theory of Machines", 3rd Edition, Tata McGraw-Hill, 2009.
2. Thomas Bevan, 'Theory of Machines', 3rd Edition, CBS Publishers and Distributors,2005.
3. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2005
4. Benson H. Tongue, "Principles of Vibrations", Oxford University Press, 2nd Edition,2007
5. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2009.
6. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines', Affiliated East-West Pvt. Ltd., New Delhi, 1988.
7. Rao. J.S. and Dukkipati.R.V. 'Mechanisms and Machine Theory', Wiley-Eastern Ltd., New Delhi, 1992.
8. John Hannah and Stephens R.C., 'Mechanics of Machines', Viva Low-Prices Student Edition, 1999.
9. Grover. G.T., "Mechanical Vibrations", Nem Chand and Bros., 1996
10. William T. Thomson, Marie Dillon Dahleh, Chandramouli Padmanabhan, "Theory of Vibration with Application**",** 5th edition Pearson Education, 2011

CE7362 PLANE AND GEODETIC SURVEYING LABORATORY L T P C
0 0 4 2

OBJECTIVE:

- To familiarize with the various surveying instruments and methods.

EXCERCISES :

1. Determination of area of polygon by base line method using chain
2. Chain traversing
3. Fly levelling
4. Check levelling
5. Study of theodolite and its accessories
6. Measurement of horizontal and vertical angles using theodolite
7. Determination of tacheometric constants
8. Determination of elevation of an object using single plane method when base is accessible/ inaccessible
9. Determination of distance and difference in elevation between two inaccessible points using double plane method.
10. Heights and distances by stadia tacheometry
11. Heights and distances by tangential tacheometry
12. Study of Total station and GPS(demonstration only)

TOTAL: 60 PERIODS

OUTCOMES:

- At the end of the course the student will be able to use various surveying instruments like chain, 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, Tata McGraw Hill Education Private Limited, New Delhi, 2012
4. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
5. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice‘ Hall of India 2004
6. K.R. Arora, Surveying Vol I & II, Standard Book house , Tenth Edition, 2008

AI7401 HYDRAULIC ENGINEERING FOR AGRICULTURAL ENGINEERS L T P C
4 0 0 4

OBJECTIVES:

- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic pumps. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I UNIFORM FLOW 12

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II VARIED FLOWS 12

Dynamic equations of gradually varied and spatially varied flows - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method, Graphical method - Applications.

UNIT III RAPIDLY VARIED FLOWS 12

Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions.

UNIT IV ROTODYNAMIC PUMPS 12

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Submersible pumps -Turbine Pumps.

UNIT V POSITIVE DISPLACEMENT PUMPS 12

Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Piston pumps - Rotary pumps: Gear pump - Jet pump - Air-lift pump - Hydraulic Ram.

TOTAL: 60 PERIODS

OUTCOMES:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

TEXTBOOKS:

1. Jain. A.K., Fluid Mechanics, Khanna Publishers, Delhi, 2010.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2002.

REFERENCES:

1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.
2. Rajesh Srivastava, Flow through open channels, Oxford University Press, New Delhi, 2008.
3. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, 2008.
4. Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2000.

AI7402 PRINCIPLES AND PRACTICES OF CROP PRODUCTION L T P C
3 2 0 4

OBJECTIVES :

- To introduce the students to principles of agricultural and horticultural crop production and to introduce the production practices of crops.
- To delineate the role of agricultural and irrigation engineers in relation to various crop production practices.

UNIT I AGRICULTURE AND CROP PRODUCTION 9+6

Introduction to agriculture and its crop production sub-sectors - field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices

UNIT II CROP SELECTION AND ESTABLISHMENT 9+6

Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage; Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing.

UNIT III CROP MANAGEMENT 9+6

Crop water Management; Crop nutrition management - need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.

UNIT IV PRODUCTION PRACTICES OF AGRICULTURAL CROPS 9+6

Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal crops, grain legumes, oil seed crops, sugarcane, and fibre crops, and special purpose crops such as those grown for green manure.

UNIT V PRODUCTION PRACTICES OF HORTICULTURAL CROPS 9+6

Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flower crops; Cultivation practices of representatives of each group; Special features of production of horticultural crops - green house cultivation.

TOTAL (L: 45 + T: 15): 75 PERIODS

OUTCOMES:

- Students completing this course would have acquired knowledge on crop selection, crop production crop management.
- The students will have the required knowledge in the area of production of agricultural and horticultural crops.

TEXT BOOKS:

1. Rajendra Prasad , Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2005.
2. Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 1995.

REFERENCES:

1. Kumar, N.,Introduction to Horticulture, Rajalakshmi Publications. Nagercoil, 1993.
2. Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil. 1993.
3. Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989.
4. Bose T. K. and L.P.Yadav. Commercial Flowers, Nayaprakash, Calcutta. 1989.
5. Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005

AI7451 HYDROLOGY AND WATER RESOURCES ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources**.**

UNIT I PRECIPITATION AND ABSTRACTIONS 10

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation-Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception- Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression- Infiltration-Horton's equation-double ring infiltrometer, infiltration indices.

UNIT II RUNOFF 8

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Runoff estimation using empirical - Strange's table and SCS methods – Stage discharge relationships-flow measurements- Hydrograph – Unit Hydrograph – IUH

UNIT III FLOOD AND DROUGHT 9

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts-Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)

UNIT IV RESERVOIRS 8

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

UNIT V GROUNDWATER AND MANAGEMENT 10

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

TOTAL: 45 PERIODS

OUTCOMES:

- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
- The students will know the basics of groundwater and hydraulics of subsurface flows

TEXTBOOKS:

1. Subramanya .K. Engineering Hydrology- Tata McGraw Hill, 2013.
2. Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 2008.

REFERENCES:

1. David Keith Todd. Groundwater Hydrology, John Wiley & Sons, Inc. 2007
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. Applied Hydrology, McGraw Hill International Book Company, 2010.
3. Raghunath .H.M., Hydrology, Wiley Eastern Ltd., 2004

GE7251 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 – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

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

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land 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. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCES :

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

MA7354 NUMERICAL METHODS L T P C
4 0 0 4

OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

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 NUMERICAL DIFFERENTATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

OUTCOMES:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyze and evaluate the accuracy of common numerical methods.

TEXTBOOKS:

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao . K, " Numerical Methods for Scientists and Engineers" PHI Learning Pvt Ltd. New Delhi, 2007.

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, 6th Edition, 2006.
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.

AI7411 SOIL SCIENCE AND WATER QUALITY LABORATORY L T P C
0 0 4 2

OBJECTIVE:

- Students should be able to verify various quality aspects of soil and water studied in theory by performing experiments in lab.

1. Identification of rocks and minerals 4
2. Conduct soil profile study 4
3. Collection and processing of soil samples 4
4. Determination of soil moisture, EC and pH 4
5. Field density determination by Core Cutter and Sand Replacement method 4
6. Specific gravity determination by Pycnometer 4

7. Textural analysis of soil by International Pipette method 4
8. Grain size analysis by using Mechanical shaker 4
9. Identification of soil colour using Munsell chart 4
10. Determination Organic carbon 4
11. Estimation of Gypsum requirements 4
12. Collection of irrigation water and analysis for EC, pH, CO_3, HCO_3, Ca, Mg, K 8
13. Computation of salts in irrigation water and classification. 8

TOTAL: 60 PERIODS

OUTCOMES:

- Students know the techniques to determine various physical and chemical properties of soil that are applicable for agriculture and irrigation by conducting appropriate tests.

REFERENCES:

1. Punmia, B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publishers, New Delhi. 2007.
2. APHA, Standard methods for the examination of water and wastewater, 19th ed. American Public Health Association, Washington, D.C. 1995.
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai. 2012.

CE7361 FLUID MECHANICS AND MACHINERY LABORATORY L T P C
0 0 4 2

OBJECTIVE:

- Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS

1. **Flow Measurement** **32**
   1. a. Calibration of Rotometer
      b. Flow through Venturimeter
   2. Flow through a circular Orifice
   3. Determination of mean velocity by Pitot tube
   4. Verification of Bernoulli's Theorem
   5. a. Flow through a Triangular Notch
      b. Flow through a Rectangular Notch
2. **Losses in Pipes** **8**
   6. Determination of friction coefficient in pipes
   7. Determination of losses due to bends, fittings and elbows
3. **Pumps** **16**
   8. Characteristics of Centrifugal pumps
   9. Characteristics of Submersible pump
   10. Characteristics of Reciprocating pump
4. **Determination of Metacentric height** **4**
   Demonstration Only

TOTAL: 60 PERIODS

OUTCOMES:

- The students will be able to measure flow in pipes and determine frictional losses.
- The students will be able to develop characteristics of pumps and turbines

REFERENCES:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, Chennai. 2004.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House, New Delhi, 2000.
3. Subramanya, K. Flow in open channels, Tata McGraw - Hill pub. Co.1992.
4. Subramanya, K. Fluid mechanics, Tata McGraw- Hill Pub. Co., New Delhi, 1992.

AI7501 GROUNDWATER AND WELL ENGINEERING L T P C
3 0 0 3

OBJECTIVES

- To introduce the concepts of groundwater, its availability, assessment and utilization
- To understand the theory behind well design, construction and management of wells.

UNIT I HYDROGEOLOGIC PARAMETERS 9

Water Balance – Distribution of subsurface water – Water bearing properties of Rocks – Types of Aquifers – Aquifer properties Estimation – Pumping test :– Permeability, Specific yield, transmissivity and Storage coefficient – Methods of Estimation – Ground water table fluctuation method – GEC Norms – Ground water development and potential in India.

UNIT II WELL HYDRAULICS 9

Darcy's law – Groundwater Flow Equation – Steady state flow – Dupuit Forcheimer Assumption – Theim's Equation - unsteady flow – Theis method and Jacob method – Image well theory – Partial penetration of wells.

UNIT III WELL DESIGN 9

Design characteristics – Design of wells - Well diameter, depth and Well screen design – Materials for well screens – Well casing – Design of collector wells and Infiltration gallery – Dug wells versus tube wells

UNIT IV WELL CONSTRUCTION AND MAINTENANCE 9

Types of wells – Well drilling - Boring, Jetting – Rotary drilling, Hammer drilling - Construction – Installation of pipes and screens - Well development, Completion and disinfection – Well maintenance – Well performance test – Well effectiveness – Well loss – Pumping equipment.

UNIT V SPECIAL TOPICS 9

Artificial Recharge Techniques – Sea water Intrusion – Ground water modeling Techniques – Ground water pollution and legislation - Ground water development and potential in India – Hazardous substances – Hazard identification – Dose response assessment – Risk analysis

TOTAL: 45 PERIODS

OUTCOMES:

- Students know the technical aspects of groundwater, its availability, assessment and utilization
- Familiarized with the theory behind well design, construction and management of wells.

TEXTBOOKS:

1. Karanth, K.R. Groundwater Assessment, Development and Management. Tata Mc-Graw Hill, 2008.
2. Raghunath, H.M. Groundwater Hydrology, Wiley Eastern Ltd., 2000.

REFERENCES:

1. Rastogi,A.K. Numerical Groundwater Hydrology, Penram International Publishing. Pvt. Ltd., Bombay, 2008.
2. David Keith Todd. Groundwater Hydrology, John Wiley & Sons, Inc. 2007
3. Fletcher.G.Driscoll, "Groundwater and Wells", Johnson Revision, New York, 1987.

AI7502 IRRIGATION ENGINEERING FOR AGRICULTURAL ENGINEERS L T P C
3 0 0 3

OBJECTIVE:

- To introduce the student to the concept of soil-plant characteristics and their water requirements. At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right time and right place.

UNIT I CROP WATER REQUIREMENT 10

Irrigation – Necessity and importance - Advantages and disadvantages – Crop and crop seasons in India –Duty, Delta, Base Period– Factors affecting Duty-Irrigation efficiencies– Consumptive use of water-Irrigation requirements of crops - Standards for irrigation water- Planning and Development of irrigation projects.

UNIT II METHODS OF IRRIGATION 8

Classification of irrigation methods – Surface irrigation – Subsurface irrigation – Drip and Sprinkler irrigation – Merits and demerits – Lift irrigation – Tank irrigation.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Head works –Weirs and Barrage –Types of impounding structures - Factors affecting, location of dams -Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways -Energy dissipaters.

UNIT IV CANAL IRRIGATION 9

Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories - Canal Head works – Canal regulators - Canal drops – Cross drainage works – Canal Outlet, Escapes –Lining and maintenance of canals.

UNIT V IRRIGATION MANAGEMENT, CLIMATE CHANGE & ADAPTATION 9

Irrigation Water Management - Farmer's organization and turn over – Water Users' Associations – Water delivery system- Command Area Development - Basics of climate change - effects of climate change - Impacts on Agriculture - Challenges of climate change in irrigation Season based irrigation practices - Adaptation to changes - System of Rice Intensification - Sustainable irrigation practices and cropping pattern .

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to understand the requirement of crop water.
- They will know about the methods of irrigation, various canal structures
- Concepts of Irrigation water management, impact of climate change and adaptation.

TEXT BOOKS:

1. Sharma, R.K., and Sharma, T.K., "Irrigation Engineering", S. Chand and Company, New Delhi, 2008.
2. Michael, A.M., "Irrigation Engineering", Vikas Publishers, New Delhi, 2008.
3. Garg, S.K., "Irrigation Engineering," Laxmi Publications, New Delhi, 2008.

REFERENCES:

1. Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.
2. Dilip Kumar Majumdar., "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
3. Jan C. van Dam, "Impacts of Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press, 2003.
4. Adams. R.M, Hurd.B.H., Lenhart. S and Leary N "Effects of global Climate Change on Agriculture", Climate Research, 1998.

AI7503 UNIT OPERATIONS IN AGRICULTURAL PROCESSING AND POST HARVEST TECHNOLOGY

L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to the fundamentals of various unit operations of Agricultural Processing
- To expose the students to different Post Harvest operations and processing methods of harvested crops
- To introduce material handling equipment, storage and waste utilization.

UNIT I EVAPORATION AND SIZE REDUCTION 9

Unit operations in agricultural processing – Evaporation - Types of evaporators – Capacity – Energy balance – Drying - principles - constant and falling rate of drying - thin layer and deep bed drying - types of dryers – Size reduction - Rittinger, Bond, Kick's laws of crushing – crushers – types – crushing rolls – hammer mills – fine crushers

UNIT II MECHANICAL SEPARATION, CRYSTALLIZATION AND DISTILLATION 8

Screening – Trommel - Filtration – definition – filtration equipment – filter press – Stoke's law – Sedimentation – centrifuging – Crystallization – crystallizers – Distillation – equipment

UNIT III ENGINEERING PROPERTIES OF AGRICULTURAL MATERIALS 9

Post harvest engineering of crops – objectives - post harvest losses in agricultural commodities - structure and composition of food grains - optimum stage of harvest - engineering properties of agricultural materials - Moisture content – measurement - – grain moisture meter - equilibrium moisture content – psychrometry.

UNIT IV THRESHING AND GRADING 9

Threshing - traditional methods - mechanical threshers - principles and operation –. Cleaning and grading – principles - air screen cleaner – separators (cylinder, spiral, magnetic, inclined belt) - effectiveness of separation and performance index - color sorter - Groundnut decorticator - Maize Sheller

UNIT V PROCESSING OF CEREALS & PULSES, MATERIAL HANDLING AND STORAGE 10

Paddy processing - parboiling - methods - dehusking of paddy – methods - rice polishers - types - degree of polishing - layout of modern rice mill - manufacture of beaten, expanded and puffed rice – Wheat milling processes and equipment - processing of pulses and corn - Material handling equipment - belt conveyor - screw conveyor and bucket elevators - storage conditions for safe storage - traditional methods – factors affecting storage – storage losses - modified and controlled atmosphere storage

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the study the student will have knowledge on

- Fundamentals of various unit operations of Agricultural Processing.
- Material handling equipments
- Post Harvest operations and processing methods of harvested crops.

TEXTBOOKS:

1. Chakraverty, A., “Post Harvest Technology of Cereals, Pulses and Oilseeds”, Oxford and IBH Publishing Company, Calcutta, 2008.
2. Sahay, K.M., and Singh, K.K., “Unit operations of Agricultural Processing”, Vikas Publishing House Pvt. Ltd., New Delhi, 2008.
3. Earle, R.L. Unit Operations in Food Processing, Pergamon Press. Oxford. U.K. 2003.

REFERENCES:

1. McCabe, W.L., J.C.Smith and P.Harriot. Unit Operations of Chemical Engineering. McGraw-Hill. Inc. Kosaido Printing Ltd. Tokyo, Japan. 2001.
2. Geankoplis C.J. Transport Process and Unit Operations. Prentice-Hall of India Private Limited, New Delhi. 1999.
3. Multon, J.L., Reimbert, A.M., Marsh D and Eydt A.J. Preservation and storage of grains, seeds and their by products. CBS Publishers and Distributors, Delhi. 1989.
4. Henderson, S.M. and R.L. Perry. Agricultural Process Engineering. John Wiley and Sons, New York. 1955.

ME7552 DESIGN OF MACHINE ELEMENTS L T P C
4 0 0 4

OBJECTIVES:

- To understand the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn the use of standard practices in design.

UNIT I FUNDAMENTAL CONCEPTS IN DESIGN 12

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional loading- Modes of failure - Factor of safety – Combined loads – Principal stresses – Impact and shock loading – Eccentric loading – curved beams – crane hook and ‘C’ frame- theories of failure – Design based on strength and stiffness – stress concentration – Fluctuating stresses – Endurance limit – Notch sensitivity - Design for finite and infinite life under variable loading - Exposure to standards.

UNIT II SHAFTS AND COUPLINGS 12

Shafts and Axles - Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys and splines – Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS 12

Threaded fasteners - Bolted joints – Simple and eccentrically loaded bolted joints, Knuckle joints, Cotter joints, Welded joints – Butt, Fillet and parallel transverse fillet welds – welded joints subjected to bending, torsional and eccentric loads, riveted joints for structures –Caulking and fullering – efficiency of joints – Strength equations.

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS 12

Types of springs, design of helical and concentric springs–surge in springs, Design of laminated springs - Flywheels considering stresses in rims and arms for engines and presses - Solid and Rimmed flywheels - Connecting Rods and crank shafts.

UNIT V BEARINGS 12

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi & Boyd graphs, -- Selection of Rolling Contact bearings -Seals and Gaskets

TOTAL: 60 PERIODS

OUTCOMES:

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

- Appreciate the functions of various machine elements and assemblies
- Design various machine components according to the requirement as per the prescribed standards
- Use standard design data books.

TEXTBOOKS:

1. Joseph Shigley,CharlesMischke,RichardBudynas and Keith Nisbett “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill , 2008.
2. Bhandari V, “Design of Machine Elements”, 15thReprint, Tata McGraw-Hill Book Co, 2014.

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REFERENCES:

1. Sundararajamoorthy T. V. Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2003.
2. Mohammed. Jalaludeen “Machine Design, Volume I”, “Design of Machine Elements”, 4th edition, Anuradha Publications, 2014.
3. Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine component Design”,5th Edition, Wiley, 2011
4. Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2006.
5. Ansel Ugural, “Mechanical Design – An Integral Approach”, 1st Edition, Tata McGraw-Hill Book Co, 2003.
6. M F. Spotts, Terry E. Shoup and Lee E. Hornberger, “Design of Machine Elements” 8th Edition, Printice Hall, 2003.
7. “Design Data Hand Book”, PSG College of Technology, 2013- Coimbatore

AI7511 DESIGN AND DRAWING OF IRRIGATION STRUCTURES L T P C
0 0 4 2

OBJECTIVE :

- To conceive, design and draw the irrigation structures in detail showing the plan, elevation and sections.

UNIT I TANK COMPONENTS 12

Fundamentals of design - Tank bunds – Tank surplus weirs – Tank sluice with tower head - Drawings showing foundation details, plan and elevation.

UNIT II IMPOUNDING STRUCTURES 16

Design principles - Earth dams – Gravity Dams - Arch dams – Spill ways – Drawing showing plan, elevation, half sections including foundation details.

UNIT III CROSS DRAINAGE WORKS 16

General design principles - Aqueducts – Syphon aqueducts – Super passage – Canal syphon – Canal drops – Drawing showing plan, elevation and foundation details.

UNIT IV CANAL REGULATION STRUCTURES 16

General Principles - Canal head works – Direct Sluice - Canal regulator – Canal escape – Drawing showing detailed plan, elevation and foundation details.

TOTAL: 60 PERIODS

OUTCOME:

- At the end of the study, the student can able to design and draw the plan, elevation and sections of tank components, impounding structures, cross drainage works and canal regulation structures.

TEXTBOOKS:

1. Satya Narayana Murthy Challa, “Water Resources Engineering: Principles and Practice”, New Age International Publishers, New Delhi, 2002.
2. Garg, S.K., “Irrigation Engineering and Design of Structures”, New Age International Publishers, New Delhi, 1997.

REFERENCES:

1. Mohanakrishnan. A, “A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu”, Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy, 2011.
2. Raghunath, H.M. “Irrigation Engineering”, Wiley India Pvt. Ltd., New Delhi, 2011.
3. Sharma R.K., “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., New Delhi, 2002.

AI7512 IRRIGATION FIELD LABORATORY L T P C
0 0 4 2

OBJECTIVE:

- Students should be able to verify the principles studied in theory by performing the experiments in lab.

1. To study various instruments in the Meteorological Laboratory
2. Determination of infiltration rate using double ring infiltrometer
   Determination of infiltration rate using digital infiltrometer

3. Determination of soil moisture wetting pattern for irrigation scheduling
4. Measurement of flow properties in open irrigated channels (flumes, notches)
5. Estimation of Leaf Area Index
6. Evaluation of surface irrigation
7. Determination of uniformity coefficient for drip irrigation system
8. Determination of uniformity coefficient for sprinkler system (catch can method)
9. To conduct experiment on canopy analyzer
10. To conduct experiment on disc filter for micro irrigation systems

TOTAL: 60 PERIODS

OUTCOME:

- On the completion of the course the student will have the knowledge on various meteorological instruments and understanding the concept of different irrigational systems in the laboratory tests.

REFERENCES:

1. Michael, A.M., "Irrigation Theory and Practice", Vikas Publishing House, New Delhi, 1999.
2. Asawa, G.L., "Irrigation Engineering", New Age International Private Limited, New Delhi, 1996.
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

AI7601 DAIRY AND FOOD ENGINEERING L T P C
3 0 0 3

OBJECTIVES :

- To introduce the students to dairy industry, properties and processing of milk, manufacture of dairy products , sanitation and effluent treatment in dairy industry
- To expose the students to the fundamental knowledge of food, its properties and different methods of food processing

UNIT I PROPERTIES AND PROCESSING OF MILK 9

Dairy Industry – importance and status – Milk Types – Composition and properties of milk - Production of high quality milk - Method of raw milk procurement and preservation - Processing – Staining - Filtering and Clarification - cream separation – Pasteurization – Homogenization - sterilization, UHT processing and aseptic packaging – emulsification - Fortification.

UNIT II DAIRY PRODUCTS 9

Manufacture of Milk Powder - Processing of Milk Products - Condensed Milk - Skim milk - Butter milk - Flavored Milk, whey, casein, yoghurt and paneer - Manufacture of Butter - Cheese Ghee, ice creams and frozen desserts - standards for milk and milk products - Packaging of Milk and Milk Products - Cleaning and Sanitation - Dairy effluent treatment and disposal .

UNIT III FOOD AND ITS PROPERTIES, REACTION AND KINETICS 9

Constituents of food - thermal processing of foods - cooking, blanching, sterilization, pasteurization, canning - Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET isotherms, Raoult's law, Norrish, Ross, Salwin - Slawson equations.

UNIT IV PROCESSING AND PRESERVATION OF FOODS 10

Coffee, Tea processing - Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and freeze dryers - rehydration of dehydrated foods - Fat and oil processing, sources, extraction, methods and equipment, refining of oils, hydrogenation, manufacture of margarine - Food preservation methods - preservation by irradiation, microwave and dielectric heating of food.

UNIT V QUALITY CONTROL 8

Quality control of processed food products - Factors affecting quality - Food packaging, importance, flexible pouches - restorable pouches - aseptic packaging, granules, powder and liquid packaging machines - nanotechnology – principles - applications in food processing – food plant location

TOTAL: 45 PERIODS

OUTCOMES:

- The students will gain knowledge about Dairy and Food process engineering
- Understand the process of manufacturing of dairy products and thermal processing of food.
- Students will understand the importance of quality control and food preservation and packaging.

TEXTBOOKS:

1. Chandra Gopala Rao. Essentials of Food Process Engineering. B.S. Publications, Hyderabad, 2006.
2. Walstra. P., Jan T. M. Wouters., Tom J. Geurts “Dairy Science and Technology”, CRC press, 2005.
3. Ananthakrishnan, C.P., and Sinha, N.N., “Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi, 1999.

REFERENCES:

1. Subbulakshmi.G., and Shobha A. Udipi, Food Processing and Preservation, New Age International Publications, New Delhi, 2007.
2. Toledo, R.T., “Fundamentals of Food Process Engineering”, CBS Publishers and Distribution, New Delhi, 1997.
3. Tufail Ahmed., “Dairy Plant Engineering and Management”, Kitab Mahal Publishers, Allahabad, 1997.
4. Dairy Science and Technology Handbook, Volumes 1-3, John Wiley & Sons,1993.
5. Charm, S.E., “Fundamentals of Food Engineering”, AVI Pub.Co.Inc, New York, 1997.

AI7602 DRAINAGE ENGINEERING AND LAND MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic concepts for planning, design and management of land drainage works in cultivated areas
- To study the various methods of land drainage and its impact on environment

UNIT I CONCEPTS OF DRAINAGE ENGINEERING 9

Problem soils - Water logging - Causes – ill effects – Land drainage – Benefits of drainage-components of drainage system: Surface drainage and sub surface drainage – drainage requirement - factors affecting land drainage: measurement of depth to water table, salinity, hydraulic conductivity, topography, impermeable layers.

UNIT II SURFACE DRAINAGE 9

Drainage surveys - Land preparation: leveling and grading - design of surface drains – calculation of design discharge – main line, lateral and collectors, drainage coefficient- rational method - CN method for drainage coefficient – Levees – Surface drainage of ponded areas, flat lands and sloping land – materials, maintenance.

UNIT III SUBSURFACE DRAINAGE 9

Groundwater flow – Darcy's equation – Boundary conditions – Dupuit -Forchheimer Theory - Design: Steady-State Equations: Hooghought, Ernst Equation – application of steady state equation - Unsteady-State Equations - Glover-Dumm Equation, De Zeeuw-Hellinga Equation - Application of Unsteady-State Equations - Seepage from a River into a Semi-confined Aquifer – Types of tile drains – Mole drains

UNIT IV WATER BALANCE AND DRAINAGE CRITEREA 9

Equations for Water Balances- Components of Water Balances: Surface, Unsaturated Zone, Groundwater, Integrated Water Balances, Practical Applications - Equations for Water and Salt Balances - Processing and Interpretation of Basic Data - Water Balance Analysis With Flow Nets - Water Balance Analysis with Models - Agricultural drainage criteria - Effects of Field Drainage Systems on Agriculture - Some examples of agricultural drainage criteria.

UNIT V ENVIRONMENTAL ASPECTS OF DRAINAGE 9

Environmental Impacts- Side effects inside the Project Area - Downstream Side-Effects- Upstream Side-Effects – Salinity in relation to Irrigation and Drainage - Salt Balance of the Root zone- Salinization due to Capillary Rise- Leaching Process - Bio drainage – principles – rainfed and irrigated systems - Design considerations for bio-drainage.

TOTAL: 45 PERIODS

OUTCOME:

- The students shall be able to plan and design the drainage system in an efficient manner.

TEXTBOOKS:

1. Michael A. M and T. P Ojha, Principles of Agricultural Engineering Vol II, Jain Brothers, New Delhi 2009
2. Ritzema, H.P., "Drainage Principles and Applications", Publication No. 16, International Institute of Land Reclamation and Improvement, Netherlands, 1994.

REFERENCES:

1. Bhattacharya, A.K., and Michael, A.M., "Land Drainage – Principles, Methods and Applications", Konark Publishers Pvt. Ltd., New Delhi, 2003.
2. Irrigation water Management, Training Manual No 6, Drainage of Irrigated Lands, Food and Agriculture Organisation, Rome 1996
3. Sharma, R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Company, New Delhi, 1984.
4. Kessler, J., "Drainage Principles and Applications", Vol. II and IV, International Institute of Land Reclamation and Improvement, Netherlands, 1979.

AI7603 **FARM TRACTORS** **L T P C**
3 0 0 3

OBJECTIVES :

- To introduce the students to the working principles of tractor, farm equipment, Power Tiller, makes of tractors and power tillers, tillage implements.
- To expose the students to farm mechanization benefits and constraints, Identification of components of primary and secondary tillage implements.
- To introduce the students to the working principles of tractor, farm equipment, Power Tiller, makes of tractors and power tillers, tillage implements.
- To expose the students to farm mechanization benefits and constraints, Identification of components of primary and secondary tillage implements.

UNIT I TRACTORS **9**

Farm mechanization in India - Makes of tractors, power tillers, earth moving machinery - Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft – firing order- combustion chambers.

UNIT II ENGINE SYSTEMS **9**

Valves-inlet and outlet valves – valve timing diagram. Air cleaner- exhaust – silencer. Cooling systems - lubricating systems - fuel system – governor- electrical system.

UNIT III TRANSMISSION SYSTEMS **9**

Transmission - clutch - gear box - sliding mesh - constant mesh - synchro mesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.

UNIT IV HYDRAULIC SYSTEMS **9**

Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability - longitudinal and lateral. Controls - visibility - operators seat.

UNIT V POWER TILLER AND TRACTOR TESTING **9**

Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors and power tillers. Types of tests- test procedure - need for testing & evaluation of farm tractor –Test code for performance testing of tractors and power tillers.

TOTAL : 45 PERIODS

OUTCOME:

- At the end of the course, the students will have a thorough knowledge on various systems of tractors, power tillers and test procedures.

TEXTBOOKS:

1. Barger, E.L., et al., “Tractors and their Power Units”, John Wiley and Sons Inc., New York, 2007.
2. Harris Pearson Smith., “Farm Machinery and equipment”, McGraw hill –publications 1955.
3. Jain, S.C. and C.R. Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi., 1999.

REFERENCES:

1. Domkundwar A.V. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi.,1999.
2. Black, P.O. Diesel engine manual. Taraporevala Sons & Co., Mumbai.,1996.
3. Grouse, W.H. and Anglin, D.L. Automative mechanics. Macmillan McGraw- Hill, Singapore., 1993.

4. Jagadishwar Sahay, “Elements of Agricultural Engineering”, Agro Book Agency,Patna, 2010
5. Srivastava, A.C., “Elements of Farm Machinery”, Oxford and IBH Publication Co.,New Delhi, 1990.
6. http://en.wikipedia.org/wiki/List_of_agricultural_machinery

AI7604 PRINCIPLES OF MANAGEMENT FOR AGRICULTURAL ENGINEERS L T P C
3 0 0 3

OBJECTIVES:

- To learn the different principles and techniques of management in planning, organizing directing and controlling.
- To study the historic development of Management thoughts
- To learn the nature and purpose of planning, forecasting and decision making
- To learn the concepts of organizing, delegation of authority and HRD concepts

UNIT I HISTORICAL DEVELOPMENT OF MANAGEMENT THOUGHTS 9

Definition of Management – Management is Science or Art – Comparison of Management and Administration – Development of Management thoughts – Contribution of F. W.Taylor and H.Fayol – Types of Business Organisation

UNIT II PLANNING 9

Nature & Purpose of Planning – Planning process – types of planning – objectives – setting objectives – policies – Planning promises – Process of MBO – Forecasting in Planning – Decision making steps and process.

UNIT III ORGANISING 9

Nature and Purpose – Formation of Organizations – Formal and informal organization – Organization Chart and Manual – Types of organization structure – Line and Staff authority – departmentalization – Delegation of Authority – centralization and Decentralizaion – advantages and disadvantages – staffing – selection and recruitment process – techniques – Career development

UNIT IV DIRECTING 9

Scope – human factors in directing – integrating objectives – leadership – types and theories of leadership – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – communication – process of communication – barrier in communication – effective communication – impact of technology in organization communication – organizational culture.

UNIT V CONTROLLING 9

System and process of controlling – requirement for effective control – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting – global business environment – globalization and liberalization – intervention management and global theory of management.

TOTAL : 45 PERIODS

OUTCOME:

- On completion of the course, students will have the knowledge on the managerial skills like organizing, planning, forecasting and decision making.

TEXT BOOKS:

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata Mcgraw Hill,1998.
2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES:

1. Tripathy PC And Reddy PN, “Principles of Management”, Tata McGraw Hill,1999.
2. Decenzo David, Robbin Stephen A, ”Personnel and Human Reasons Management”, Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, “ Engineering Management”, Addison Wesley, 2000.

AI7611 AGRICULTURAL PROCESSING AND FOOD ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVE:

- To get hands on experience on various aspects of food science, agricultural processing, post harvest technology and food process engineering.

A. Experiments on Engineering properties of agricultural materials **12**

1. Determination of porosity of grains.
2. Determination of coefficient of friction and angle of repose of grains.
3. Evaluation of thin layer drier
4. Determining the efficiency of bucket elevator and screw conveyor

B. Experiments on Food Adulteration **8**

1. Test for adulterant in Ghee
   Test for adulterants in oils and fats
2. Test for dye in tea
   Test for Non-Permitted colours in foods

C. Experiments on Macro & Micro Nutrients **12**

1. Estimation of protein in foods
   Estimation of sugars in foods
   Estimation of fat in foods
2. Estimation of Calcium, Sodium, Potassium and Iron in foods
3. Estimation of Fortificants in food

D. Experiments on Food Processing & Preservation **12**

1. Gluten in Wheat Flour and Maida
2. Brix values of fruit products
   Test for preservative in fruit products
   Estimation of preservative in fruit products
3. Estimation of Vitamin C in fruit juice

E. Experiments on Post Harvest Technology **8**

1. Determination of Moisture in food grains, spices and condiments
2. Microscopic examination of Mould infestation in food grains and nuts
3. Visit to modern rice mill / pulse milling industry

F. Experiments on Food Process Engineering **8**

1. Acid values and peroxide value of edible oils
2. Expansion and Oil Absorption characteristic of snacks on frying

(Some experiments will be through demonstration / video presentation)

TOTAL: 60 PERIODS

OUTCOMES:

- On completion of the lab course, the students will be able to get experience on various aspects of food processing, preservation.
- The students will have knowledge on different engineering properties of agricultural materials and post harvesting technologies.

REFERENCES:

1. Chakraverty, A., "Post Harvest Technology of Cereals, Pulses and Oilseeds", Oxford and IBH Publishing Company, Calcutta, 2008.
2. Pande, P.H. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana, 1994.
3. Sri Lakshmi.B., Food Science, New Age International Publications, 4th Edition, New Delhi, 2007.
4. Chandra Gopala Rao. Essentials of Food Process Engineering. B.S. Publications, Hyderabad, 2006.
5. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

AI7612 **CAD FOR AGRICULTURAL ENGINEERING** **L T P C**
0 0 4 2

OBJECTIVE

- To draft the agricultural engineering related machineries and structures manually and also by computer aided methods.

1.	Design and Drawing of Underground pipeline system	8
2.	Design and Drawing of Check dam	6
3.	Design and Drawing of Mould board plough	8
4.	Design and Drawing of Disk plough	8
5.	Design and Drawing of Post harvest technology units (threshers and winnowers)	8
6.	Design and Drawing of Biogas plant.	6
7.	Introduction & demonstration on 3D modeling softwares	16

TOTAL: 60 PERIODS

OUTCOMES:

- The student will be able to understand the plan and layout of underground pipes, post harvesting units and check dams.
- The students also will be able to design and draw the components using computer aided methods

REFERENCES

1. Michael, A.M. “Irrigation Theory and Practice”, Vikas Publishing House, New Delhi, 1999.
2. Rai, G.D. “Nonconventional Sources of Energy”, Khanna publishers, New Delhi, 1995.
3. Srivastava, A.C.”Elements of Farm Machinery”, Oxford and IBH Publications Co., New Delhi, 1990.
4. Vijay Duggal. “A general guide to Computer Aided Design & Drafting, Mailmax Publications, 2000
5. Tadeusz Stolarski et al. “Engineering Analysis with ANSYS Software”, Butterworth Heinemann Publications, 2006
6. Louis Gary Lamit, “Introduction to Pro/ENGINEER” SDC Publications, 2004.

AI7613 TECHNICAL SEMINAR L T P C
0 0 2 1

OBJECTIVE:

- To work on a specific technical topic in Agricultural and Irrigation 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 six 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.

AI7701 FARM EQUIPMENT L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the working principles of tractor, farm equipments, Power Tiller, makes of tractors and power tillers, tillage implements.
- To expose the students to farm mechanization benefits and constraints, Identification of components of primary and secondary tillage implements

UNIT I FARM MECHANIZATION 9

Farm mechanization – objectives. Tillage - objectives - methods – primary tillage implements - secondary tillage implements - animal drawn ploughs - construction. Types of farm implements – trailed, mounted. Field capacity - forces acting on tillage tool.

UNIT II PRIMARY & SECONDARY TILLAGE IMPLEMENTS 9

Mould board plough – Disc plough - force representation – Subsoiler plough - Rotary plough – spading machine - Cultivators -. Disc harrows - Bund former - ridger – leveller. Basinlister - Wetland preparation implements. Hitch systems - vertical and horizontal hitching of pull type and mounted implements.

UNIT III SOWING AND WEEDING EQUIPMENT 9

Crop planting - methods - row crop planting systems - Devices for metering seeds – furrow openers – furrow closers- types – Types of seed drills and planters - Weeding and Interculture equipment. Junior hoe - blade harrow - dry land weeders - tractor mounted and engine operated sweeps. Engine operated and rotary weeders for upland and low land.

UNIT IV SPRAYERS AND DUSTERS 9

Sprayers – classifications - parts and accessories - atomizers - agitators - determination of particle size and distribution - operation – boom sprayer - precaution - coverage - factors affecting drift. Rotating disc sprayers – Controlled Droplet Application (CDA) - Electrostatic sprayers - Arial spraying - Dusters - types - mist blower cum duster - other plant protection devices, care and maintenance.

UNIT V FERTILIZER APPLICATION & OTHER FIELD CROP MACHINERY 9

Transplanters - Drill calibration - metering devices – seed cum fertilizer drill - application of liquid fertilizers - Harvesters - mowers, windrowers, reapers, binders and forage harvesters. Combine harvester – Diggers - Sugarcane harvesters - cotton pickers - corn harvesters - Thresher - multi crop thresher. Fruit pluckers - tree shakers – shrub cutters - tree cutting machines – post hole diggers – Chaff cutter

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to understand the mechanization and various equipment used in the farm.
- The students will have the knowledge on earth moving machineries and tillage implements.

TEXTBOOKS :

1. Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6.,2006.
2. Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005

REFERENCES:

1. Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.
2. Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.
3. Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990.

AI7702 SOIL AND WATER CONSERVATION ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To present the concepts of erosion so that students get a sound knowledge about the problems associated with it.
- To enable the students to make use of the principles and concepts to solve issues related to soil and water management.

UNIT I SOIL EROSION PRINCIPLES 9

Approaches to soil conservation – Soil conservation in India - Erosion – Agents - Causes - Mechanics of water erosion – Soil erosion problems - Types of water erosion: Raindrop erosion, Sheet erosion, Rill erosion, Gully erosion, Stream bank erosion – Classification of Gully – Gully Control Structures: Drop Spillway, Drop Inlet, Chute Spillways - Prerequisites for soil and water conservation measures.

UNIT II ESTIMATION OF SOIL EROSION 9

Runoff computation for soil conservation: SCS-CN method – Evolution of Universal Soil Loss Equation: Applications and Limitations – Modified Universal Soil Loss Equation – Revised Universal Soil Loss Equation-2 - Permissible erosion – Land use capability classification - Classification of eroded soils.

UNIT III EROSION CONTROL MEASURES 10

Agronomic practices: contour cultivation - strip cropping – tillage practices – Soil management practices – Bunding: Types and design specifications - Mechanical measures for hill slopes – Terracing: Classification and design specification of bench terrace – Grassed waterways: Location, construction and maintenance – Types of temporary and permanent gully control structures.

UNIT IV WATER CONSERVATION MEASURES 9

In-situ soil moisture conservation – Water harvesting principles and techniques: Micro catchments, catchment yield using morphometric analysis - Farm ponds: Components, Design, Construction and Protection – Check dams - Earthen dam – Retaining wall.

UNIT V SEDIMENTATION 8

Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to gain fundamental knowledge on the concepts of erosion and sedimentation.
- They will have sufficient knowledge on soil and water conservation measures.

TEXTBOOKS:

1. Suresh, R., “Soil and Water Conservation Engineering”, Standard Publication, New Delhi, 2007.
2. Ghanshyam Das, “Hydrology and Soil Conservation Engineering”, Prentice Hall of India Private Limited, New Delhi, 2000.
3. “Sedimentation Engineering”, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing., 2006.

REFERENCES:

1. Murthy, V.V.N., “Land and Water Management Engineering”, Kalyani Publishers, Ludhiana, 1998.
2. Gurmail Singh, “A Manual on Soil and Water Conservation”, ICAR Publication, New Delhi, 1982.
3. Mal, B.C., “Introduction to Soil and Water Conservation Engineering”, Kalyani Publishers, New Delhi, 2002

HS7551	EMPLOYABILITY SKILLS	L	T	P	C
		3	0	0	3

COURSE DESCRIPTION:

- This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

COURSE OBJECTIVES:

- To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills
- To help them improve their reading skills, writing skills, and soft skills necessary for the workplace situations
- To make them employable graduates

CONTENTS

UNIT I READING AND WRITING SKILLS 9

Reading: skimming & scanning strategies – note making skills – interpreting visual material (charts & tables) – critical reading – fast reading necessary for reading letters & files - preparing job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc.) writing reports – collecting, analyzing and interpreting data

UNIT II SOFT SKILLS 9

Hard skills & soft skills – soft skills: self-management skills & people skills - training in soft skills - persuasive skills – sociability skills –interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills -

UNIT III PRESENTATION SKILLS 9

Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice – presenting the visuals effectively – 5 minute presentation

UNIT IV GROUP DISCUSSION SKILLS 9

Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD

UNIT V INTERVIEW SKILLS 9

Interview etiquette – dress code – body language – mock interview – attending job interviews – answering questions confidently – technical interview – telephone/Skype interview - practice in different types of questions – one to one interview &panel interview – FAQs related to job interview- Emotional and cultural intelligence.

TOTAL: 45 PERIODS

LEARNING OUTCOMES:

- Students will be able to make presentations and participate in group discussions with high level of self-confidence.
- Students will be able to perform well in the interviews
- They will have adequate reading and writing skills needed for workplace situations

REFERENCES:

1. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
2. Dabreo, Desmond A. Group Discussion and Team Building. Mumbai: Better Yourself Books, 2004.
3. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.
4. Gulati, Sarvesh. Corporate Soft Skills. New Delhi: Rupa and Co. 2006.
5. Van Emden, Joan, and Lucinda Becker. Presentation Skills for Students. New York: Palgrave Macmillan, 2004.

EXTENSIVE READING

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 2013.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

WEB RESOURCES

1. www.humanresources.about.com
2. www.careerride.com
3. https://bemycareercoach.com/softskills

AI7711 CREATIVE AND INNOVATIVE PROJECT (ACTIVITY BASED – SUBJECT RELATED) **L T P C 0 0 4 2**

OBJECTIVE:

- To use the knowledge acquired in Agricultural and Irrigation Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

STRATEGY:

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 60 PERIODS

AI7712 INDUSTRIAL TRAINING (4 WEEKS DURING VI SEMESTER - SUMMER) **L T P C 0 0 0 2**

To train the students in field work by attaching to any industry / organization so as to have a first hand knowledge of practical problems and to gain working experience and skills in carrying out engineering tasks related to various fields of agriculture.

The students individually undertake training in reputed engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

AI7811 **PROJECT WORK** **L T P C**
0 0 20 10

OBJECTIVE:

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

TOTAL: 300 PERIODS

STRATEGY

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

AI7001 **AGRICULTURAL BUSINESS MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the importance of Agri-business management, its characteristics and principles
- To impart knowledge on the functional areas of Agri-business like Marketing management, Product pricing methods and Market potential assessment.

UNIT I CONCEPTS OF AGRICULTURAL BUSINESS 9

Agri-business - scope, characteristics, types. Management - importance, definition, management and administration, management thoughts, Small business - characteristics and stages of growth - Management functions - planning, organizing, leading.

UNIT II AGRI – BUSINESS ORGANIZATION 9

Principles, forms of agri-business organizations, staffing, directing, supervision and motivation. Controlling - types, performance evaluation and control techniques. Management approaches - Profit Centered Approach, Management by objectives and Quality Circles. Strength, Weakness, Opportunities and Threat (SWOT) Analysis.

UNIT III AGRICULTURAL MARKETING 9

Functional areas of Agri-business - Production and Operations management - functions, planning physical facilities and managing quality. Agro-inputs and products inventory management - raw material procurement, inventory types, and costs. Marketing management- Marketing environment, marketing mix - Agricultural input marketing firms.

UNIT IV AGRICULTURAL BUSINESS FINANCE 9

Forms of agri-business organizations - Role of lead bank in agribusiness finance - Financial management. Acquiring capital- Budget analysis. Concepts and determinants- Business project scheduling of raw material procurement - production management - launching products (branding, placement) - Input marketing promotion activities.

UNIT V MARKET PROMOTION AND HUMAN RESOURCES 9

Agricultural products - marketing promotion activities - product pricing methods. District Industries Centre - Consumer survey - Agricultural inputs retailing - Market potential assessment - types of distribution channels - Return on Investment - Personnel management. Recruitment, selection and training - Technology in Agri Business

TOTAL: 45 PERIODS

OUTCOME:

- The students shall be exposed to various trends in agricultural business management.

TEXTBOOKS:

1. Himanshu, "Agri Business Management – Problems and prospects", Ritu Publications, Jaipur, 2005.
2. Smita Diwase, "Indian Agriculture and Agribusiness Management", Krishi resource Management Network, Pune 2004.

REFERENCES:

1. Chandra Prasanna, "Projects: Preparation, Appraisal, Budgeting and Implementation", Tata McGraw Hill Publications, New Delhi, 2001.
2. Kotler, P., "Marketing Management. Analysis, Planning and Control", Prentice Hall Inc., New York, 2001.
3. Rao, V.S.P., and Narayana, P.S., "Principles and Practices of Management", Konark Publishing Private Limited, New Delhi, 2001.
4. Tripathy, P.C., and Reddy, P.N., "Principles of Management", Tata McGraw Hill Publications, New Delhi, 2000.

AI7002 AGRICULTURAL ECONOMICS AND FARM MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:

At the end of the course the students would be exposed to fundamental knowledge in

- Farm Management, and Basic Concept of Farm Management Product Relationship and Law of diminishing return
- Type of resource and Investment analysis in agriculture sector
- Farm financial analysis, Investment and Budgeting for farms

UNIT I INTRODUCTION & SCOPE OF FARM MANAGEMENT 9

Farm Management - definition and scope - relationship between farm management and other sciences - Characteristics and significance. Farm management decision making process. Basic concepts in farm management. Factor and Farm layout - Farm records and Accounts - Farm Appraisal Techniques. Valuation and Depreciation – Factor

UNIT II LAWS OF ECONOMICS 9

Product relationship - Production function - definition & types - Impact of technology. Law of diminishing returns. Equi-marginal returns and Opportunity cost comparative advantage. Cost concepts & interrelations. Optimum level of input use and optimum production. - Economies of scale external and internal economies and diseconomies. Returns to scale - Economies of size. Factor - Factor relationship.

UNIT III COST CURVES 9

Principle of substitution - isoquant, isocline. Expansion path, ridge line and least cost combination of inputs. Product - Product relationship. Types of products. Production possibility curve, ISO revenue line and optimum combination of outputs - Concepts of Risk and uncertainty – Product relationship - Cost curves, optimum input and output levels - Factor - Factor relationship least cost combination of inputs - Product - Product relationship - Preparation of Interview schedule and visit to a farm for data collection - Estimation of cost of cultivation and cost of production of annual and perennial crops.

UNIT IV MANAGEMENT OF RESOURCES 9

Types of uncertainty in agriculture - Managerial decisions to reduce risks in production process - Management of resources - Types of resources - land, labour, capital, and measurement of their efficiencies - mobilization of farm resources. Cost of maintenance of machinery and break even analysis - Estimation of cost of production - Dairy and poultry products - Investment analysis - Undiscounted and Discounted methods.

UNIT V FINANCIAL ANALYSIS 9

Farm Financial Analysis - Balance sheet - Income statement - Cash flow analysis - Ratio analysis - Farm Investment Analysis - Time comparison principles - Discounted and undiscounted measures – Farm planning and control - Elements of planning - Farm level management information systems - Farm Budgeting partial, enterprise and complete budgeting - Preparation of Balance sheet and income statement - Preparation of cash flow statement and ratio analysis - Estimation of 3Rs of credit - Preparation of Farm plan Enterprise budgeting - Partial budgeting and complete budgeting.

TOTAL: 45 PERIODS

OUTCOMES:

The students will have the knowledge on

- Basic concepts of economics and laws of economics.
- Familiarize with the financial analysis and will be able to manage the resources.

TEXTBOOKS:

1. Johl, S.S., and Kapur, T.R., “Fundamentals of Farm Business Management”, Kalyani Publishers, Ludhiana, 2001.
2. Muniraj, R., “Farm Finance for Development”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2000.

REFERENCES:

1. Raju, V.T., “Essentials of Farm Management”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
2. Sankhayan, P.L., “Introduction to Farm Management”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001.
3. Subba Reddy, S., and Raghu Ram, P., “Agricultural Finance and Management”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1996.

AI7003 BIO - ENERGY RESOURCE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors.
- Alcohol and ethanol production and
- Energy and Environment

UNIT I BIO RESOURCE AN INTRODUCTION` 9

Bio resource – origin – biomass types and characteristics- biomass construction technology- Biodegradation - steps in biogas production- parameters affecting gas production- Types of biogas plants- Construction details- operation and maintenance.

UNIT II BIO ENERGY 9

Slurry handling- enrichment and utilization – Biogas appliances- Biochemical characteristics of bio resources- Bioenergetics –Biocatalysis –Kinetics of product formation.

UNIT III BIO REACTORS AND FERMENTORS 9

Bio reactors/ fermentors – Batch type – continuous stirred tank reactors- Biological waste water treatment- Activated sludge process- Down stream processing-Recovery and purification of products.

UNIT IV ALCOHOL PRODUCTION 9

Alcohol ethanol production - Acid hydrolysis - enzyme hydrolysis-Methanol synthesis - Antibiotics-enzymes- principles of thermochemical conversion – combustion - pyrolysis- Gasification – types of gasifiers.

UNIT V ENERGY AND ENVIRONMENT 9

Principles of operation- chemical reaction- cleaning and cooling - Utilization- Improved wood burning stove - Energy plantations- Biomass briquetting - co generation- Impact on Environment – Non renewable sources – solar & wind energy – concepts - applications.

TOTAL: 45 PERIODS

OUTCOME:

- The students will be able to understand the concepts of bio energy sources and its applications.

TEXTBOOKS:

1. Rai G.D,Non conventional sources of Energy, Khanna publishers, New Delhi, 1995.
2. Bouley James .E & David Follis - Biochemical Engineering Fundamentals Mc Graw-Hill publishing company, Tokyo.1986

REFERENCE:

1. Chawla O.P, Advances in Biogas Technology ICAR publication New Delhi 1986.

AI7004 ENVIRONMENT AND AGRICULTURE L T P C
3 0 0 3

OBJECTIVES

- To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.

UNIT I ENVIRONMENTAL CONCERNS 8

Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II ENVIRONMENTAL IMPACTS 9

Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT III CLIMATE CHANGE 8

Global warming and changing environment – Ecosystem changes – Changing blue-green-grey water cycles – Water scarcity and water shortages – Desertification.

UNIT IV ECOLOGICAL DIVERSITY AND AGRICULTURE 10

Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

UNIT V EMERGING ISSUES 10

Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

TOTAL: 45 PERIODS

OUTCOMES:

- Students will appreciate the role of environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.
- Ecological context of agriculture and its concerns will be understood

TEXTBOOKS:

1. M.Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
2. Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

REFERENCES:

1. T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. Economic Research Service, 2006.
2. Robert D. Havener, Steven A. Breth, Environment and agriculture: rethinking development issues for the 21st century : proceedings of a symposium, Winrock International Institute for Agricultural Development, 1994
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989

AI7005 GEOLOGY FOR AGRICULTURAL AND IRRIGATION ENGINEERS L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to the different types of soils, rocks, their characteristics, identification.
- To impart the fundamental knowledge of hydrogeology and geological investigation

UNIT I MINEROLOGY 9

Scope of geology in irrigation engineering – Physical properties of minerals – Quartz – Feldspars – Mica – Gypsum – Calcite – Clay minerals – Igneous, sedimentary and metamorphic rocks – Granite – Synite – Gabbro –Basalt – Sandstone – Shale – Limestone – Conglomerate – Gneiss – Schist – Marble.

UNIT II WEATHERING AND SOIL 9

Identification of soil and rock types- Types of rock weathering –Mechanical and Chemical weathering- factors controlling weathering – products of weathering – soil formation -common rock forming minerals-action of river, wind, glacier types of soils – soil profile.

UNIT III SOIL TYPES 9

Soil genesis – Soil mineralogy and geochemistry of soil types – laterites, bauxites, ardisols, vertisols – geological sources of soil nutrients, nitrogen, phosphorus, potassium, calcium, magnesium and sulphur in soil and their and its significance in plant growth, micronutrients.

UNIT IV HYDROGEOLOGY 9

Sources of groundwater- Aquifers-Groundwater in various geological formations– Water bearing properties of rocks-dating of groundwater-springs – geological work of river- Chemical work of groundwater-Geological work of groundwater – Groundwater potential in Tamil Nadu.

UNIT V GEOLOGICAL INVESTIGATION 9

Remote sensing methods -Methods of geological investigation – Classification of geophysical methods- electrical resistively, seismic refraction, gravity, magnetic and acoustic prospecting for mineral and groundwater – Application of geophysics in groundwater and mineral study-Geophysical logging.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing this course

- Will be able to understand the importance of geology by understanding the various soil formations.
- Will realize the importance of this knowledge in agriculture.

TEXTBOOKS:

1. Parbin Singh, “Engineering and General Geology”, Katson Publications, New Delhi, 2009.
2. Blyth, F.G.H., and M.H. de Freitas, “Geology for Engineers”, Edward Arnold, New York, 2010.
3. Varghese, P.C., Engineering Geology for Civil Engineering PHI Learning Private Limited, New Delhi, 2012.
4. Parbin Singh. A Text book of Engineering and General Geology, Katson publishing house, Ludhiana 2009
5. Venkatareddy. D. Engineering Geology, Vikas Publishing House Pvt. Ltd. 2010.

REFERENCES

1. N. Chenna Kesavulu. Textbook of Engineering Geology, Macmillan India Ltd., 2009
2. F.G.Bell. Fundamentals of Engineering Geology, B.S. Publications. Hyderabad 2011
3. Brady, N.C., and Weil, R R., “The Nature and Properties of Soils,” 13th Edition, Prentice Hall, New York, 2002.

AI7006 IRRIGATION EQUIPMENT DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to the fundamental knowledge in Pumps for Irrigation use
- To introduce the concept of micro-irrigation
- To design a Sprinkler & Drip irrigation system

UNIT I WATER LIFTS AND PUMPS 8

Pump classification Variable displacement pumps–Centrifugal pump- Submersible pump- Vertical Turbine pumps mixed flow – Jet and Airlift pumps-Pump selection and installation- Pump troubles and Remedies.

UNIT II PUMP VALVE 7

Types of valves- Pressure relief valve- Gate valve-Isolated valve- Non return valve- Butterfly valve-Solenoid valves- Automated control valve- selection, repair and maintenance.

UNIT III MICRO IRRIGATION CONCEPT AND APPLICATIONS 10

Micro irrigation- Comparison between Traditional and Micro irrigation methods -Merits and demerits of micro-irrigation system, Types and components of micro irrigation system- Scope and potential problem of micro irrigation - Low cost Micro irrigation Technologies- Gravity fed micro irrigation -Care and maintenance of micro-irrigation System- Economics of micro-irrigation system - Automation in micro-irrigation-Surge and cablegation irrigation- Greenhouse irrigation system.

UNIT IV DRIP IRRIGATION DESIGN 10

Drip irrigation - Components- Dripper- types and equations governing flow through drippers-Wetting pattern- Chemigation application- Pump capacity-Installation- Operation and maintenance of Drip irrigation system. - Design of surface and sub-surface drip irrigation.

UNIT V SPRINKLER IRRIGATION DESIGN 10

Sprinkler irrigation- Components and accessories - Hydraulic design - Sprinkler selection and spacing- Capacity of sprinkler system - types - Sprinkler performance- Sprinkler discharge- Water distribution pattern- Droplet size, filtering unit, fertigation - System maintenance

TOTAL: 45 PERIODS

OUTCOMES:

- At the completion of course the student will get the knowledge on concepts of micro irrigation.
- The students shall able to design drip and sprinkler irrigation system.

TEXTBOOKS:

1. Suresh, R., “Principles of Micro-Irrigation Engineering”, Standard Publishers Distributors, New Delhi, 2010.
2. Michael, A.M., “Irrigation Theory and Practice”, Vikas Publishers, New Delhi, 2002.

REFERENCES

1. Modi, P.N., and Seth, S.M., “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 1991.
2. Jack Keller and Rond Belisher., “Sprinkler and Trickle Irrigation”, Vannistrand Reinhold, New York, 1990.
3. Sivanappan R.K., “Sprinkler Irrigation”, Oxford and IBH Publishing Co., New Delhi, 1987.
4. Keller.J and D. Karmeli, “Trickle Irrigation Design”, Rainbird Sprinkler Irrigation Manufacturing Corporation, Glendora, California, USA.

AI7007 IRRIGATION WATER QUALITY AND MODELING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the water quality concepts, its estimation and evaluation for irrigation purposes, besides relevant environmental problems and modeling of non-point pollution sources.
- To understand the importance of water quality for irrigation, the collection and use of water quality data.

UNIT I WATER QUALITY PRINCIPLES 8

Water as a unique substance - Physical and chemical properties of water – Water quality parameters – Water cycle and water quality – Anthropogenic influences -Water quality problems..

UNIT II WATER QUALITY ESTIMATION 8

Water quality investigation – Sampling design and samplers – Data collection platforms – Field kits and investigations – Hydro chemical methods - Water quality data management - Analysis and inference – Graphical and statistical methods.

UNIT III EVALUATION OF WATER QUALITY 10

Water quality standards – Water quality for irrigation – Salinity and permeability - Irrigation practices with poor quality of water – Waste water reuse in irrigation – Benefits and limitations – Low cost Waste water treatment - Saline water irrigation – Future strategies.

UNIT IV WATER QUALITY MODELS 10

Water quality in irrigation systems – Eutrophication - Waste loads - BOD – DO sag curve - Leaching of agrochemicals – Non Point Source (NPS) models – Agricultural Non Point Source (AGNPS) pollution model.

UNIT V ENVIRONMENTAL ISSUES 9

Water quality indices - Agro ecosystems – Sustainable agriculture – Ecological farming – Vertical farms - Irrigation projects and environmental impacts.

TOTAL: 45 PERIODS

OUTCOMES:

- Students will understand the importance of water quality for beneficial uses, especially in irrigation and its management.
- Students will understand the role of environment in water quality and acquire skills in the use of tools available for modelling water quality.

TEXTBOOKS:

1. Boyd, C. E., Water Quality : An Introduction, Kluwer Academic Publishers, Massachusetts, USA, 2000
2. Ayers, R. S. and D. W. Westcott, Water quality for Agriculture, FAO Irrigation and Drainage Paper no. 29 (REV. 1), FAO, Rome, 1994

REFERENCES:

1. Masters, G.M., Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education, Singapore, 2008.

AI7008 IT IN AGRICULTURAL SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to areas of agricultural systems in which IT and computers play a major role.
- To also expose the students to IT applications in precision farming, environmental control systems, agricultural systems management and weather prediction models.

UNIT I PRECISION FARMING 9

Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.

UNIT II ENVIRONMENT CONTROL SYSTEMS 9

Artificial light systems, management of crop growth in greenhouses, simulation of CO_2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.

UNIT III AGRICULTURAL SYSTEMS MANAGEMENT 9

Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.

UNIT IV WEATHER PREDICTION MODELS 9

Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.

UNIT V E-GOVERNANCE IN AGRICULTURAL SYSTEMS 9

Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e-business systems & applications, Technology enhanced learning systems and solutions, e-learning, Rural development and information society.

TOTAL: 45 PERIODS

OUTCOME:

- The students shall be exposed to IT applications in environmental control systems, precision farming, agricultural systems management and weather prediction models.

TEXTBOOKS:

1. National Research Council, "Precision Agriculture in the 21st Century", National Academies Press, Canada, 1997.
2. H. Krug, Liebig, H.P. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", 1989.

REFERENCES:

1. Peart, R.M., and Shoup, W. D., "Agricultural Systems Management", Marcel Dekker, New York, 2004.
2. Hammer, G.L., Nicholls, N., and Mitchell, C., "Applications of Seasonal Climate", Springer, Germany, 2000.

AI7009 MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand the fundamentals of minor irrigation, its types, operation and maintenance and people's participation
- Command Area Development, On farm structures, policy, operation and maintenance

UNIT I MINOR IRRIGATION 8

Definition – Classification of minor irrigation- Minor irrigation through wells, tanks, ooranies and canals- Development of minor irrigation in India- Advantages.

UNIT II LIFT IRRIGATION 9

Dug well and Tube well irrigation – Construction, operation and maintenance- Conjunctive use of ground water with surface water - Ground water market- Ground water estimation-norms – case studies.

UNIT III TANK IRRIGATION 9

Concept of tank irrigation – Classification- components of tank irrigation- water distribution network- Cascade of tanks- People's participation in tank irrigation system and its maintenance- Turn over – case studies.

UNIT IV COMMAND AREA DEVELOPMENT 9

Need for command area development- Definition – Importance of CAD in agricultural production - On Farm Development – organization, operation and maintenance- Farmers participation- Turn over- case studies.

UNIT V SPECIAL TOPICS 10

National water policy - Institutional aspects - Socio-economic perspective- Reclamation of salt affected soils- Seepage loss in command area- Irrigation conflicts- Water productivity – Water pricing.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have knowledge and skills on planning, design, operation and management of a minor irrigation system.
- The student will gain knowledge on different aspects of on farm development works.

TEXTBOOKS:

1. Rakesh Hooja, Management of Water for Agriculture: Irrigation, Water sheds and Drainage" Rawat Publications, New Delhi, 2006.
2. Sathyanarayana Murthy C., "Design of Minor Irrigation and Canal Structures" Wiley Eastern Ltd., New Delhi, 1990.

AI7010 REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM L T P C

3 0 0 3

OBJECTIVES:

- To introduce the principles and basic concepts of Remote Sensing and GIS
- To introduce the remote sensing systems, data products and analysis
- To introduce the spatial data models, analysis and presentation techniques
- To study the applications of Remote Sensing and GIS in agriculture, soil and water resources

UNIT I CONCEPTS OF REMOTE SENSING AND SATELLITES 9

Definition- Historical background - Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing – Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation.- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT,SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution - Recent satellites with its applications

UNIT II DATA PRODUCTS AND IMAGE ANALYSIS 9

Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.

UNIT III CONCEPTS OF GIS 9

Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.

UNIT IV DATA INPUT AND ANALYSIS 9

Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries – Reclassification – Simple spatial analysis – Buffering – Neighboring functions – Map overlay – Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling – Expert systems

UNIT V APPLICATION OF RS AND GIS 9

Crop Acreage estimation - Estimation of Crop Water Requirement – Crop condition - Soil mapping – classification of soil with digital numbers – soil erosion mapping- reservoir sedimentation using image processing - Inventory of water resources – water quality assessment - Application of Remote Sensing and GIS in Precision Agriculture - Monitor Crop Health - Management Decision Support Systems

TOTAL: 45 PERIODS

OUTCOMES:

- The students will understand the remote sensing principles, remote sensing systems satellite data processing and available data products.
- The students will understand decision making process using DBMS and utilization of these advanced techniques in addressing the real world problems.

TEXTBOOKS:

1. Anji Reddy. M, Remote Sensing and Geographical Information Systems, BS Publications, Hyderbad, 2001
2. Lillesand, T. M., and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2000.

REFERENCES

1. Bettinger, P., and Michael, G.W., “Geographical Information System: Applications in Forestry and Natural Resources Management,” Tata McGraw–Hill Higher Education, New Delhi, 2003
2. Ian Heywood., “An Introduction to GIS”, Pearson Education, New Delhi, 2001.
3. Jeffery Star and John Estes, “Geographical Information System – An Introduction,” Prentice Hall India Pvt. Ltd., New Delhi, 1998.
4. Patel A.N & Surendra Singh, “Remote sensing principles & applications”, Scientific Publishers , Jodhpur 1992

AI7011 **SEED TECHNOLOGY APPLICATIONS** **L T P C**
3 0 0 3

OBJECTIVES:

- To expose the students to scope and importance of good quality seed production.
- To acquaint them with the principles and special techniques used in the process of production of good quality seed using specific examples.
- To familiarize them with planning, development and organization of seed programmes.

UNIT I INTRODUCTION **9**

Definition and characteristics of seed and how it differs from grain; Propagation of crop plants through true seed and vegetative means; Features of good quality seed; Importance of seed in successful crop production; Floral biology: self and cross pollination; Methods of genetic improvement of crop plants such as selection, hybridization, mutation and polyploidy; Seed legislations promulgated in India from 1966 to date and the purpose of each of these legislations.

UNIT II SEED PRODUCTION AND CERTIFICATION **9**

Multiplication of seed and seed material: systems of seed multiplication, classes of seed, multiplication models, multiplication ratio, field selection, planting ratio, isolation needs and rouging; Harvest and extraction of seed; Methods of hybrid seed production; Genetic deterioration during crop production cycles; Seed certification process: legal basis, pre-requisites for applicability, detailed description of the specific steps of the certification process (with particular emphasis on field inspection).

UNIT III SEED PROCESSING AND TESTING **9**

Components of seed processing in a broader sense; Steps in seed processing in its narrower sense: preliminary cleaning, basic cleaning and grading, and equipment used in each of the steps; Seed treatment; Seed drying; Seed sampling; Seed testing: details of specific tests conducted for different purposes (service, certification and seed law enforcement); Standards prescribed for different crops.

UNIT IV DEVELOPING SEED PROGRAMMES **9**

Types of organizations involved in seed production (public, quasi-governmental, private and cooperative), and their objectives and features; Organizational set up of a seed company; Steps involved in planning and developing a seed programme; Seed marketing activities, and analysis of seed demand and supply; Costing and pricing strategies; Economics of production of different crop seed; Seed packaging; Opportunities for Indian seed companies to have a greater share of world seed market; Visit to seed organizations; Preparing seed projects to obtain credit; Export procedures and formalities; Seed/plant quarantine methods.

UNIT V SEED PRODUCTION IN SPECIFIC CROPS **9**

Principles and special techniques used for seed production in important horticultural crops by selecting representatives of vegetable / flower / fruit / spice / condiment / plantation crops.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students will be

- exposed to the biology of seed production and gain knowledge on seed legislation, various aspects of multiplication of seeds and their certification
- acquiring the knowledge on seed processing and testing methods.
- understand different seed programmes, special techniques for seed production and their cost economics

TEXTBOOKS:

1. Singh, S.P., Commercial Vegetable Seed Production, Kalyani Publishers, Chennai, 2001.
2. Agarwal, R.L., Seed Technology, Oxford IBH Publishing Co., New Delhi, 1995.

REFERENCES:

1. Subir Sen and Ghosh, N., Seed Science, Kalyani Publishers, Chennai, 1999.
2. Dahiya, B.S., and Rai, K.N., Seed Technology, Kalyani Publishers, Chennai, 1997.
3. George, Raymond, A.T., Vegetable Seed Production, Longman Orient Press, London and New York, 1985.
4. Hand Book of Seedling Evaluation, ISTA, 1979.

AI7012 SUSTAINABLE AGRICULTURE AND FOOD SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To study the importance of sustainable agriculture for the growing population, various resources required and their sustainability.
- Importance of science, food security and ecological balance.

UNIT I LAND RESOURCE AND ITS SUSTAINABILITY 9

Land Resources of India, Population and land, Land utilization, Net Area Sown, changes in cropping pattern, land degradation.

UNIT II WATER RESOURCE AND ITS SUSTAINABILITY 9

Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential – Available, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water)

UNIT III SUSTAINABLE AGRICULTURE & ORGANIC FARMING 9

Agro-ecosystems - Impact of climate change on Agriculture, Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance – Natural farming principles – Sustainability in rain fed farming – organic farming – principles and practices.

UNIT IV FOOD PRODUCTION AND FOOD SECURITY 9

Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Rural Land Market – Emerging Water market – Vertical farming - Sustainable food security indicators and index – Indicator of sustainability of food Security – Path to sustainable development.

UNIT V POLICES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECURITY 9

Food and Crop Production polices – Agricultural credit Policy – Crop insurance –Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade - Sustainable food Security Action Plan.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students will gain knowledge on the need for sustainable agriculture
- They will be able to comprehend the need for food security on global level and the Nutritional Security.
- The students will be able to demonstrate how ecological balance is required for sustainability of agriculture.

TEXTBOOKS:

1. M.S.Swaminathan, Science and sustainable food security, World Scientific Publishing Co., Singapore, 2010.
2. B.K.Desai and Pujari, B.T. Sustainable Agriculture: A vision for future, New India Publishing Agency, New Delhi, 2007.

REFERENCES:

1. Swarna S.Vepa etal., Atlas of the sustainability of food security. MSSRF, Chennai, 2004.
2. Sithamparanathan, J., Rengasamy, A., Arunachalam, N. Ecosystem principles and sustainable agriculture, Scitech Publications, Chennai, 1999.
3. Tanji, K. K., and Yaron, B. Management of water use in agriculture, Springer Verlag, Berlin, Germany, 1994.

AI7013 SYSTEMS ANALYSIS IN IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the application of systems concept to irrigation planning and management.
- Optimization technique for modeling water resources systems, irrigation management and advanced optimization techniques to cover the socio-technical aspects will be taught.

UNIT I SYSTEM CONCEPTS 9

Definition, classification, and characteristics of systems – Scope and steps in systems engineering – Need for systems approach to water resources and irrigation.

UNIT II LINEAR PROGRAMMING 9

Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis, application to design and operation of reservoir, single and multipurpose development plans – Irrigation water allocation- Cropping pattern optimization.

UNIT III DYNAMIC PROGRAMMING 9

Bellman's optimality criteria, problem formulation and solutions – Application to design and operation of reservoirs, Single and multipurpose reservoir development plans – Applications in Irrigation management.

UNIT IV SIMULATION 9

Basic principles and concepts – Random variate and random process – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic and stochastic simulation – Irrigation Scheduling.

UNIT V ADVANCED OPTIMIZATION TECHNIQUES 9

Integer and parametric linear programming – Applications to Irrigation water management-Goal programming models with applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students will

- have an understanding on systems approach methodology applied to water resources and irrigation
- be able to apply the Linear programming, Dynamic Programming and Simulation for water resources and irrigation problems.

TEXTBOOKS:

1. Vedula, S., and Majumdar, P.P. Water Resources Systems – Modeling Techniques and Analysis Tata McGraw Hill, New Delhi, Fifth reprint, 2010.
2. Gupta, P.K., and Man Mohan, "Problems in Operations Research", (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.

REFERENCES:

1. Chaturvedi, M.C., "Water Resources Systems Planning and Management", Tata McGraw Hill, New Delhi, 1997.
2. Taha, H.A., "Operations Research", McMillan Publication Co., New York, 1995.
3. Hiller, F.S., and Liebermann, G.J., "Operations Research", CBS Publications and Distributions, New Delhi, 1992.

AI7071 INTEGRATED WATER RESOURCES MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the interdisciplinary analysis of water and design of intervention strategies.
- To develop knowledge base on capacity building on IWRM.

UNIT I IWRM FRAMEWORK 9

Definition – meanings –objectives- evolution of IWRM- IWRM relevance in water resources management – Importance of paradigm shift in India: processes and prospective outcomes.

UNIT II CONTEXTUALIZING IWRM 9

IWRM in Global and Regional water partnership - MDG goals - UN formulations-Institutional Transformation- bureaucratic reforms and inclusive development.

UNIT III EMERGING ISSUES IN WATER MANAGEMENT 9

IWRM and Irrigation – Domestic - Drinking water Management in the context of Climate change-Flood –Drought – Pollution – Water poverty-sanitation and health-Conceptual problems and policy issues.

UNIT IV IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA 9

Rural Development-Ecological sustainability- -Watershed Development and conservation-Ecosystem Regeneration – waste water reuse-Sustainable livelihood and food security-Links between water – health- and poverty.

UNIT V ASPECTS OF INTEGRAL DEVELOPMENT 9

Capacity building - Solutions for effective Water Management. Case studies on conceptual framework of IWRM – IWRM and regional and global partnership – Emerging issues – IWRM and water resources development

TOTAL: 45 PERIODS

OUTCOME:

- At the completion of the course, the student will be able to apply appropriate management techniques different components of water resources under IWRM framework.

TEXTBOOKS:

1. Mollinga .P. etal " Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006
2. Sithamparanathan, Rangasamy, A., and Arunachalam, N., "Ecosystem Principles and Sustainable Agriculture", Scir Publisher, Chennai, 1999.

REFERENCES:

1. Cech Thomas V., Principles of Water Resources: History, Development, Management and Policy. John Wiley and Sons Inc., New York. 2003.
2. Murthy, J.V.S., "Watershed Management in India", Wiley Eastern Ltd., New York, 1995.
3. Dalte, S.J.C., "Soil Conservation and Land Management", International Book Distribution, India, 1986.

AI7072 PARTICIPATORY WATER RESOURCES MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To gain an insight on local and global perceptions and approaches on participatory water resource management

UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH 6

Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach

UNIT II UNDERSTANDING FARMERS PARTICIPATION 10

Farmers participation –need and benefits – Comparisons of cost and benefit -Sustained system performance - Kinds of participation – Context of participation, factors in the environment – WUA - Constraints in organizing FA – Role of Community Organiser – Case Studies.

UNIT III ISSUES IN WATER MANAGEMENT 9

Multiple use of water – Issues in Inter-sectoral Water Allocation - domestic, irrigation, industrial sectors - modernization techniques – Rehabilitation – Command Area Development - Water delivery systems

UNIT IV PARTICIPATORY WATER CONSERVATION 10

Global Challenges -Social – Economic – Environmental - Solutions –Political - Water Marketing – Water Rights -Consumer education – Success Stories Case Studies

UNIT V PARTICIPATORY WATERSHED DEVELOPMENT 10

Concept and significance of watershed - Basic factors influencing watershed development –- Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes –- People's participation – Entry point activities - Evaluation of watershed management measures.

TOTAL: 45 PERIODS

OUTCOMES:

- The students shall gain knowledge on various processes involved in participatory water resource management.
- The students shall be aware of the issues related to water conservation and watershed development

TEXTBOOKS:

1. Sivasubramaniyan, K. Water Management, SIMRES Publication, Chennai, 2011
2. Uphoff.N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, No.11, Westview press, Boulder,CO, 1986.
3. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

REFERENCE:

1. Chambers Robert, Managing canal irrigation, Cambridge University Press, 1989

GE7071 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, scenarios 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.

GE7074 HUMAN RIGHTS L T P C

3 0 0 3

OBJECTIVES :

- 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

GE7351 ENGINEERING ETHICS AND HUMAN VALUES **L T P C**
3 0 0 3

OBJECTIVES

- To emphasise into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES **3**

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Discrimination- Character.

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 –Professional Ideals and Virtues - uses of ethical theories. Valuing Time – Co-operation – Commitment –

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV ENGINEER'S RIGHTS AND RESPONSIBILITIESON 12

Collegiality and loyalty – Respect for authority – Collective Bargaining – Confidentiality- Conflict of interest – Occupational Crime – Professional Rights – IPR- Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island, Bhopal Gas plant and Chernobyl as case studies.

UNIT V GLOBAL ISSUES 12

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOME

- Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXTBOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 2005.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000
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 Press , 2000
5. R.Subramanian , "Professional Ethics ",Oxford University Press ,Reprint ,2015.

GE7072	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends **- Introduction to Product Development Methodologies and Management -** Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies **-** Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - **System Design & Modeling -** Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – **Challenges in Integration of Engineering Disciplines** - Concept Screening & Evaluation - **Detailed Design -** Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program **-** Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping -** Introduction to Rapid Prototyping and Rapid Manufacturing - **System Integration, Testing, Certification and Documentation**

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance -**Maintenance and Repair – Enhancements - **Product EoL -** Obsolescence Management – Configuration Management - EoL Disposal

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product Development in Industry versus Academia –**The IPD Essentials -** Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:

1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.

REFERENCES:

1. Hiriyappa B, “Corporate Strategy – Managing the Business”, Author House, 2013.
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning – Concepts”, Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

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