SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)
SRM Nagar, Kattankulathur-603203.

**(An Autonomous Institution Affiliated to Anna University, Chennai,
'A'grade accredited by NAAC, NBA accredited ISO 9001: 2015 certified)**

CURRICULA AND SYLLABI

B.Tech. AGRICULTURAL ENGINEERING

(Regulations 2023)

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.Tech. AGRICULTURAL ENGINEERING

REGULATIONS – 2023

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

2. To provide a sound theoretical knowledge in engineering principles applied to agriculture

3. To prepare students for a successful agricultural engineering career integrating all aspects of engineering in agriculture.

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

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Agriculture Engineering Graduates will exhibit ability to:

PO	Graduate Attribute	Programme Outcome
1.	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	Problem analysis	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of Mathematics, natural sciences, and engineering sciences.
3.	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of	Use research-based knowledge and research

		methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. PROGRAM SPECIFIC OUTCOMES (PSOs):

1) Establish an Agricultural Engineering career in industry, government or academicfield and achieve professional expertise as appropriate.

2) Execute innovation and excellence in Agricultural engineering problem solving anddesign in global and societal contexts.

3) Commit to lifelong learning and professional development in the agriculture engineering field to stay updated in technology, research topics and contemporaryissues.

4) Understand the fundamentals of Agriculture engineering in commercial contexts and in expediting irrigation projects.

4. PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1.	3	1	1	1	3	3	3	3	3	3	1	3	3	3	2	3
2.	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3
3.	1			3	3	3	1	1	3		3	1	3	3	3	2
4.	3			1	3	3	3		3	3	3	3	3	3	3	3

		Courses	PROGRAMME OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Year I	Semester I	Professional English - I	2.2	2.6	2	2.0	2.0	-	2.0	-	-	2.8	1.0	1.0	-	-	-	-
		Matrices and Calculus	3.0	2.0	2.0	1.0	-	-	-	-	-	-	-	1.0	-	-	-	-
		Engineering Physics	2.8	1.4	1.4	1.0	1.0	1.0	1.0	-	-	-	-	1.0	-	-	-	-
		Engineering Chemistry	2.8	1.8	2.2	1.2	1.0	1.0	2.0	-	-	-	-	2.0	1.0	-	-	-
		Basic Electrical and Electronics Engineering	2.8	2.8	1.8	1.7	3.0	2.0	2.0	2.0	-	-	-	-	1.8	1.5	2.5	2.0
		தமிழர் மரபு / Heritage of Tamils																
		Physics and Chemistry Laboratory	3.0	2.4	2.6	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-
		Engineering Practices Laboratory	2.0	1.0	0.8	1.0	1.2	-	1.0	-	-	-	-	1.0	2.0	-	-	-
		English Language Learning Laboratory	3.0	2.0	2.3	2.0	2.3	1.0	-	-	1.0	-	1.0	1.0	-	-	-	-
Year I	Semester II	Professional English - II	2.0	2.0	1.4	2.0	2.0	-	2.0	-	-	2.8	1.0	1.0	-	-	-	-
		Statistics and Numerical Methods	3.0	3.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-
		Physics for Agricultural Engineering	2.6	1.4	1.7	1.6	1	1	1	-	-	-	-	1	-	-	-	-
		Chemistry for Agricultural Engineering	2.4	1.8	2.2	1.6	1.4	1.2	1.6	-	-	-	-	1.2	-	0.8	1	-
		Problem solving and Python Programming	2.2	2.4	3.0	2.7	1.8	-	-	-	-	-	1.5	2.0	2.0	-	2.0	1.0
		தமிழரும் தொழில்நுட்பமும் / Tamils and Technology																
		Engineering Graphics and Design	3.0	2.4	2.6	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-
		Problem Solving and Python Programming Laboratory	2.0	1.4	1.0	1.0	1.2	2.0	1.5	2.0					2.0			
		Engineering Sciences	2.0	3.0	3.0	3.0	2.0	-	-	-	-	-	2.0	2.0	1.0	3.0	2.0	2.0

Year	Semester	Course																
		Laboratory	2.0	-	3.0	-	1.0	-	-	-	1.0	3.0	-	2.0	2.0	1.0	1.0	1.0
		NSS / YRC / NSO / Club Activities#																
Year II	Semester III	Transforms and Partial Differential Equations	3.0	3.0	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-
		Fluid Mechanics and Open Channel	1.8	2.5	2.3	1.7	-	1.0	1.7	2.0	-	-	1.7	2.6	2.6	1.6	2.4	2.6
		Hydrology and Water Resources Engineering	2.2	2	2.2	1.4	2	1	1	2	1	-	2	2	2	2	2	-
		Soil Science and Engineering	2.8	1.8	1.7	1.0	1.0	2.0	2.0	-	2.0	1.0	-	3.0	2.6	2.5	3.0	2.0
		Theory of Machines for Agricultural Engineering																
		Surveying and Levelling	2.4	2.5	-	3	1.2	2	2	1.5	2.4	2.4	2	2.2	2.4	1.8	2.5	2.6
		Fluid Mechanics Laboratory	3.0	3.0	2.3	1.7	-	1.0	1.7	2.0	-	-	-	1.7	2.6	1.6	2.4	2.6
		Soil Science Laboratory	1.2	1.3	1.0	2.0	2.0	1.0	1.0	-	1.0	1.0	-	1.5	2.0	2.0	2.2	1.2
		Surveying and Levelling Laboratory	2.6	2.75	2	2	1.2	2	2	1.5	3	2.4	2	2.6	2.8	1.6	2.6	2.6
Year II	Semester IV	Applied Mathematics for Agricultural Engineering	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
		Tractors and Farm Engines	2.0	2.0	-	1.0	-	-	-	-	-	-	2.0		2.0	1.0	1.0	-
		Irrigation and Drainage Engineering	1.3	1.0	2.5	1.0	1.5	1.5	3.0	1.0	2.3	1.0	1.5	-	1.3	2.0	3.0	2.5
		Principles and Practices of Crop Production	1.8	1.8	2	2	1	2.4	2.2	1	1.2	-	2	2	2.4	2.2	2	2
		Strength of Materials for Agricultural Engineering	3	1.6	1.8	1	-	1	-	-	-	-	1	1	3	3	1	2
		Thermodynamics for Agricultural Engineering	2.0	2.0	1.0	-	-	-	-	-	-	-	-	1.0	1.0	-	1.0	-
		NCC Credit Course Level - I*																
		Crop Husbandry Laboratory	2.6	1.4	2	2.2	1.6	1	2.6	2	2	1.5	1.8	2.2	2.4	2	2.4	1.4

		Irrigation Field Laboratory	2.0	2.0	1.6	2.0	2.3	1.0	1.5	2.0	1.7	2.4	1.8	2.2	1.6	1.4	2.2	2.0
		Strength of Materials Laboratory	2.7	1.7	2.0	1.0	-	1.0	-	-	-	-	2.0	1.0	3.0	3.0	1.0	-

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B.Tech. AGRICULTURAL ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULAM BASED ON REGULATIONS 2023
(I - IV SEMESTERS)

SEMESTER I

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EN3111	Professional English - I	HSMC	3	3	0	0	3
2.	MA3122	Matrices and Calculus	BSC	4	3	1	0	4
3.	PH3123	Engineering Physics	BSC	3	3	0	0	3
4.	CH3124	Engineering Chemistry	BSC	3	3	0	0	3
5.	GE3131	Basic Electrical and Electronics Engineering	ESC	3	3	0	0	3
6.	GE3111	தமிழர் மரபு / Heritage of Tamils	HSMC	1	1	0	0	1
PRACTICALS								
7.	GE3121	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
8.	GE3134	Engineering Practices Laboratory	ESC	4	0	0	4	2
9.	EN3119	English Language Learning Laboratory	EEC	2	0	0	2	1
			TOTAL	27	16	1	10	22

SEMESTER II

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EN3211	Professional English - II	HSMC	3	3	0	0	3
2.	MA3222	Statistics and Numerical Methods	BSC	4	3	1	0	4
3.	PH3224	Physics for Agricultural Engineering	BSC	3	3	0	0	3
4.	CH3224	Chemistry for Agricultural Engineering	BSC	3	3	0	0	3
5.	GE3231	Problem solving and Python Programming	ESC	3	3	0	0	3
6.	GE3211	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	HSMC	1	1	0	0	1

		PRACTICALS						
7.	GE3221	Engineering Sciences Laboratory	BSC	4	0	0	4	2
8.	GE3232	Problem solving and Python Programming Laboratory	ESC	4	0	0	4	2
9.	GE3233	Engineering Graphics and Design	ESC	5	1	0	4	3
10.	GE3251	NSS / YRC / NSO / Club Activities#	PCD	0#	0	0	0	0#
			TOTAL	30	17	1	12	24

#conducted after college hours

SEMESTER III

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA3321	Transforms and Partial Differential Equations	BSC	3	3	0	0	3
2.	AG3361	Fluid Mechanics and Open Channel	PCC	3	3	0	0	3
3.	AG3362	Hydrology and Water Resources Engineering	PCC	3	3	0	0	3
4.	AG3363	Soil Science and Engineering	PCC	3	3	0	0	3
5.	AG3364	Theory of Machines for Agricultural Engineering	PCC	3	3	0	0	3
6.	CE3363	Surveying and Levelling	ESC	3	3	0	0	3
PRACTICALS								
7.	AG3365	Fluid Mechanics Laboratory	PCC	3	0	0	3	1.5
8.	AG3366	Soil Science Laboratory	PCC	3	0	0	3	1.5
9.	CE3366	Surveying and Levelling Laboratory	ESC	3	0	0	3	1.5
			TOTAL	27	18	0	9	22.5

SEMESTER IV

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA3426	Applied Mathematics for Agricultural Engineering	BSC	2	2	0	0	2
2.	AG3461	Tractors and Farm Engines	PCC	3	3	0	0	3
3.	AG3462	Irrigation and Drainage Engineering	PCC	3	3	0	0	3
4.	AG3463	Principles and Practices of Crop Production	PCC	3	3	0	0	3

5.	AG3431	Strength of Materials for Agricultural Engineering	ESC	3	3	0	0	3
6.	AG3432	Thermodynamics for Agricultural Engineering	ESC	3	3	0	0	3
7.	GE3451	NCC Credit Course Level – I*	PCD	3*	3*	0	0	3*
PRACTICALS								
8.	AG3464	Crop Husbandry Laboratory	PCC	4	0	0	4	2
9.	AG3465	Irrigation Field Laboratory	PCC	3	0	0	3	1.5
10.	AG3433	Strength of Materials Laboratory	ESC	3	0	0	3	1.5
			TOTAL	**27**	**17**	**0**	**10**	**22**

* conducted after college hours

MAPPING – B.Tech. - AGRICULTURAL ENGINEERING

Year	Semester	Courses	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Year I	Semester I	Professional English - I	✓	✓	✓	✓	✓		✓			✓	✓	✓				
		Matrices and Calculus	✓	✓	✓	✓								✓				
		Engineering Physics	✓	✓	✓	✓	✓	✓	✓					✓				
		Engineering Chemistry	✓	✓	✓	✓	✓	✓	✓					✓		✓		
		Basic Electrical and Electronics Engineering	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓
		தமிழர் மரபு / Heritage of Tamils																
		Physics and Chemistry Laboratory	✓	✓	✓	✓	✓											
		Engineering Practices Laboratory	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓	✓
		English Language Learning Laboratory	✓	✓	✓	✓	✓	✓	✓			✓		✓				
Year I	Semester II	Professional English - II	✓	✓	✓	✓	✓		✓			✓	✓	✓				
		Statistics and Numerical Methods	✓	✓											✓			
		Physics for Agricultural Engineering	✓	✓	✓	✓	✓							✓				
		Chemistry for Agricultural Engineering	✓	✓	✓	✓	✓	✓	✓					✓		✓	✓	
		Problem solving and Python Programming	✓	✓	✓	✓	✓					✓	✓		✓		✓	✓
		தமிழரும்																

Year	Semester	Course																
		தொழில்நுட்பமும் / Tamils and Technology																
		Engineering Graphics and Design	✓		✓		✓				✓	✓		✓	✓	✓	✓	✓
		Problem Solving and Python Programming Laboratory	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓
		Engineering Sciences Laboratory	✓	✓	✓	✓	✓											
			✓	✓	✓	✓	✓	✓	✓	✓							✓	
		NSS / YRC / NSO / Club Activities#																
Year II	Semester III	Transforms and Partial Differential Equations	✓	✓			✓							✓				
		Fluid Mechanics and Open Channel	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓
		Hydrology and Water Resources Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
		Soil Science and Engineering	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
		Theory of Machines for Agricultural Engineering	✓	✓	✓		✓		✓	✓				✓	✓	✓	✓	
		Surveying and Levelling	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Fluid Mechanics Laboratory	✓	✓	✓	✓		✓	✓	✓				✓	✓	✓	✓	✓
		Soil Science Laboratory	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
		Surveying and Levelling Laboratory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year II	Semester IV	Applied Mathematics for Agricultural Engineering	✓	✓	✓	✓								✓				

Course	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Tractors and Farm Engines	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	
Irrigation and Drainage Engineering	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Principles and Practices of Crop Production	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔
Strength of Materials for Agricultural Engineering	✔	✔	✔	✔		✔					✔	✔	✔	✔	✔	✔
Thermodynamics for Agricultural Engineering	✔	✔	✔								✔	✔		✔		
NCC Credit Course Level - I*																
Crop Husbandry Laboratory	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Irrigation Field Laboratory	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Strength of Materials Laboratory	✔	✔	✔	✔		✔					✔	✔	✔	✔	✔	

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(I - IV SEMESTERS)

SEMESTER I

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EN3111	Professional English - I	HSMC	3	3	0	0	3
2.	MA3122	Matrices and Calculus	BSC	4	3	1	0	4
3.	PH3123	Engineering Physics	BSC	3	3	0	0	3
4.	CH3124	Engineering Chemistry	BSC	3	3	0	0	3
5.	GE3131	Basic Electrical and Electronics Engineering	ESC	3	3	0	0	3
6.	GE3111	தமிழர் மரபு / Heritage of Tamils	HSMC	1	1	0	0	1
PRACTICALS								
7.	GE3121	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
8.	GE3134	Engineering Practices Laboratory	ESC	4	0	0	4	2
9.	EN3119	English Language Learning Laboratory	EEC	2	0	0	2	1
			TOTAL	27	16	1	10	22

SEMESTER II

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EN3211	Professional English - II	HSMC	3	3	0	0	3
2.	MA3222	Statistics and Numerical Methods	BSC	4	3	1	0	4
3.	PH3224	Physics for Agricultural Engineering	BSC	3	3	0	0	3
4.	CH3224	Chemistry for Agricultural Engineering	BSC	3	3	0	0	3
5.	GE3231	Problem solving and Python Programming	ESC	3	3	0	0	3
6.	GE3211	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	HSMC	1	1	0	0	1

PRACTICALS

7.	GE3221	Engineering Sciences Laboratory	BSC	4	0	0	4	2
8.	GE3232	Problem solving and Python Programming Laboratory	ESC	4	0	0	4	2
9.	GE3233	Engineering Graphics and Design	ESC	5	1	0	4	3
10.	GE3251	NSS / YRC / NSO / Club Activities#	PCD	0#	0	0	0	0#
			TOTAL	**30**	**17**	**1**	**12**	**24**

#conducted after college hours

SEMESTER III

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA3321	Transforms and Partial Differential Equations	BSC	3	3	0	0	3
2.	AG3361	Fluid Mechanics and Open Channel	PCC	3	3	0	0	3
3.	AG3362	Hydrology and Water Resources Engineering	PCC	3	3	0	0	3
4.	AG3363	Soil Science and Engineering	PCC	3	3	0	0	3
5.	AG3364	Theory of Machines for Agricultural Engineering	PCC	3	3	0	0	3
6.	CE3363	Surveying and Levelling	ESC	3	3	0	0	3
PRACTICALS								
7.	AG3365	Fluid Mechanics Laboratory	PCC	3	0	0	3	1.5
8.	AG3366	Soil Science Laboratory	PCC	3	0	0	3	1.5
9.	CE3366	Surveying and Levelling Laboratory	ESC	3	0	0	3	1.5
			TOTAL	**27**	**18**	**0**	**9**	**22.5**

SEMESTER IV

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA3426	Applied Mathematics for Agricultural Engineering	BSC	2	2	0	0	2
2.	AG3461	Tractors and Farm Engines	PCC	3	3	0	0	3
3.	AG3462	Irrigation and Drainage Engineering	PCC	3	3	0	0	3
4.	AG3463	Principles and Practices of Crop Production	PCC	3	3	0	0	3

5.	AG3431	Strength of Materials for Agricultural Engineering	ESC	3	3	0	0	3
6.	AG3432	Thermodynamics for Agricultural Engineering	ESC	3	3	0	0	3
7.	GE3451	NCC Credit Course Level – I*	PCD	3*	3*	0	0	3*
PRACTICALS								
8.	AG3464	Crop Husbandry Laboratory	PCC	4	0	0	4	2
9.	AG3465	Irrigation Field Laboratory	PCC	3	0	0	3	1.5
10.	AG3433	Strength of Materials Laboratory	ESC	3	0	0	3	1.5
			TOTAL	**27**	**17**	**0**	**10**	**22**

conducted after college hours

EN3111   **PROFESSIONAL ENGLISH – I**   **L T P C**

                                                                              3 0 0 3

OBJECTIVES:

- To upgrade the English language skills of students by introducing communication techniques, speaking and grammar learning activities which are relevant to authentic contexts.
- To improve the basic reading and writing skills of the learners.
- To enhance the communicative competence of the first-year engineering students.
- To enable learners to use language effectively in academic/work contexts.
- To help learners understand content- context in relevant situations.

UNIT – I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

Listening: Podcast watching – Listening for new words and pronunciation.**Speaking:** Note of appreciation for classmates /family member – formal appreciation of someone, expression of feelings.**Reading:** Books, shorts stories to be read. Filling forms (i.e.) post office or bank.**Writing:** Film and series Review / Book Review, Email and Informal letters.**Language and Vocabulary development**: WH questions, Yes/No questions, Single Word Substitutes, Pronouns, Parts of Speech, Question tags, Prefixes and Suffixes.

UNIT – II NARRATION AND SUMMATION

Listening: Books – Short Stories to be read aloud in class for listening purpose.**Speaking:** Short stories to be read and narrated in the class.**Reading:** Reading favourite blogs on Travel, Sports and Food and expressing opinions regarding the same.**Writing:** Paragraph writing, Report – field trip / I.V., Autobiography and Comprehension.**Language and Vocabulary development**: Tenses – Past, Antonyms, Synonyms, Subject Verb agreement and Prepositions.

UNIT – III DESCRIPTION OF A PROCESS/PRODUCT

Listening: Listening to snippets from celebrities/ National leaders' lives.**Speaking:** Narrating personal experiences/ events – Expression of emotions and feelings.**Reading:**

Reading short biographies – famous people and description of the same.**Writing:** Instruction, Product / Process description and Advertisements (Normal and Block).**Language and Vocabulary development**: Adjectives- Degrees of Comparison, Tenses – Present, Compound Nouns, Homonyms, Homophones and Discourse markers – connective and sequence words.

UNIT – IV CLASSIFICATION AND INTERPRETATION

Listening: Listening to Ted Talks.**Speaking:** Recreating a Ted talk session in the class.**Reading:** Newspaper Reading (Editorial) and understanding.**Writing:** Note making, Blogging, Interpretation of charts and graphs.**Language and Vocabulary development**: Articles, Collocations and Phrasal Verbs.

UNIT – V EXPRESSION OF THOUGHTS AND IDEAS

Listening: Listening to audio books and answering questions.**Speaking:** Presentation on a non-technical topic.**Reading:**Edito,rials from newspaper.**Writing:** Essay writing – Descriptive and Narrative essays.**Language and Vocabulary development**: Tenses – future, Negative statements and questions, Punctuations, Cause and Effect, Content and Function words.

COURSE OUTCOMES

At the end of the course, learners will be able

1.To strengthen the basics of grammar.

2. To narrate informal and informal situations.

3. To describe a process/product and express opinion.

4. To interpret and analyse the content/information given.

5**.** To write short essays, personal letters and emails in English.

TEXT BOOKS:

1. English for Science and Technology Cambridge University Press,2021. Dr.VeenaSelvam, Dr.SujathaPriyadarshini, Dr. Deep Mary Francis, Dr.K.N.ShobaandDr.LourdesJoevani, Department of English, Anna University.

2. Technical Communication – Principles and Practice by Meenakshi Raman &Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.

REFERENCES:

1. Effective Communication Skill, Kulbhusan Kumar, R.S.Salaria, KhannaPublishing House.

2. Wings of Fire - An Autobiography by A.P.J Abdul Kalam with ArunTiwari, Sangam Books Ltd , Edition: 50, 1999.

3. World's Most Popular Short Stories Saki Maupassant, Anton Chekhov, O Henry Paperback.

4. Professional Speaking skills,ArunaKoneru, Oxford University Press.

5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English,Anna University,2020.

EN3111	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2	2	-	-	-	-	3	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	3	1	1	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	3	-	1	-	-	-	-
CO4	3	3	-	2	-	-	2	-	-	3	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	2.2	2.6	2	2	2	-	2	-	-	2.8	1	1	-	-	-	-

MA3122   **MATRICES AND CALCULUS**   **L T   P C**

                                                                     3 1   0 4

OBJECTIVES:

- To understand and apply matrix techniques for engineering applications.
- To familiarize the student with basic calculus and traditions of traditional calculus.
- To solve the problems in single and multivariable calculus and plays an important role in science, economics, engineering.
- Vector calculus can be widely used for modeling the various laws of physics.
- To familiarize the student with multiple integrals and their usage in find the area and volume of two and three dimensional objects.

UNIT- I : MATRICES   **9L+3T**

Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigen vectors - Statement and Applications of Cayley-Hamilton Theorem - Reduction of a quadratic form into canonical form by orthogonal transformation.

UNIT- II :DIFFERENTIAL CALCULUS   OF ONE VARIABLE   **9L+3T**

Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Rolle's Theorem and Mean Value theorem -Taylor's series- Maxima and Minima of functions of one variable.

UNIT- III :DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES   **9L+3T**

Partial derivatives - Total derivatives - Jacobians and properties - Taylor's series for functions of two variables - Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT- IV : MULTIPLE INTEGRALS   **9L+3T**

Double integrals in Cartesian and polar coordinates - Change of order of integration - Area enclosed by plane curves - Change of variables in Polar coordinates - Triple integrals - Volume of solids.

UNIT- V : VECTOR CALCULUS 9L+3T

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Vector Integration Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

TOTAL: 45L + 15T PERIODS

OUTCOMES:

- To apply the idea of reducing complex problems into simple form using matrix technique.
- Basic application of single variable calculus in engineering problems.
- This course equips the students to have basic knowledge and understanding of multivariable calculus.
- Basic application of Double and Triple integrals used in Engineering real life problems
- To study Vector Calculus and apply the application of vectors in modeling the various laws of physics

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.3. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", S.Chand Private Ltd.,11th Edition, 2005.

2. Veerarajan.T, "Engineering Mathematics", McGraw Hill Education(India) Private Ltd 2019.

REFERENCE BOOKS:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt. Ltd., 2011.

2. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015

3. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume I, Second Edition, Pearson Publishing, 2017.

4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

MA3122	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO3	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO4	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO5	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
Average	3.0	2.0	2.0	1.0	-	-	-	-	-	-	-	1.0	-	-	-	-

PH3123   **ENGINEERING PHYSICS**   **L T P C**

(Common to all Branches of B.E. / B.Tech. Programmes)   **3 0 0 3**

OBJECTIVES:

- To enhance the fundamental knowledge in crystalline materials and its applications.
- To explore the knowledge in the production of ultrasonic waves and its application.
- To familiarize the basics of laser and its technical advances in scientific, industrial and health care areas.
- To understand the principle of optical fibre and its applications.
- To explore basic concepts of quantum physics.

UNIT- I: CRYSTAL PHYSICS   9

Single crystalline, polycrystalline and amorphous materials - unit cell - space lattice - crystal systems - Bravais lattice - characteristics of unit cell - SC, BCC, FCC and HCP structure - Miller indices - d-spacing - X-ray diffraction (XRD) - Photonic crystals - crystal growth techniques:Czochralski and Bridgmann method.

UNIT- II: ULTRASONICS   9

Introduction - properties - Production: MagnetostrictionandPiezoelectric method **-** Acoustic grating - determination of ultrasonic velocity in liquid - Application: Detection of flaw in materials (Non Destructive Testing) - ultrasonic soldering, welding - SONAR - diagnostic sonography - air bag sensor - dispersion of fog.

UNIT- III: LASER   9

Basic concepts and characteristics - Einstein's A and B coefficients (derivation) - population inversion - pumping methods - Nd-YAG laser - CO_2 laser - Excimer laser - Applications: laser welding, laser cutting, pattern formation by laser etching, laser bar code scanner - LIDAR - Laser tissue interaction, laser surgery.

UNIT-IV: FIBRE OPTICS   9

Structure and principle - propagation of light through optical fibre - acceptance angle, numerical aperture - fractional index change - Types of optical fibres (material, mode and

refractive index) - Attenuation: absorption, scattering and bending - dispersion - fibre optic communication system (Block diagram) and advantages over conventional methods - fibre optic sensors: pressure and displacement - Endoscope.

UNIT-V: QUANTUM PHYSICS   9

Black body radiation and energy distribution spectrum - Planck's theory of radiation - matter waves - de-Broglie wavelength in terms energy, voltage and temperature - Electron diffraction - G.P.Thomson experiment - physical significance of wave function - Schrödinger's wave equation: time independent and time dependent equations - particle in a one - dimensional box - Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM).

TOTAL: 45 PERIODS

OUTCOMES:
After completion of this course, the students should be able to

1. Understand the crystalline material and growth techniques.
2. Understand the basics, generation and application of ultrasonics.
3. Acquire knowledge on the concepts of lasers and their applications in industry and medical field.
4. Conversant on principle behind the fibres and their applications in communication and devices made out of optical fibre.
5. Get knowledge on physics concepts of quantum theory and its applications.

TEXT BOOKS:

1. Bhattacharya, D.K. &Poonam, T. "Engineering Physics". Oxford University Press,2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". DhanpatRai Publishers, 2012.
3. Pandey, B.K. &Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.
4. M. Arumugam, Engineering Physics. Anuradha agencies and publishers.M.N.Avadhanulu&P.G.Krishnasagar, "A Text Book of Engineering Physics" – IX Edition, S.Chand Publications, 2014.
5. V. Rajendiran, Engineering Physics, Tata McGraw Hill publishing company Ltd.

REFERENCES :

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.

2. Tipler, P.A. &Mosca, G. "Physics for Scientists and Engineers with Modern Physics" W.H.Freeman, 2007.

3. Shatendra Sharma &Jyotsna Sharma, "Engineering Physics". Pearson, 2018

4. Allen H. Cherin, McGraw Hill International Edition "Fundamentals of fibre optic communication".

5. S.L.Gupta&Sanjeev Gupta, "Modern Engineering Physics" – DhanpatRai Publications, 2011.

PH3123	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	1	1	-	-	1	1	-	-	-	-	1	-	-	-	-
CO2	3	1	1	1	2	1	1	-	-	-		1	-	-	-	-
CO3	3	2	2	1	1	1	1	-	-	-	-	1	-	-	-	-
CO4	3	2	2	1	1	1	1	-	-	-	-	1	-	-	-	-
CO5	2	1	1	1	1	1	1	-	-	-	-	1	-	-	-	-
Average	2.8	1.4	1.4	1.0	1.0	1.0	1.0	-	-	-	-	1.0	-	-	-	-

CH3124   **ENGINEERING CHEMISTRY**   **L T P C**   (

First Semester -Common to all Branches) **3 0 0 3**

OBJECTIVES

- To make the students familiar with boiler feed water requirements, related problems and domestic water treatment techniques.

- To introduce the basic concepts and applications of chemical thermodynamics.

- To acquaint the student with the principles of chemical kinetics and its applications towards engineering.

- To make the student conversant with the basics of surface chemistry and catalysis.

- To inculcate the students with the basics principles and preparatory methods of nanomaterials.

UNIT-I :WATER TECHNOLOGY   9

Introduction-sources of water-impurities present in water-hard water and hardness – types, Municipal water treatment: primary treatment and disinfection - Desalination of brackish water: Reverse Osmosis, Boiler troubles: scale and sludge, caustic embrittlement, boiler corrosion priming and foaming, Treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning). External treatment: Ion exchange process, cooling waters (Langelier index).

UNIT – II :CHEMICAL THERMODYNAMICS   9

Introduction-terminology of thermodynamics, the first law of thermodynamics: enthalpy, second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions: Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions, Criteria of spontaneity; Gibbs-Helmholtz equation, Clausius-Clapeyron equation, Maxwell relations, Van't Hoff isotherm and isochore.

UNIT – III: CHEMICAL KINETICS   9

Introduction-factors influencing the rate of reaction, order and molecularity of a reaction, kinetic equations of different orders (first, second and third order) - determination of the order of a reaction, the temperature dependence of reaction rates, unimolecular reactions,

photochemical reactions and chain reactions, Theories of reaction rates, lasers in chemistry, fast reactions.

UNIT - IV :SURFACE CHEMISTRY AND CATALYSIS   9

Adsorption: classification - adsorption of gases on solids - adsorption from solutions - adsorption isotherms - applications of adsorption - Freundlich's adsorption isotherm - Langmuir's adsorption isotherm, B.E.T isotherm. Catalysis: introduction - types of catalysis - criteria - autocatalysis - catalytic poisoning and catalytic promoters - acid -base catalysis - enzyme catalysis - Michaelis - Menten equation.

UNIT – V :NANOCHEMISTRY   9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties; Types of nanomaterials: Definition, properties and uses of - nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electrospinning. Applications of nanomaterials in medicine, agriculture, food science and energy resources.

Total Periods: 45

OUTCOMES

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

1. To infer the quality of water from quality parameter data and propose suitable treatment.
2. To apply the knowledge of chemical thermodynamics for material design and aspects
3. To recommend the proper chemical kinetics for engineering processes and applications.
4. To recognize the surface morphology and its engineering applications.
5. To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

TEXT BOOKS

1. Payal B. Joshi and Shashank Deep, "Engineering Chemistry", Oxford University Press, New Delhi, 2019.
2. ShikhaAgarwal, "Engineering Chemistry"-Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.

3. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, DhanpatRai Publishing Company (P) LTD, New Delhi, 2019.

REFERENCES

1. R. V. Gadag and A. NithyanandaShetty, "Engineering Chemistry", 3rd Edition, Wiley & I.K. International (P), LTD, New Delhi, 2019.

2. S.S. Dara and S.S. Umare, "A Text Book of Engineering Chemistry", 12th Edition, S. Chand & Company LTD, New Delhi, 2018.

3. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Publishing Company LTD, 2023.

4. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.

CH3124	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	2	-	1	3	-	-	-	-	2	-	-	-	-
CO2	3	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	3	2	1	-	1	-	-	-	-	2	-	1	-	-
Average	2.8	1.8	2.2	1.2	1.0	1.0	2.0	-	-	-	-	2.0	1.0	-	-	-

GE3131   **BASIC ELECTRICAL AND ELECTRONICS**   **L T P C**

                    ENGINEERING   **3 0 0 3**

COURSE OBJECTIVES

- To introduce the basics of electric circuits and analysis**.**
- To impart knowledge in the basics of working principles and application of electrical machines.
- To introduce analog devices and their characteristics.
- To educate on the fundamental concepts of digital electronics.
- To introduce the functional elements and working of measuring instruments.

UNIT- I :ELECTRICAL CIRCUITS   9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only).

UNIT-II :ELECTRICAL MACHINES   9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications.Construction, working principle and Applications of Transformer, three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT- III :ANALOG ELECTRONICS   9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

UNIT-IV :DIGITAL ELECTRONICS   **9**

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations – minimization using K maps (Simple Problems only).

UNIT-V :MEASUREMENTS AND INSTRUMENTATION   **9**

Functional elements of an instrument, Standards and calibration, Operating Principle, types Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

1. Ability to compute the electric circuit parameters for simple problems
2. Ability to explain the working principle and applications of electrical machines
3. Ability to analyze the characteristics of analog electronic devices
4. Ability to explain the basic concepts of digital electronics
5. Ability to explain the operating principles of measuring instruments.

TEXTBOOKS

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008.
4. James A. Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, PuneetSawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, 2015.

REFERENCE BOOKS

1. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.

2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.

3. MahmoodNahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.

4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

GE3135	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	2	-	-	3	-	-	-	-	-	2	-	2	-
CO2	3	2	-	-	-	2	-	2	-	-	-	-	1	2	-	2
CO3	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-	-
CO4	3	3	1	-	3	-	2	-	-	-	-	-	1	-	3	-
CO5	3	3	2	1	-	-	1	-	-	-	-	-	2	1	-	2
Average	2.8	2.8	1.8	1.7	3.0	2.0	2.0	2.0	-	-	-	-	1.8	1.5	2.5	2.0

GE3111 தமிழர்மரபு **L T P C**
1 0 0 1

அலகு I மொழி மற்றும் இலக்கியம் 3

இந்தியமொழிக்குடும்பங்கள் – திராவிட மொழிகள்- தமிழ் ஒரு செம்மொழி- தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல்அறம்- திருக்குறளில் மேலாண்மைக் கருத்துகள்-தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள்- தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி –தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் – சிற்பக்கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை –ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள் ,பொம்மைகள்- தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள்.

அலகு III நாட்டுபுறக் கலைகள் மற்றும் வீரவிளையாட்டுகள் 3

நாட்டுப்புற கதைகள், பாடல்கள்-தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து- ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம்- வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்கஇலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள்- தமிழர்கள் போற்றிய அறக்கோட்பாடு – தமிழ் சங்கம்– சங்கம் வளர்த்த தமிழ்- சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும்- சங்ககால நகரங்களும் துறைமுகங்களும்– சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியா மற்றும் வெளிநாட்டின் பிறபகுதிகளின் தமிழ்ப் பண்பாட்டின் தாக்கம்-சுயமாரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின்

பங்கு- கல்வெட்டுகள், கையெழுத்துப் படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL PERIODS: 15 Hours

TEXT CUM REFERENCES:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் – முனைவர். இல.சுந்தரம். (விகடன்பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology& Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GE3121   **PHYSICS AND CHEMISTRY LABORATORY**   **L T P C**

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

PHYSICS LABORATORY

OBJECTIVES:

- To familiarize with Physics principles and interpretation of experimental data.
- To elucidate the basics of quantum Physics, optics and thermal Physics.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Calculation of lattice cell parameter – X-ray diffraction method.

2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer

3. (a). Compact disc- Determination of width of the groove using Laser.

   (b). Determination of particle size using Laser

4. (a) Determination of wavelength using Laser

 (b) Determination of acceptance angle and numerical aperture in an optical fiber.

5. Determination of Planck's constant using LED.

6. Determination of thickness of a thin wire – Air wedge method

7. Determination of wavelength of mercury spectrum – spectrometer grating

8. Determination of rigidity modulus – Torsion pendulum

9. Determination of Young's modulus by non-uniform bending method.

                 TOTAL: 30 PERIODS

OUTCOMES:

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

1. Understand the functioning of various physics laboratory equipment.
2. Use graphical models to analyze laboratory data.
3. Use mathematical models as a medium for quantitative reasoning and describing physical reality.
4. Access, process and analyze scientific information.
5. Solve problems individually and collaboratively.

REFERENCES

1. Wilson J.D. and Hernaandez Hall C.A., —Physics Laboratory Experiments, Houghton MifflinCompany, New York, 2005.

2. S. Srinivasan, A Text Book of Practical Physics, S. Sultan Chand publications. 2005.

3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

GE3127	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-		-	-	-		-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	3.0	2.4	2.6	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY: (Any five experiments to be conducted)

OBJECTIVES

- To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, TDS, chloride, and chlorine.

- To familiarise the students with electroanalytical techniques like conductometry and flame photometry to determine the impurities in aqueous solution.

- To find the various characteristics of domestic water.

- To understand the Pseudo first-order kinetics reaction.

- To make the students know the synthesis of nanoparticles.

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Determination of chloride content of water sample by Argentometric method.

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. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a watersample using the primary standard.

5. Determination of types and amount of alkalinity in water samples.

6. Estimation of available chlorine in bleaching powder solution.

7. Conductometric titration of barium chloride against sodium sulfate (Precipitation titration).

8. Estimation of sodium /potassium present in water using a flame photometer.

9. Estimation of TDS of a water sample by gravimetry.
10. Preparation of nanoparticles (Ag/Au/TiO2/ZnO/CuO).

11. Pseudo first-order kinetics- ester hydrolysis.

TOTAL: 30 PERIODS

OUTCOMES

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

- To infer the quality of water samples for alkalinity, hardness, DO, TDS, chloride, and chlorine.

- To apply the knowledge on the estimation of metal ions, acidity and its precipitation nature towards their process.

- To recognize the threshold limit for various characteristics of domestic water.

- To identify the simple method of synthesis of nanoparticles.

- To understand the pseudo first-order kinetics reaction from ester hydrolysis.

TEXTBOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014).
2. Suchi Tiwari, Engineering Chemistry Lab Manual, Scitech Publications (India) Pvt. Ltd. (2nd Edition, 2013).

3. Pushpendra Kumar, Laboratory Manual for Engineering Chemistry, Reyansh Authortopic Pvt. Ltd., (1st Edition, 2022).

GE3127	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-		-	-	-		-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	2	-	-	-	-	-	-	1	-	2	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	2.0	1.0	0.8	1.0	1.2	-	1.0	-	-	-	-	1.0	2.0	-	-	-

GE3138   **ENGINEERING PRACTICES LABORATORY**   **L T P C**

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

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment / tools
- To gain the skills for making fitting joints and assembling air conditioner
- To develop the skills for making simple electrical wiring connections using suitable tools
- To provide hands on experience for soldering and gain knowledge about the behavior of electronics components.

GROUPA(CIVIL &MECHANICAL)

I   CIVIL ENGINEERING PRACTICE   15

Buildings:

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

Plumbing Works:

a) Study   of   pipeline   joints,   its   location   and functions:valves,taps,couplings,unions,reducers, elbows in household fittings.

b) Study of pipe connections requirements for pumps and turbines.

c) Preparation of plumbing line sketches for water supply and sewage works.

d) Hands-on-exercise:

e) Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

f) Demonstration of plumbing requirements of high-rise buildings.

Carpentry works:

a) Studyof thejointsin roofs, doors, windows and furniture.

b) Hands-on-exercise:

Wood work, joints by sawing,planning and cutting.

II   MECHANICALENGINEERINGPRACTICE   15

Welding:

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

b) Gas welding practice - Study

Basic Machining:

a) Facing

b) Simple Turning

c) Step Turning

Sheet Metal Work:

a) Forming &Bending

b) Model making–Trays

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending.

b) Foundry operations like mould preparation for gear and step cone pulley.

c) Assembly of centrifugal pump

d) Assembly of air conditioner

GROUPB (ELECTRICAL &ELECTRONICS)

III   ELECTRICAL ENGINEERING PRACTICE   15

1. Residential house wiring using Switches, Fuse,Indicator,Lamp and Energy meter.

2. Fluorescent Lamp Wiring.

3. Staircase Wiring.

4. Measurement of Voltage,Current, Power and Power factor in electrical circuit.

5. Measurement of Energy using Analog & Digital Energy meter.

6. Measurement of Earth Resistance.

7. Study of Industrial house wiring.

8. Identification & Study of protective devices: Fuses &Fuse carriers, MCB, ELC Band Isolators with ratings and usage.

IV ELECTRONICS ENGINEERING PRACTICE   15

1. Study of Electronic components and equipments–Resist or,colour coding measurement of AC signal parameter (peak-peak, RMS period, frequency)using CR.

2. Study of logic gates AND, OR, EX-OR and NOT.

3. Generation ofClock Signal.

4. Soldering practice– Components, Devices and Circuits – Using general purpose PCB.

5. Measurement of ripple factor of HWR and FWR.

COURSE OUTCOMES:

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

1. Carry out various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

2. Fabricate carpentry components and pipe connections including plumbing works And use welding equipment's to join the structures.

3. Carry out the basic machining operations, make the models using sheet Metal works. Illustrate on centrifugal pump, air conditioner, operations of smithy, Foundry and fittings.

4. Carryout basic home electrical works and measure the electrical quantities

5. Elaborate on the electronics components, gates and soldering practices.

LIST OFEQUIPMENT FOR A BATCH OF30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions,elbows, plugs and other fittings.   15Sets

2.Carpentry vice(fitted to work bench)   15Nos.

3.Standard wood working tools   15 Sets

4.Models of industrial trusses, door joints,furniture joints   5 each

MECHANICAL

1. Arc welding transformer with cables and holders   5 Nos.

2. Welding booth with exhaust facility   5 Nos.

3. Welding accessories like welding shield, chipping hammer,   5Sets
   Wire brush, etc.

4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.   2 Nos.

5. Centre lathe   2 Nos.

6. Hearth furnace, anvil and smithy tools   2 Sets

7. Moulding table,foundry tools   2Sets

8. Power Tool:Angle Grinder   2Nos.

9. Study-purpose items: centrifugal pump, air-conditioner   One each

10. Fitting tools, Hack saw frame, 12' file, hack saw blade   15 Nos.

ELECTRICAL

1. Assorted electrical components for house wiring   15 Sets

2. Fluorescent Lamp   15 Sets

3. Electrical measuring instruments   10 Sets

4. Analog & Digital energy meter   5 Sets

5. Megger   2

ELECTRONICS

1. Soldering guns   10 Nos.

2. Assorted electronic components for making circuits   50 Nos.

3. Small PCBs   10 Nos.

4. Multimeters10 Nos.

5. Study purpose items:Telephone, FMradio, low-voltage power supply.

CE3138	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	-	-	-	1	-	-	-	-	-	1	2	-	3	-
CO2	-	1	2		3	-	-	-	-	-	1		-	-	2	-
CO3	-	-	-	3	2	-	-	-	-	-	-	1	1	-	-	2
CO4	-	2	3	1	2	-	-	-	-	-	-	-	-	2	-	-
CO5	-	3	2	2	-	-	-	-	1	-	-	-	2	-	-	-
Average	3.0	2.0	2.3	2.0	2.3	1.0	-	-	1.0	-	1.0	1.0	-	-	-	-

EN3119   **ENGLISH LANGUAGE LEARNING LABORATORY**   **L T P C**

                                                   0 0 2 1

COURSE OBJECTIVE:

The course aims to

- Enhance the employability and career skills of students.
- Orient the students towards grooming as a professional.
- Make them industry ready.
- Develop their confidence and help them attend interviews successfully.
- Help students to interact confidently in a professional scenario.

UNIT 1: PRONUNCIATION   6

Tone- Pronunciation – Intonation- Reading Aloud and Addressing- Syllable- Rhythm-Accent-Wrongly Pronounced words -Poetry Reading.

UNIT 2: NON VERBAL COMMUNICATION   6

Non Verbal Communication - Facial expressions- Eye contact - Subtle (and not so subtle) gestures -Tone of voice – Touch- Posture -Personal space.

UNIT 3: SELF INTRODUCTION AND PRESENTATION   6

Self Introduction- Introducing oneself to the audience- Introducing the Topic – answering questions – Individual Presentation Practice – Presenting Visuals effectively -5 Minute Presentations.

UNIT 4: BASICS OF SOFT SKILLS   6

Recognizing differences between groups and teams – managing time – networking professionally – Respecting social protocols- understanding career management – Developing a long - term career plan- making career changes.

UNIT 5: GROUP DISCUSSION   6

Introduction to Group Discussion – Participating in Group discussions – Understanding group dynamics – Brainstorming the Topic – Questioning and Clarifying – GD Strategies – activities to improve GD Skills.

                                              TOTAL: 30 PERIODS

COURSE OUTCOME

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

1. Pronounce the words correctly.
2. Understand the nonverbal clues.
3. Make an effective presentation.
4. Adequate soft skills required for the workplace.
5. Participate confidently in Group Discussions.

REFERENCES:

1. Professional Communication by Meenakshi Raman &Sangeeta Sharma, Oxford Univ.Press, 2014.
2. Soft Skills by S. Hariharan , N. Soundarajaran and S.P. Shanmugapriya MJP Publishers, Edition: 2013
3. Soft Skills for Everyone by Butterfield , Jeff, Cengage Learning India Pvt. Ltd.,2015. New Delhi.

EN3119	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	-	-	1	-	-	-	-	-	3	-	1	-	-	-	-
CO2	1	1	-	-	-	-	1	-	-	2	-	1	-	-	-	-
CO3	2	2	1	2	2	-	-	-	-	3	-	1	-	-	-	-
CO4	2	1	1	-	-	-	3	-	-	3	-	1	-	-	-	-
CO5	-	1	-	1	-	-	-	-	-	3	-	1	-	-	-	-
Average	1.6	1.2	1	1.3	2	-	2	-	-	2.8	-	1	-	-	-	-

EN3211   **PROFESSIONAL ENGLISH – II**   **L T P C**

                                                                    3 0 0 3

OBJECTIVES

The course prepares the second semester Engineering students

- To develop strategies and techniques to enhance their reading skills.
- To engage them in meaningful activities in order to improve their listening, speaking, reading and writing skills.
- To improve their ability to write effective job application, resumes and draft impressive reports.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To participate in group discussions.

UNIT – I: MAKING COMPARISON   9

Listening: Clippings of Ted talk, cartoon and interviews of sports personalities for listening and discussion.**Speaking:** Descriptions and discussions based on newspaper.**Reading:** Learning shades of meaning (using Thesaurus) and inferring the context from general passages.**Writing:** Compare & Contrast essays and Jumbled Sentences.**Language and Vocabulary development**: Prepositional phrases, contextual meaning of words. Verbal Analogy, Same word used as Noun and Verb.

UNIT – II: EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING9

Listening: Anecdotes to be read from books like Chicken Soup books. Evaluativelistening – Advertisement and Product description.**Speaking:** Marketing a product, persuasive speech**Reading:** Description of any product / jewellery, Brochures and Manual.**Writing:** Formal letters- letters of complaint, appreciation, and suggestion, Comprehension and E-mail (formal)**Language and Vocabulary development**: Active & Passive, Infinitive, Gerund, Purpose Statements, Adverbs and Word formation

UNIT – III: ABILITY TO PUT IDEAS OR INFORMATION COGENTLY   9

Listening: Listen to English songs and find the lyrics/new words**Speaking:** Role play and Interviews**Reading:** Reading magazine articles, Excerpts from literary texts**Writing**:

JobApplication, Resume, Cover letter, SWOC Analysis and Recommendations.**Language and Vocabulary development**: Correction of errors, If conditional, Sentence completion and Connotations.

UNIT – IV: ANALYZING PROBLEMS AND EXPRESSING SOLUTIONS   9

Listening: Watching Stand-up comedies and comprehending ideas expressed there.**Speaking:** Speak about the Stand-up comedies viewed and express personal viewsabout the same**Reading:** Reading different types of books (novels, short stories, biographies, magazines etc. and speaking about the same.**Writing**: Dialogue Writing, Checklist and Problem Solving essays.**Language and Vocabulary development:** Reported Speech, Modals, Slogan writing and Conjunctions.

UNIT – V: REPORTING EVENTS   9

Listening: Listening to spot errors, listening to varied dialects and accents of English.**Speaking:** Group discussion- Expression of opinions, assertion and coercion etc.**Reading:** Reading life experiences of common man from magazines. **Writing**: Accident Report / Survey Report and Letters to the Editor.**Language and Vocabulary development**: Numerical Adjective, Idioms, Vocabulary – Shades of Meaning.

TOTAL: 45 PERIODS

COURSE OUTCOME

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

1. To compare and contrast ideas and information from technical texts.
2. To incorporate basic grammar structures to express appreciation, suggestion and complaint in writing**.**
3. To draft effective resumes using appropriate vocabulary and to avoid common errors.
4. To analyse problems so as to arrive at appropriate solutions and to communicate relevantly.
5. To draft technical reports, letters and to express ideas creatively.

TEXT BOOKS:

1. English for Science and Technology Cambridge University Press, 2021. Dr.VeenaSelvam, Dr.SujathaPriyadarshini, Dr. Deep Mary Francis, Dr.K.N.ShobaandDr.LourdesJoevani, Department of English, Anna University.
2. Technical Communication – Principles and Practice by Meenakshi Raman &Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.
3. Technical English for Professional – Advanced by C. Gangalakshmi, B. Rathika and L. Saranraj, Cengage Learning India Pvt. Ltd.,2022.

REFERENCES:

1. Learning to communicate – Dr. V. Chellammal, Oxford Univ.Press,2001 New Delhi.
2. Business Correspondence and Report Writing by Prof. R. C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Developing Communication Skills by Krishna Mohan, MeeraBannerji- Macmillan India Ltd. 1990, Delhi.
4. Improve Your Writing ed. V.N AroraLaxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English, Anna University,2020.

EN3211	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	1	2	1	-	-	-	-	-	3	-	1	-	-	-	-
CO2	2	2	1	2	2	-	-	-	-	3	1	1	-	-	-	-
CO3	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-
CO4	2	3	2	3	-	-	2	-	-	3	-	-	-	-	-	-
CO5	2	-	1		-	-	-	-	-	2	-	-	-	-	-	-
Average	2.0	2.0	1.4	2.0	2.0	-	2.0	-	-	2.8	1.0	1.0	-	-	-	-

MA3222   **STATISTICS AND NUMERICAL METHODS**   **L T P C**

3 1 0 4

OBJECTIVES:

- This course aims at providing the necessary basic concepts of statistical and Numerical Methods for solving numerically different problems of engineering and Technology.

- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.

- To introduce the basic concepts of solving algebraic and transcendental equations.

- To introduce the numerical techniques of interpolation in various intervals and differentiation and integration in engineering and technology disciplines.

- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT-I: STATISTICAL HYPOTHESIS TESTS   9L+3T

Sampling distributions - Tests for single mean and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT-II: EXPERIMENTAL DESIGN FOR ANOVA   9L+3T

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT-III: SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS   9L+3T

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 method – Iterative method of Gauss Seidel –Dominant Eigenvalue of a matrix by Power method.

UNIT-IV: INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION   9L+3T

Lagrange's and Newton's divided difference interpolations – Newton's forward and

backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical integrations using Trapezoidal, Simpson's rules.

UNIT-V:NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9L+3T

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

TOTAL: 45L+15T PERIOD

OUTCOMES:

- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the ordinary differential equations with initial and boundary conditions by using certain techniques with engineering application.

TEXT BOOKS:

1. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCE BOOKS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning,2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald.C.F., Wheatley. P.O. "Applied Numerical Analysis" Pearson Education,

Asia,NewDelhi,2006.

MA3222	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Average	3.0	3.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-

PH3224　　　　**PHYSICS FOR AGRICULTURAL ENGINEERING**　　　　**L T P C**
　　　　　　　　(For Second Semester- B.Tech.Agricultural Engineering)　　**3 0 0 3**

OBJECTIVES:

- To understand the basic properties of soil.
- To enrich the idea of artificial means of growing plants.
- To understand various methods involved in energy harvesting.
- To explore various Physics principles used in agriculture techniques.
- To facilitate the basics of nanotechnology used in agriculture.

UNIT - I: BASICS OF SOIL PHYSICS　　　　　　　　　　　　　　　　9

Poly-phase system of soil - components of soil - soil profile-Physical properties: Soil texture, mass- volume relationship- Soil structure: aggregation-porosity- pore size distribution- Soil water measurements- Soil water potential- Rheological properties and transport phenomena: stress -strain relations - soil moisture -movements- surface tension - contact angle -Evaporation and solution diffusion-osmosis and osmotic pressure-factors affecting soil temperature and its importance to plant growth.

UNIT- II:　　　　PHYSICS OF PRECISION FARMING AND IOT　　　　　　9

Planting techniques: vertical farming- hydroponics-Indoor farming-plant environment interactions- Solar radiation and transpiration - greenhouse effect- light- temperature-relative humidity- Precision farming principles-IoT devices- Unmanned Aerial Vehicles (UAVs)- Drones in Agriculture -Types and Properties of Crops Monitored-Basic components of remote sensing- signals, sensors and sensing systems; active and passive remote sensing- Liquid Level Sensors.

UNIT- III:　　　　PHYSICS OF ENERGY HARVESTING　　　　　　　　　9

Energy sources – Classification – Biomass and its types - Energy from Biomass-Types of biogas plants-constructional details.-Principles of combustion, pyrolysis, gasification and briquetting (qualitative). Wind energy-Types of wind mills, Constructional details and application – Solar energy applications - grain dryers- Refrigeration system- ponds- fencing-pumping systems.

UNIT- IV:　　　　PHYSICAL TECHNIQUES IN AGRICULTURE　　　　　　9

Basics in Sensing by Electromagnetic Radiation - Emission, Absorbsion, Reflection and Transmission of Radiation-sensing the electrical conductivity of soil- Chlorophyll fluorescence-steady state and non-steady state - Application of X-ray computed tomography to soil science. Infrared radiometer – sensing water supply of crops – transpiration of crops. Sensing techniques in topography-. Soil thermometers-soil heat flux plates, instruments for measuring soil moisture.laser land leveller.

UNIT –V: NANO TOOLS FOR AGRICULTURE   **9**

Nano materials - properties- -nanofibers-nanowires- biomass waste based nanomaterials- fluroscent C-dots- nano sensors-nano biosensors- nanosmart dust and gas nanosensors- fluorescent dye biosensors- magnetic nanoparticle based sensors-nanophoto semiconductors.

                                         TOTAL: 45 PERIODS

OUTCOMES:

After completion of the course, the students should be able

1. To understand the physical properties and transport phenomena of soil.
2. To apply the concepts of artificial means of growing crops.
3. To apply the physics principles for energy harvesting.
4. To understand the basics of emradiation and apply knowledge for crop growth.
5. To know the concepts and applications of nano materials in agriculture.

TEXT BOOKS:

1. Hand book of Solar Energy, G.N. Tiwari, AravindDivari, Shyam, Springer Publications.
2. Principles of Soil Physics, Rattan LalManoj K .Shukla, New York: Marcel Dekker; London: Taylor & Francis, 2004.
3. Environment Problems and Solution, D. K. Asthana and M. Asthana ,S.Chand Publications.
4. Agricultural Physics, Vikas Singh, Vikas Publications. Bioscientific Publisher Edition: 1, 2017.
5. Precision Farming, Sharma P, Daya Publishing House New Delhi, 2007.

REFERENCES:

1. Non-Conventional Energy Sources,Rai, G.D. Khanna Publishers, New Delhi, 2013.

2. Non-Conventional Energy Resources, B. H. Khan, The McGraw Hill Publishers.

3. Principles of Agricultural Engineering, Michael, A.M. and T.P. Ojha. Volume II. 4th Edition, Jain Brothers, New Delhi, 2003.

4. Soil Physics, Jury, W.A., Gardner, W. and Horton, R., John Wiley and Sons, New York, 2004.

5. Agricultural Nanobiotechnology Modern Agriculture for a Sustainable Future ,Fernando López-Valdez FabiánFernández-Luqueño Editors , Springer Nature Switzerland AG 2018.

PH3224	PROGRAM OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	1	2	1	1	-	-	-	-	-		1	-	-	-	
CO3	3	2	2	2	1	-	1	-	-	-	-	1	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	-	-	-
CO5	1	1	1	-	1	1	1	-	-	-	-	1	-	-	-	-
Average	2.6	1.4	1.7	1.6	1	1	1	-	-	-	-	1	-	-	-	-

CH3224   **CHEMISTRY FOR AGRICULTURAL ENGINEERING**   **LT P C**
                (Second Semester-B.Tech., Agricultural Engineering)   **3 0 0 3**

OBJECTIVES

- To understand the biological functions and nutritional importance of carbohydrates, protein, fat, amino acid, starch, gum & dietary fibres, and vitamins.
- To improve biofertilizer technology to ensure high quality and to demonstrate an understanding of the biological compost process.
- To provide a foundation for understanding the principles of nuclear energy, solar cell and batteries for designing and operation.
- To understand the elements of a healthy soil ecosystem to increase soil fertility in crop production.
- To gain knowledge on working principles and theory of instruments for analysis of samples.

UNIT I FOOD CHEMISTRY & MICROBES   **9**

Food chemistry: definition, scope and importance of carbohydrate, protein, fat, amino acid, starch, gum & dietary fibres, vitamins in the food, enzymatic & non-enzymatic browning reaction. Contribution to texture, flavour and organoleptic properties of food, food additives - functions. FSSAI: role and function,Microbes: definition, food as a substrate for microorganisms, factors affecting the growth of microbes- pH and water activity.

UNIT II FERTILIZERS AND COMPOST   **9**

Chemical fertilizers: classification, composition, manufacturing and properties of major nitrogenous, phosphatic, and potassic fertilizers - secondary and micronutrient fertilizers, complex fertilizers, nano fertilizers, biofertilizers - constraint in the application of biofertilizers. Manures: sources and production.Compost: different composting technologies-mechanical compost plants - vermicomposting.

UNIT III ENERGY STORAGE SYSTEMS   **9**

Introduction - nuclear energy - light water nuclear power plant - breeder reactor, solar energy conversion, solar cells- principle, working and applications. Types of batteries - primary battery (alkaline battery), secondary battery (lead acid battery, NICAD battery, lithium-ion battery), fuel cells (H_2-O_2 fuel cell). Supercapacitors: storage principle, applications. Electric vehicles-working principle.

UNIT IV ELEMENTS IN SOIL   **9**

Chemistry of soil (nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients) - source, form, and their behaviour - agricultural significance - biotic factors in soil development, microbial toxins in the soil- factors affecting their availability in soil.

UNIT V ANALYTICAL TECHNIQUES   9

Introduction, absorption of radiation, types of spectra, UV-Visible, IR spectrophotometer and atomic absorption spectrophotometer (AAS): Instrumentation (block diagram) and applications. Thin layer chromatography (TLC), gas chromatography, high-performance liquid chromatography (HPLC): working principle and applications, C,H,N,O analyser.

Total Periods: 45

OUTCOMES

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

1. To apply the gained knowledge on biological functions of carbohydrates, protein, fat, amino acid, starch, gum & dietary fibres, and vitamins.
2. To recommend the utilization of manures, and biofertilizers to increase soil fertility through various approaches.
3. To utilize different renewable sources in the agriculture sector.
4. To identify the physical and chemical properties of soil and their effect on plant health.
5. To get experience in advanced analytical and instrumentation methods in the estimation of elements in the soil.

TEXTBOOKS
1. D.B. Ray, "Introductory Agricultural Chemistry", Bioscientific Publisher, Karnataka, 2017.
2. D.S. Yashona, S.B. Aher, "Soil Science and Agricultural Chemistry" NIPA, New Delhi, 2021.
3. J. J. F. Weir,"Elements of Agricultural Chemistry",AgriHorti Press, New Delhi, 2022.

REFERENCES

1. A. Rakshit, PriyankarRaha,Nirmal De, Manures Fertilizers and Pesticides. CBS Publishing,Chennai, 2015.
2. Rai G.D, "Non-conventional Energy Sources", Khanna Publishers, New Delhi,2000.
3. GopalRanjan and A.S.R Rao, "Basic and Applied Soil Mechanics", New Age International (P) Limited, New Delhi, 2000.
4. L. G. Hargis, "Analytical Chemistry: Principles and Techniques," Prentice Hall International Editions, Upper Saddle River, 1988.

Course Outcomes	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	2	2	2	1	1	1	2	-	-	-	-	2	-	2	1	-
CO2	2	1	2	1	1	2	2	-	-	-	-	2	-	2	1	-
CO3	2	2	2	2	1	1	2	-	-	-	-	1	-	-	1	-
CO4	3	2	2	1	1	2	2	-	-	-	-	1	-	-	1	-
CO5	3	2	3	3	3	-	-	-	-	-	-	0	-	-	1	-
AVG	2.4	1.8	2.2	1.6	1.4	1.2	1.6	-	-	-	-	1.2	-	0.8	1	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

GE3231   PROBLEM SOLVING AND PYTHON PROGRAMMING   L T P C

(Common to All branches)   **3 0 0 3**

OBJECTIVES:

- To know the basics of Python programming
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures and its implementation – lists, tuples,dictionaries.
- To understand Object Oriented Concept in Python.

UNIT –I : PYTHON BASICS   9

Introduction to Python – Literals – Variables and Identiiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions – Modes of python. Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration, Illustrative programs: Basic Arithmetic Operations, GCD of numbers, Square root (Newton's Method).

UNIT- II :FUNCTIONS, LIST, TUPLES   9

Functions, function definition and use. **Fruitful functions:** return values, parameters, local and global scope, recursion. **Lists:** list operations, list slices, list methods, list loop, mutability, list parameters; **Tuples:** tuple assignment, tuple as return value. Comparison of Lists and tuples. Illustrative programs: exchange the values of two variables, square root, Linear and Binary search. Fibonacci series using functions.

UNIT –III :STRINGS, DICTIONARY, SET   9

Strings: string slices, immutability, string functions and methods, string module. **Dictionaries:** Operations (create, access, add, remove) and methods. (Insert, delete).Set operation (Access, Add, Remove). Illustrative programs: creates a dictionary of radius of a circle and its circumference.

UNIT-IV :FILES, EXCEPTIONS, MODULES AND PACKAGES9

Files and exception: Text Files, Reading and Writing files, Format operator; Errors and

Exceptions, Handling Exceptions, Multiple Except blocks, Modules, Packages; Illustrative programs: word count, copy file, Creating user defined Exceptions.

UNIT- V :CLASSES AND OBJECTS9

Classes and Objects: Introduction, Classes and Objects, Defining Classes, Creating Objects, Data Abstraction and Hiding, The Class Method and Self Argument, The __ init__( ) method, Class Variables and Object Variables, Public and Private data members, Private Methods. Illustrative Programs: Creating Student Class and Objects.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Develop simple computationalproblems using control flow statements.

- Decompose a Python program intofunctions, Modules and Packages.

- Represent compound data using Python lists, tuples, Strings, Set anddictionaries.

- Read and write data from/to files and Exception handling in PythonPrograms.

- Understand the concepts of Object Oriented Programming.

- To develop real time applications.

TEXT BOOKS:

1. ReemaThareja,**"PythonProgrammingusingProblemsolvingApproach",** Oxford Higher Education,2018.

2. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist"**, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

3. Guido van Rossum and Fred L. Drake Jr, **"**An Introduction to Python**"** – Revised and updated for Python 3.2, Network Theory Ltd.,2011.

REFERENCES:

1. Charles Dierbach, **"**Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition,2013.

2. John V Guttag, **"**Introduction to Computation and Programming Using Python**"**, Revised and expanded Edition, MIT Press ,2013

3. Kenneth A. Lambert, **"**Fundamentals of Python: First Programs**"**, CENGAGE Learning,2012.

4. Paul Gries, Jennifer Campbell and Jason Montojo, **"**Practical Programming: An Introduction to Computer Science using Python 3**"**, Second edition, Pragmatic Programmers,LLC,2013.

5. Robert Sedgewick, Kevin Wayne, Robert Dondero, **"**Introduction to Programming in Python: An Inter-disciplinary Approach**"**, Pearson India Education Services Pvt. Ltd.,2016.

WEB REFERENCES:

1. http://greenteapress.com/wp/think-python/

2. www.docs.python.org

3. https://nptel.ac.in/courses/106/106/106106182/

GE3231	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	3	2	-	-	-	-	-	2	2	2	-	-	1
CO2	3	3	3	3	2	-	-	-	-	-	2	2	-	-	3	-
CO3	3	3	3	3	2	-	-	-	-	-	2	-	-	-	1	-
CO4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	2	-
CO5	1	2	-	-	1	-	-	-	-	-	1	-	-	-	-	1
Average	2.2	2.4	3.0	2.7	1.8	-	-	-	-	-	1.5	2.0	2.0	-	2.0	1.0

GE3211   தமிழரும் தொழில்நுட்பமும்   **L T P C**
                                                                1 0 0 1

அலகு I   <u>நெசவு மற்றும் பானைத் தொழில்நுட்பம் :</u>   **3**

சங்ககாலத்தில் நெசவுத்தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II   **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**   **3**

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு. சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிறவழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோ செனிக் கட்டிடக்கலை.

அலகு III   **உற்பத்தித் தொழில்நுட்பம் :**   **3**

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாகச் செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV   **வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்**   **3**

அணை, ஏரி, குளங்கள், மதகு – சோழர் காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V   **அறிவியல் தமிழ் மற்றும் கணித்தமிழ் :**   **3**

அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ்நூல்களை மின்பதிப்பு செய்தல் – தமிழ்மென்பொருட்கள் உருவாக்கம் – தமிழ்

இணையக் கல்விக்கழகம் – தமிழ் மின்நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT – CUM – REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம்.(விகடன்பிரசுரம்).

3. கீழடி / வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by : International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by : International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)

9. Keeladi – 'Sangam City Civilization on the banks of river Vaigal' (Jointly Published by :Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by : The Author)

11. Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by : RMRL) – Reference Book.

GE3211   **TAMILS AND TECHNOLOGY**   **L T P C**

                                                                                                1 0 0 1

UNIT- I :WEAVING AND CERAMIC TECHNOLOGY   3

Weaving Industry during sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II:DESIGN AND CONSTRUCTION TECHNOLOGY   3

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of NayakaPriod – Type study (Madurai Meenakshi Temple) – ThirumalaiNayakarMahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

UNIT III:MANUFACTURING TECHNOLOGY   3

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel – Copper and gold – Coins as source of history – Minting of Coins – Beads making – Industries Stone beads – Glass beads – Terracotta beads – Shell beads / bone beats – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY   3

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of CholaPerio, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V:SCIENTIFIC TAMIL & TAMIL COMPUTING   3

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

                                                                         TOTAL : 15 PERIODS

TEXT – CUM – REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் – முனைவர்இல. சுந்தரம்.(விகடன்பிரசுரம்).

3. கீழடி / வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by : International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by : International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)

9. Keeladi – 'Sangam City Civilization on the banks of river Vaigal' (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by : The Author)

11. Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by : RMRL) – Reference Book.

GE3237　　　**ENGINEERING GRAPHICS AND DESIGN**　　　**L T P C**

(Common to all branches of B.E. / B.Tech. Programmes)　　　**1 0 4 3**

OBJECTIVES:

The main learning objective of this course is to impart knowledge

- To draw the conics curves and special curves.
- To draw the orthographic projection of lines and plane surfaces.
- To draw the projections and solids and Isometric projection of simple solids.
- To draw the projections and solids and Isometric projection of simple solids.
- To draw free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)　　　1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT-I: PLANE CURVES AND SPECIAL CURVES　　　11

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid (Rolling Circle rolls on flat surface only). Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT-II: PROJECTION OF POINTS, LINES AND PLANE SURFACES　　　12

Orthographic projection- Principles-Principal planes - First angle projection-projection of points at the First Quadrant only. 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. Projection of planes (polygonal and circular surfaces) which inclined to both the principal planes by rotating object method.

UNIT-III: PROJECTION OF SOLIDS AND ISOMETRIC PROJECTION　　　12

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one of the principal planes by the rotating object method. Principles of isometric projection – isometric scale – Isometric projections of simple solids - Prisms, pyramids, cylinders, cones -

isometric view of the object from the 2D coded plan.

UNIT-IV: PROJECTION OF SECTIONED SOLIDS & DEVELOPMENT OF SURFACES

12

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

UNIT-V: FREE-HAND SKETCHING AND PERSPECTIVE PROJECTIONS   **12**Free Hand

sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects. Perspective projection of simple solids-Prisms and pyramids by visual ray method.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

1. To construct the conics curves and special curves.
2. To construct the orthographic projection of lines and plane surfaces.
3. To construct the projections and solids and Isometric projection of simple solids.
4. To construct projections of section of solids and development of surfaces.
5. To construct free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids.

TEXTBOOKS:

1. N.D.Bhatt, "Engineering Drawing (Plane and Solid Geometry)", Charotar Publishing House PVT. LTD. 53rd Edition 2019 (Fifth Reprint).
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition 2018.

REFERENCES :

1. T. Jeyapoovan, "Engineering Graphics Using Auto CAD", Vikas Publishing House Pvt. LTD, seventh Edition, 2015.

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. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2011.

4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2011.

5. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

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 scales to fit solutions within A3 size.

4. The examination will be conducted in appropriate sessions on the same day

GE3237	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
CO2	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
CO3	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
CO4	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
CO5	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
Average	3.0	2.4	2.6	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-

GE3232   **PROBLEM SOLVING AND PYTHON**   **L T P C**
                    PROGRAMMING LABORATORY   **0 0 4 2**

COURSE OBJECTIVES:

- To write, test, and debug simple Python programs.

- To implement Python programs with conditionals and loops.

- Use functions for structuring Python programs.

- Represent compound data using Python lists, tuples, and dictionaries.

- Read and write data from/to files in Python.

- Knowing about Object Oriented Concepts.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.

2. Find the square root of a number. (Newton's method)

3. Find exponentiation of a number. (power of a number)

4. Find the maximum of a list of numbers.

5. Program for basic calculator operations using functions.

6. Generate Fibonacci series using function.

7. Program for Armstrong number.

8. Program for check the number is Palindrome or Not.

9. Program for sum of array of numbers.

10. How to create, slice, change, add, delete and index elements using list.

11. Linear search and Binary search.

12. Find First n prime numbers.

13. Program to remove duplicate elements from a list.

14. Program for addition and transpose of a matrix.

15. How to create, slice, change, delete and index elements using Tuple.

16. Write a program to reverse the string.

17. How to change, delete, add and remove elements in Dictionary.

18. Create a dictionary of radius of circle and its circumference.

19. Program for count the number of words in a file.

20. Find the most frequent words in a text read from a file.

21. Program for student information system using class and objects.

22. Program for Employee Payroll Processing using class and objects.

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

GE3232	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	3	3	-	-	-	-	-	3	2	1	3	-	-
CO2	3	3	3	3	3	-	-	-	-	-	3	2	-	-	2	-
CO3	3	3	3	3	2	-	-	-	-	-	2	-	-	3		2
CO4	3	2	-	2	2	-	-	-	-	-	1	-	-	-	1	-
CO5	1	2	-	-	1	-	-	-	-	-	1	-	1	-	2	2
CO6	2	-	-	-	2	-	-	-	-	-	1	-	1	-	1	-
Average	2.0	1.4	1.0	1.0	1.2	2.0	1.5	2.0					2.0			

GE3221   **ENGINEERING SCIENCES LABORATORY**   **L T P C**

                                                                   0 0 4 2

PHYSICS LABORATORY

OBJECTIVES:

- To gain practical knowledge and to co-relate with the theoretical studies.
- To achieve perfectness in experimental skills and the study of practical applications.
- To bring more confidence and ability to develop and fabricate engineering and technical equipment.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Determination of the electrical conductivity of metals by plotting a current-voltage characteristic curve.

2. Determination of band gap of a semiconductor.

3. Determination of Fermi energy. (Measurement of Fermi energy in copper).

4. Study of I-V characteristics of solar cell and determination of its efficiency

5. Determination of electrical resistivity of metal and alloy –Carey foster Bridge.

6. Measurement of susceptibility of paramagnetic solution by Quinke's method.

7. Study of magnetic Hysteresis-B-H curve.

8. Determination of the dark resistance of light detective resister (LDR).

9. Measurement of Temperature using LM35.

                                                    TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course, the students should be able

1. To understand the functioning of various physics laboratory equipment.

2. To use graphical models to analyze the laboratory data and to solve problems individually and collaboratively.

3. Use mathematical models as a medium for quantitative reasoning and describing physical reality.

4. Access, process and analyze scientific information.

5. Solve problems individually and collaboratively.

TEXTBOOKS:

1. Wilson J.D. and Hernandez C.A., ―Physics Laboratory Experiments‖, Houghton Mifflin Company, New York, 2005.
2. S. Srinivasan, A Text Book of Practical physics, S. Sultan Chand publications. 2005
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

GE3221	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-		-	-	-		-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY:

OBJECTIVES

- To train the students in basic experimental skills in water contaminants such as copper and chromium.
- To familiarise the students with electro analytical techniques such as pH metry, potentiometry, and conductometry to determine impurities in aqueous solutions.
- To familiarize the students with the determination of the molecular weight of a polymer by a viscometer.
- To make the student up-to-date with the properties and nature of alloys experimentally.
- To demonstrate the analysis of coal.

LIST OF EXPERIMENTS: (Any five experiments to be conducted)

1. Estimation of copper content of the given solution by Iodometry.
2. Determination of strength and amount of acids in a mixture of acids using a conductivity meter.

3. Determination of strength and amount of HCl present in the whole of the given solution using a conductivity meter.
4. Estimation of the iron content of the given solution using a potentiometer.
5. Determination of chromium by EDTA titration.
6. Determination of strength of given hydrochloric acid using a pH meter.
7. Determine the molecular weight of the polyvinyl alcohol using an Ostwald viscometer.
8. Estimation of Nickel in steel.
9. Proximate Analysis of Coal.
10. Corrosion experiment-weight loss method.
11. Determination of COD value of industrial effluents.

TOTAL: 30 PERIODS

OUTCOMES

At the end of the course, the student should be able:
1. To find the quality of water samples for copper and chromium present in water.
2. To recognize the amount of various ions present in the water sample through volumetric and instrumentation techniques.
3. To identify the molecular weight of the polymer using an Ostwald viscometer.
4. To recognize an environmental hazardous and threshold limit for industrial effluents.
5. To recommend quality of coal and steel when it is exposed to various environment.

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014).
2. Suchi Tiwari, Engineering Chemistry Lab Manual, Scitech Publications (India) Pvt. Ltd. (2nd Edition, 2013).
3. Pushpendra Kumar, Laboratory Manual for Engineering Chemistry, Reyansh Author topic Pvt. Ltd., (1st Edition, 2022).

GE3228	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-
CO2	2	2	1	1	1	-	-	-	-	-	-	-	-	2	-	-
CO3	2	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	1	1	2	2	2	-	-	-	-	-	-	-	-
CO5	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	2.0	-	3.0	-	1.0	-	-	-	1.0	3.0	-	2.0	2.0	1.0	1.0	1.0

GE3251   **NSS/YRC/NSO & CLUB ACTIVITIES**   **L T P C**

0 0 1 1#

Unit – 1 : NATIONAL SERVICE SCHEME (NSS)

Objectives:

The main objectives of this course are:

- To help learners know about NSS in the context of youth, community and voluntary service.

- To teach the importance of health, hygiene and sanitation for a healthy Nation.

- To understand the community in which they work.

- To identify the problems of the community and involve them in problem-solving.

- To develop the capacity to meet emergencies and natural disasters.

- To practice the National integration and social harmony.

- To utilize their knowledge in finding practical solutions to individual and community

Credit:

Total Lecture Hours / Semester	Total Tutorial Hours / Semester	Total Practical Hours / Semester	Credit
6	0	18	1*

* To be conducted after college hours and week ends

Outcome:

Learners will have the knowledge about NSS and its role in the fields of health, hygiene, emergencies & natural disasters and involve them in problem-solvingof the nearest community so as to build a strong country.

Syllabus:

Semester : I&II   Attendance weightage : 50   Activities weightage : 50

Topic -I :Introduction and Basic Concepts of NSS [8]

a. History – Aim – Objectives of NSS

b. Emblem – Motto – Badge - Song

c. Organizational structure - Roles and Responsibilities of NSS

d. Regular activities

e. Any approved indoor / outdoor programs by the Principal

Topic-II : Youth Leadership, Social Harmony and National Integration[8]

a. Meaning and types of Leadership

b. Qualities of good leaders and leadership

c. Importance and role of youth leadership

d. Role of youth in peace and Nation building

e. Any approved indoor / outdoor programs by the Principal

Topic-III :Health, Hygiene and Sanitation and Youth Health [8]

a. Definition, Needs and Scope of Health Education

b. Swachh Bharat Abhiyan

c. Healthy Lifestyles

d. HIV, AIDS, Drugs abuse

e. Any approved indoor / outdoor programs by the Principal

Topic-IV :Environment Issues, Emergencies and Disaster Management [8]

a. Environment conservation, enrichment and sustainability

b. Waste management

c. Natural resource management [Rain water harvesting and Energy conservation]

d. Introduction to Disaster Management, Classification of Disasters

e. Any approved indoor / outdoor programs by the Principal

References:

1. National Service Scheme Manual (Revised) 2006, Government of India, Ministry ofYouth Affairs and Sports, New Delhi.

2. National Youth Policy, Government of India, Ministry of Youth Affairs and Sports, New Delhi.

3. https://nss.gov.in/

NSS/NSO/YRC & CLUB ACTIVITIES

YOUTH RED CROSS – Social Service based activities

OBJECTIVES:

- To enhance the societal awareness
- To upgrade the Personality

ACTIVITIES   **5**

1. **HEALTH PROMOTION**- Activities that promotes health **(2)**

2. **SOCIETAL SERVICE**-Social Service activities**(2)**

3. **FRIENDSHIP BUILDING** - Friendship building activities between communities **(1)**

COURSE OUTCOME

1. Enhanced Social Awareness

2. Personality development of the individual

REFERENCES:

1. IRCS/YRC Handbook
2. https://www.indianredcross.org/youth/Guidelines-for-JYRC-LR.pdf

NSS/NCC/NSO/YRC & CLUB ACTIVITIES

National Sports Organization (NSO)

OBJECTIVES:

- To create awareness about basic fitness and mental strength
- To promote the development of physical fitness
- To develop the sporting activities of the youth
- To create the social responsibilities and social interaction through participation

ACTIVITIES   **5**

INTRODUCTION - Introduction of NSO & Physical Fitness and games Skills Test**(1)**

PHYSICAL FITNESS ACTIVITIES - Importance of Basic Physical Fitness - BMI Calculation - Identification of deformities, **(2)**

SPORTS PRACTICE - Games and fitness activities Physical Fitness Activities **(2)**

COURSE OUTCOMES:

- Get basic knowledge about physical and mental fitness
- NSO create self-esteem and self confidence
- NSO provide opportunity get social interaction
- Development of character and personality through participation

REFERENCES:

1. www.google.com
2. https://scholar.google.com/
3. https://www.medindia.net/patients/lifestyleandwellness/five-essential-components-of-physical-fitness-references.htm
4. https://pubmed.ncbi.nlm.nih.gov/

தமிழ் மன்றம்

பாடத்திட்டத்தின் நோக்கங்கள்

- மாணவர்களை சிறந்த மேடைப் பேச்சாளர்களாக உருவாக்குவது
- தாய்மொழியின் மேன்மையை பாதுகாப்பது..

பயிற்சித் திட்டம்

1. பேச்சுக்கலைப் பயிற்சி
2. கவிதை மற்றும் கட்டுரைகள் எழுதும் பயிற்சி
3. அறிவியல் பொறியியல் தொழில் நுட்பங்களைத் தமிழில் எழுதுதல்.
4. பட்டிமன்ற மேடைகளில் பேசும் பயிற்சி.
5. நாட்டுப்புறப்பாடல்கள்பாடுதல் மற்றும் கதைகள் எழுதும் பயிற்சி.

கற்றல் முடிவு

1. பேச்சுக் கலைப்தேர்ச்சி
2. நாட்டுப்புறப்பாடல்கள்பற்றிய புரிதல்

மேற்கோள்கள்

1. https://eegarai.darkbb.com/t63483-topic
2. https://poriyari.in/

RESONANCE – SKILL BASED ACTIVITIES

OBJECTIVES:

- To know the basics and general principles of Physics.
- To provide knowledge of the current trends in Physics.

- To develop a solid scientific and technical competence for investigating and applying the relationships of Physics *phenomena in* various fields of Physics.

ACTIVITIES   **5**

1. **QUIZ** - Basics and general principle   **(1)**

2. **PAPER PRESENTATION** - Current trends   **(2)**

3. **PROJECTS -** Fun with Physics   **(2)**

COURSE OUTCOME

Students were able to:

- Recollect the general principles of Physics.
- To explore the topics in the current trends in Physics.
- *Develop practical expertise in various areas of Physics.*

REFERENCES:

1. Principles of Physics, 10Ed, Isvby Robert ResnickJearl Walker, David Halliday (2015)
2. 'The Feynman Lectures on Physics' (Volume I, II and III) ,Matthew Sands, Richard Feynman, and Robert B. Leighton.
3. https://www.science-sparks.com/top-5-physics-experiments-you-can-try-at-home
4. https://www.electronicsforu.com/category/electronics-projects/hardware-diy.

NSS/NCC/NSO/YRC & CLUB ACTIVITIES

Eclectic Lingua – Skill based activities

OBJECTIVES:

- To enhance the communicative competence of the first-year engineering students by means of creating opportunity for impromptu/ /spontaneous speeches.
- To upgrade the English language skills of students by introducing appropriate vocabulary in different situations.

ACTIVITIES **5**

1. **Extempore**- Giving expression to thoughts **(2)**

2. **Building Vocabulary**-Using relevant set of words for different contexts**(2)**

3. **Pronunciation**- Speaking accurately and fluently **(1)**

COURSE OUTCOME

1. To enable students to express themselves easily and coherently.

2. To help students to speak the language using the right words and pronouncing them correctly.

References

https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=pronunciation

https://www.quillsandquotes.ca/post/12-fun-games-to-get-students-public-speaking

NSS/NCC/NSO/YRC & CLUB ACTIVITIES

EULER.COM – Skill based activities

OBJECTIVES:

- To enhance the Logical reasoning of the first-year engineering students by means of creating opportunity to improve the aptitude skill.
- To explore the applications of Mathematics in the field of Engineering, Science and Technology and to utilize this skill for their academic activities.

ACTIVITIES   **5**

1.OLYMPIAD- The students will be provided with 25 questions in Engineering Mathematics. This should be completed in one hour.**(1)**

2.MATHEMATICAL MODELLING- The students are expected to present physical models (Working as well as static models) based on the application of Engineering Mathematics**(2)**

3.PAPER PRESENTATION- Students will be provided 5-7 minutes of time to present their findings in application of Mathematics.**(2)**

COURSE OUTCOME

1. To enable students to explore their mathematical reasoning skills.

2. To motivate the students to apply Mathematics in Engineering and Technology and demonstrate their work by means of Physical model and present their research article.

References:

1. Advanced Engineering Mathematics , Erwin Kreyszig, 10th Edition, Wiely India Pvt Ltd.
2. https://www.stewartcalculus.com/

NSS/NCC/NSO/YRC & CLUB ACTIVITIES

Fine Arts Club VECTORIANS – Skill based activities

OBJECTIVES:

- To enhance the inbuilt talents in arts and crafts and fine arts activities.
- To explore and exhibit theirs qualities in cultural activities as well as in the leadership.

ACTIVITIES   **5**

1. **ARTS & CRAFTS** - The students will be given with innovative Theme, they have to Show their talents in one hour time with basic facilities provided. **(1)**
2. **SINGING & DANCING** - The students are expected to present their talents on spot or With given Theme, either solo or group performance. **(2)**

3.MIME &DRAMA - Students will be given 5 - 7 minutes of time to present their variety Entertainments in way of Mono acting or Drama .**(2)**

COURSE OUTCOME

1. To enable students to explore their inbuilt talents in fine arts activities.

2. To motivate the students to show case their cultural and leadership qualities.

REFERENCES:

1. https://www.youtube.com/watch?v=1mkESRWiSKc – Teach your own crafts.
2. https://www.youtube.com/watch?v=YHqwrDGywH4 – How to teach Arts & Crafts

NSS/NCC/NSO/YRC & CLUB ACTIVITIES

Catalysis – Skill-based activities

Objectives:

- To inculcate a scientific attitude and temper.
- To provide an opportunity to develop constructive, explorative & inventive ideas among the students.
- To develop training in the scientific method of problem-solving for engineering

1. **Quiz/debate**- the latest advancement in Chemistry towards engineering **(2)**

2. **Essay competition/Chart preparation** - Environmental sustainability **(2)**

3. **Nature Study - field visit to eco-parks etc.** **(1)**

COURSE OUTCOME

1. To promote inquisitiveness among the students and inculcate Scientific mind mapping.

2. To develop students, interest and participation in the practical applications of the knowledge related to environmental sciences.

3. Take part in practical, hands-on science activities close to nature.

REFERENCE

1. M. Senapati, Advanced Engineering Chemistry, Infinity science press, New Delhi, 2007.
2. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/environmental-sustainability
3. https://www.indiabix.com/general-knowledge/chemistry.

MA3321   TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

L T P C
3 0 0 3

OBJECTIVES:
- To introduce the effective mathematical tools for the solutions of partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To model several physical problems to develop Z transform techniques for discrete time systems.

UNIT-I:PARTIAL DIFFERENTIAL EQUATIONS   9
Solutions Lagrange's linear equation — linear partial differential equations of second and higher order with constant coefficients of homogeneous type.

UNIT-II:FOURIER SERIES   9
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Harmonic analysis.

UNIT-III: LAPLACE TRANSFORMS   9
Existence conditions – Transforms of elementary functions – Basic properties – Inverse transforms – Convolution theorem – Transform of periodic functions.

UNIT-IV:FOURIER TRANSFORMS   9
Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT-V:Z – TRANSFORMS AND DIFFERENCE EQUATIONS   9
Z- Transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Solution of difference equations using Z – transform.

TOTAL: 45 PERIODS

OUTCOMES:
- Understand the fundamental concept of the concepts of Partial differential Equations.

- Understand the basic concepts of mathematical principles on Fourier & Z- transforms.
- Laplace transform and inverse transform of simple functions, properties, are studied.
- Apply the concept of Understand the concept Fourier series and apply the concept in solving PDE.
- Understand the fundamental concept of the concepts of Solution of difference equations.

TEXT BOOKS:
1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.

REFERENCE BOOKS:
1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
3. P.Sivaramakrishna Das, C.Vijayakumari, Transforms and Partial Differential Equations, Pearson India Education Services Pvt. Ltd, 2019.

MA3321	PROGRAM OUTCOMES												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO2	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO3	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO4	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
CO5	3	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-
Average	3.0	3.0	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-

AG3361   **FLUID MECHANICSAND OPEN CHANNEL**

L TP C

30 03

OBJECTIVES:
- Tointroducethestudentstothemechanicsoffluidsthroughathoroughunderstanding of the properties of the fluids, behaviour of fluids under staticconditions.
- Thestudentsareexposedtothedynamicsoffluids,introducedthroughthecontrolvolume approach which gives an integrated understanding of the transport ofmass,momentumandenergy.
- Toexposetotheapplicationsoftheconservationlawstoa)flowmeasurements

b)flowthroughpipesandc)forces onvanes.

- To introduce the students to various hydraulic engineering problems like openchannelflows.
- Atthecompletionofthecourse,thestudentshouldbeabletorelatethetheoryandpracticeof problemsinhydraulicengineering.

UNIT-I:PROPERTIES OF FLUID   9
Propertiesoffluids–definition–unitsofmeasurement– Pressure Measurement –Fluid Statics.Hydrostaticforcesonsurfaces.Archimedesprinciples–buoyancy-metacentre– metacentricheight.

UNIT-II:FLUID FLOW ANALYSIS   9
Types of fluid flow–Fluid Kinematics - Flow pattern – stream line – equipotential line – stream tube pathline — streak line — flow net — velocity potential — stream function. Principles of conservation of mass – energy – momentum – continuity equation in Cartesian co-ordinates-Euler'sequationofmotion.

UNIT-III:FLOWMEASUREMENT   9
Bernoulli's equation its applications – Orifice – sharp edged orifice discharging free - submerged orifice – mouth piece - Flow through orifice under variable head – time ofemptying a tank with and without inflow. Flow through pipes ——Chezy's formula – Manning's formula – Hazen- William‟ s formula - Major and minorlossesinpipes– Pipe network.

UNIT-IV:OPENCHANNELFLOW   9
Types of flow in channel — most economical section of channel. Specificenergyandcriticaldepth-momentuminopenchannelflow – specific force – critical flow – computation. Flow measurement in channels – float method - Flow measurement inrivers– current meter – Parshallflume.

UNIT-V:DIMENSIONALANALYSIS   9
Dimensionalanalysis–Fundamentaldimensions–dimensionalhomogeneity–
Rayleigh'smethod and BuckinghamPi-Theorem- conceptofgeometric,kinematic and dynamic similarity. Important non dimensional numbers – Reynolds, Froude, Euler, Machand Weber.

TOTAL:45PERIODS

OUTCOMES:

- The studentswill beable to geta basic knowledgeoffluids instatic,kinematicanddynamicequilibrium.

- Tounderstandthetypesofflowanditspattern.

- Apply the various methods offieldmeasurements and empiricalformulaeforpipeflow.

- Compute,analyse,andmanagetheopenchannelflow.

- They will also gain the knowledge of the applicability of physical laws inaddressingproblemsin hydraulics.

TEXTBOOKS:

1. Modi, P.N. and SethS.M., "Hydraulics andFluidMechanics",StandardPublishersDistributors,NewDelhi,2010.
2. Bansal, R.K., "A text book of Fluid Mechanics and Hydraulic Machinery", LaxmiPublications(P)Ltd.,NewDelhi,2002.
3. JagdishLal,"HydraulicMachines",Metropolitan BookHouse,New Delhi,2000.

REFERENCEBOOKS:

1. Garde, R.J., "Fluid Mechanics through problems", New Age InternationalPublishers(P)Ltd.,NewDelhi,2002.
2. MichaelA.M.and S.D.Khepar,"WaterWelland Pump Engineering",TataMcGrawHillCo.NewDelhi,2005.
3. Michael A.M., "Irrigation Theory and Practice", Vikas Publishing House, NewDelhi,2008.

WEBSITES:

1. www.onesmartclick.com/engineering/fluid-mechanics.html

2. www.it.iitb.ac.in/vweb/engr/civil/fluid_mech/course.html

AG3361	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	-	-	1	-	1	-	-	-	-	-	3	3	1	3	3
CO2	2	3	2	-	-	-	2	2	-	-	-	2	3	2	3	2
CO3	2	2	3	2	-	-	1	2	-	-	1	2	3	1	2	2
CO4	1	3	-	-	-	1	-	-	-	-	2	3	2	1	2	3
CO5	2	2	2	2	-	-	2	-	-	-	2	3	2	3	2	3
Average	1.8	2.5	2.3	1.7	-	1.0	1.7	2.0	-	-	1.7	2.6	2.6	1.6	2.4	2.6

AG3362   HYDROLOGY AND WATER RESOURCES ENGINEERING   L T P C
3 0 0 3

COURSE OBJECTIVES:
To impart knowledge on the following topics
- To introduce the student to the concept of hydrological aspects of water availability and requirements.
- Students should be able to quantify, control and regulate the water resources.
- To have an insight on runoff, flow measurements and hydrographs, flood, drought.
- To have exposure on flood and drought analysis
- To have a deep learning on principles and design of reservoirs, ground water and its management.

UNIT-I:PRECIPITATION, EVAPORATION AND ABSTRACTIONS   9
Hydrological cycle- Meteorological measurements – Types and forms of precipitation - Spatial analysis of rainfall data using Thiessen polygon and Iso-hyetal methods-Interception – Evaporation: Measurement, Evaporation suppression – Infiltration: Horton' equation-Double ring infiltrometer, infiltration indices.

UNIT-II:RUNOFF   9
Catchment: Definition, Morphological characteristics - Factors affecting runoff - Run off estimation using Strange's table and empirical methods–Soil Conservation Service –Curve Number method– Stage discharge relationship- Flow measurements- Hydrograph – Unit Hydrograph – Instantaneous Unit Hydrograph.

UNIT-III: HYDROLOGICAL EXTREMES   9
Natural Disasters-Frequency analysis-Flood estimation- Flood management- Definitions of drought: Meteorological, hydrological, agricultural and Integrated- India Meteorological Department method-Normalized Difference Vegetation Index analysis- Drought Prone Area Programme.

UNIT-IV: RESERVOIRS   9
Water Resources - River basins - Development and Utilization in India and Tamil Nadu Irrigation - Classification of reservoirs, General principles of design, site selection-Spillways- Elevation – Area capacity curve - Storage estimation-Sedimentation –life of reservoirs.

UNIT-V: GROUNDWATER AND MANAGEMENT   9
Origin- Classification and types - Properties of aquifers- Governing equations – Steady and unsteady flow - Artificial recharge - RWH in rural and urban areas.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- An understanding of the key drivers on water resources, hydrological processes and their integrated behavior in catchments.
- Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and Hydrograph.
- Explain the concept of hydrological extremes such as Flood and Drought and management strategies.
- Ability to conduct spatial analysis of rainfall data and design water storage reservoirs.
- Understand the concept and methods of ground water management.

TEXT BOOKS:

1. Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008.

3. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.

REFERENCE BOOKS:

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc.2007
2. VenTe Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
3. Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 1998

AG3363	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2	2	1	1	-	-	-	-	-	-		2			
CO2	3	2	2	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	3	3	-	1	2	-	-	-	2	-	-	2	
CO4	2	2	3	1	2	1	-	-	-	-	2	-	-	2	-	-
CO5	2	2	2	1	2	1	1	-	1	-	-	-	-	-	-	-
Average	2.2	2	2.2	1.4	2	1	1	2	1	-	2	2	2	2	2	-

AG3363   **SOIL SCIENCE AND ENGINEERING**   **L T P C**
                                                                   3 0 0 3

OBJECTIVES

- To expose students to the fundamental knowledge on Soil physical properties, soil water movement, permeability, infiltration, drainage.

- To introduce students about the types and methods of soil survey, classification of soils in India and Tamil Nadu.

- To introduce students about soil phase relations, atterberg limits and indices.

- To expose students to the engineering properties of soil viz., shear strength, cohesion etc.

- To gain knowledge on Compaction, Bearing Capacity and slope stability.

UNIT-I: INTRODUCTION AND SOIL PHYSICS   **9**
Soil - definition - major components – Soil forming minerals and processes - soil profile Physical properties, capillary and non - capillary – plasticity - Soil air - soil temperature - soil water - Infiltration, hydraulic conductivity, percolation, permeability and drainage. Soil colloids – organic and inorganic matter - Ion exchange- pH –Soil reaction, Buffering capacity and EC-plant nutrient availability.

UNIT-II: SOIL CLASSIFICATION AND SURVEY   **9**
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- Engineering Classification of soil – Soil compaction- factors affecting compaction- the Standard Proctor compaction test - field and laboratory methods.

UNIT-IV: ENGINEERING PROPERTIES OF SOIL   **9**
Shear strength of cohesive and cohesionless - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test - Permeability- Coefficient of Permeability-Darcy's law-field and lab methods - Assessment of seepage – Compressibility – Liquefaction.

UNIT-V: BEARING CAPACITY AND SLOPE STABILITY   **9**
Bearing capacity of soils - Factors affecting Bearing Capacity- method of improving the bearing capacity of soils.- Shallow foundations- Terzaghis 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

- To understand the basic soil properties and to describe the various minerals and organic components of soils which affects the various soil physical properties. It is a basic understanding of soil reaction, especially how they relate to nutrient availability.
- An introductory understanding of soil classifications along with land use and problematic soil, including the advantages and limitations of the various soil orders.
- Apply principles of phase diagram for soil properties, their classification and also understand the basic science of soil compaction.
- Learn the concept of engineering properties through standard tests and understand principles of slow and soil permeability through porous medium.
- Understanding the basic concepts of ultimate bearing capacity of shallow foundations including bearing capacity equations and slope stability problems.

TEXT BOOKS:

1. Biswas T.D. and Mukherjee S.K., Second edition. Text Book of Soil Science–Tata McGraw Hill Education, 2017. ISBN-13 : 978-0074620434.

2. Punmia, B.C., "Soil Mechanics and Foundation", Laxmi Publishers, New Delhi, 16th edition. 2017. ISBN-13 : 978-8170087915.

3. Nyle C. Brady., "The Nature and Properties of Soil", Macmillan Publishing Company, 10th Edition, New York, 2008.

4. Modi, P.N.2010."Soil Mechanics and Foundation Engineering", Rajsons publication, Standard book house, New Delhi.

REFERENCE BOOKS:

1. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7Th Reprint edition. 2019.

2. Murthy, V.N.S., "Textbook Of Soil Mechanics And Foundation Engineering" CBS Publishers and Distributors New Delhi, Geotechnical Engineering Series   (Pb 2018) Paperback – 1 January 2018.

3. Sehgal, S.B., "Text Book of Soil Mechanics", Third edition. CBS Publishers and Distributors New Delhi, 2012. ISBN: 978-8123901237

4. Edward J. Plaster., "Soil Science and Management" 6th Edition, Cengage Learning India Ltd, New Delhi, 2013.

E-REFERENCES:

1. http://www.soils.wisc.edu/courses/SS325/morphology.htm

2. www.asssi.asn.au/.../Understanding_Soils_and_Their_Interactions_with_Land Management_2005.pdf

AG336	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	1	-	-	3	2	-	-	-	-	-	3	-	3	3
CO2	3	1	2	-	-	-	-	-	2	1	-	3	3	3	-	-
CO3	2	2	-	-	1	2	1	-	-	-	-	3	2	-	-	-
CO4	3	2	2	1	-	1		-	-	-	-	-	3	-	3	2
CO5	3	2	-	-	1	2	3	-	-	-	-	-	2	2	3	1
Average	2.8	1.8	1.7	1.0	1.0	2.0	2.0	-	2.0	1.0	-	3.0	2.6	2.5	3.0	2.0

AG3364   **THEORY OF MACHINES FOR AGRICULTURAL**

                              ENGINEERING

                                                                    L T P C
                                                                    3 0 0 3
OBJECTIVES:

- Applying the basic components of mechanisms.

- Designing cam mechanisms for specified output motions.

- Applying the basic concepts of toothed gearing and kinematics of gear trains.

- Understanding the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.

- To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.

UNIT-I: BASICS OF MECHANISMS   9
Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four-bar chain and slider crank chains.

UNIT-II: KINEMATICS OF CAM MECHANISMS   9
Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams .

UNIT-III: GEARS AND GEARTRAINS   9
Law of toothed gearing – Involutes and cycloidal tooth profiles –Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains-Compound gear trains- reverted gear trains-cyclometer- differential gear.

UNIT-IV: FORCE ANALYSIS   9
Dynamic force analysis – Inertia force and Inertia torque– D Alembert's principle –Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod– Bearing loads –Crank shaft torque – Turning moment diagrams –Fly Wheels.

UNIT-V: BALANCING   9
Balancing of rotating masses – Balancing of several masses rotating in same plane - Balancing of several masses rotating in different planes. Balancing of reciprocating masses

– Swaying couple - Hammer blow – Partial balancing of unbalanced primary force in a reciprocating engine

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Upon the completion ofthis coursethe students will be able to:

- Becomefamiliar with thebasic components of mechanisms and implement it.
- Create customized cammechanisms forrequiredparticularoutputmotions.
- Understand the basic concepts of toothed gearing and kinematics of gear trains and bring into practicable form of the concepts learned.
- Calculate static and dynamic forces of mechanisms.
- Work out the amount of balancing masses required and their locations of reciprocating and rotating masses.

TEXTBOOKS:
1. Dr.Khurmi R S, "Theory of Machines", 14th edition, S Chand publications, 2020.
2. Rattan, S.S, "Theory of Machines", 5th Edition, Tata McGraw-Hill, 2019.

REFERENCE BOOKS:

1. Allen S. HallJr., "Kinematics and Linkage Design", Prentice Hall, 1961
2. Cleghorn.W.L,"Mechanisms of Machines", Oxford University Press, 2014
3. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines",

    3^{rd}Edition Affiliated East-West Pvt.Ltd., New Delhi, 2006.
4. John Hannah and Stephens R.C.," Mechanics of Machines",Viva Low-Prices Student Edition, 1999.

5. ThomasBevan,"TheoryofMachines",3^{rd}Edition,CBS Publishers and Distributors, 2005.

AG3364	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	✓	✓	✓		✓			✓				✓	✓		✓	
CO2	✓	✓	✓		✓			✓				✓	✓		✓	
CO3	✓	✓	✓		✓			✓				✓	✓		✓	
CO4	✓	✓	✓				✓						✓	✓		
CO5	✓	✓	✓				✓						✓	✓		
Average																

CE3363 **SURVEYING AND LEVELLING**

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3 0 0 3

COURSE OBJECTIVES:

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

- To introduce the fundamentals of surveying, its principles, accessories for chain and ranging.
- To expose students about the concepts of compass and plane table surveying.
- To learn the various types of theodolite and modern surveying.
- To introduce the concepts of levelling.
- To impart knowledge on levelling applications.

UNIT-I: FUNDAMENTALS OF CONVENTIONAL SURVEYING **9**
Definition – Classifications – Principles – Equipment and accessories for ranging and chaining – Methods of ranging – Well conditioned triangles – Chain traversing – Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Dip – compass traversing – Plane table and its accessories – Merits and demerits.

UNIT-II: LEVELLING **9**
Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Precise leveling - Contouring.

UNIT-III: THEODOLITE SURVEYING **9**
Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric leveling – Single Plane method – Double Plane method.

UNIT- IV: CONTROL SURVEYING AND ADJUSTMENT **9**
Horizontal and vertical control – Methods – Triangulation – Traversing – Gale's table – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.

UNIT-V: MODERN SURVEYING 9

Total Station: Digital Theodolite, Electronic Distance Measurer –- Coordinate Geomentry functions – Field procedure and applications. Geographical positioning system: Advantages – System components – Signal structure – Selective availability and anti spoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors – Field procedure and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, learners will be able to:
1. Introduce the rudiments of various surveying and its principles.
2. Imparts knowledge in computation of levels of terrain and ground features.
3. Imparts concepts of Theodolite Surveying for complex surveying operations.
4. Understand the procedure for establishing horizontal and vertical control.
5. Imparts the knowledge on modern surveying instruments.

TEXT BOOKS:
3. Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
4. T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 2008.

REFERENCES:
1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. S. K. Roy, Fundamentals of Surveying, Second Edition, Prenticeˆ Hall of India2010.
3. K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.

CE3363	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	-	-	-	1	3	-	3	1	3	2	2	3	1	3	3
CO2	2	3	-	-	1	2	-	1	3	2	-	2	2	3	-	2
CO3	3	3	-	-	1	2	-	1	2	2	-	3	3	2	3	2
CO4	2	2	-	-	1	1	-	-	3	3	2	-	2	1	2	3
CO5	2	2	-	3	2	2	2	1	3	2	2	2	2	2	2	3
Average	2.4	2.5	-	3	1.2	2	2	1.5	2.4	2.4	2	2.2	2.4	1.8	2.5	2.6

AG3365 **FLUID MECHANICS LABORATORY**

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OBJECTIVES:

- To have a knowledge on flow measurements using various devices.

- To give hands on experience on the flow through different types of notches.

- To gain experimental knowledge on computation of major losses in pipes.

- To train students on determination of minor losses in pipes.

- To study the characteristics of various pumps.

LISTOFEXPERIMENTS

1. FLOWMEASUREMENT

- Calibration of Rotameter

- Flow through Venturimeter

- Flow through a circular Orifice

- Determination of mean velocity by Pitottube

- Flow through a Triangular Notch

- Flow through a Rectangular Notch

2. LOSSES IN PIPES

- Determination of friction coefficient in pipes

- Determination of losses due to bends, fittings and elbows

OUTCOMES:

- The students will be able to measure flow through pipes.

- The students will be able to measure flow in open channel.

- The students will be able to compute the major and minor losses in pipes.

- The students will be able to study the characteristics of pumps.

- The students will be able to analyse the performance of pumps.

<div align="right">

TOTAL:30PERIODS

</div>

REFERENCEBOOKS:

1. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University,2004.
2. Modi P.N. andSeth S.M.,"Hydraulics and FluidMechanics",StandardBookHouse,NewDelhi, 2000.
3. Subramanya,K.,"FlowinOpenChannels", TataMcGraw- HillPub.Co.1992.
4. Subramanya, K., "Fluid Mechanics",TataMcGraw-HillPub. Co.,New Delhi,1992.

LISTOFEQUIPMENTSREQUIRED

- Rotameter–1no.

- Venturi meter–1no.

- Orifice meter–1no.

- Pitot tube–1no.

- Bernoulli"s theorem apparatus–1no.

- Triangular notch and Rectangular notch–1each(with alinedopen channel setup)
- Coefficient of friction apparatus

- Pipe setup with bends,fittings and elbows for estimating minor losses

- Centrifugal pump,Reciprocating pump,Submersible pump,Jet pump–1 each

- Collecting tank,Stop watch–1no.foreachexperiment.

AG3365		PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	1	-	1	-	-	-	-	-	-	3	1	3	3
2	3	3	2	-	-	-	2	2	-	-	-	-	3	2	3	2
3	3	3	3	2	-	-	1	2	-	-	-	1	3	1	2	2
4	3	3	-	-	-	1	-	-	-	-	-	2	2	1	2	3
5	3	3	2	2	-	-	2	-	-	-	-	2	2	3	2	3
Average	3.0	3.0	2.3	1.7	-	1.0	1.7	2.0	-	-	-	1.7	2.6	1.6	2.4	2.6

AG3366   **SOIL SCIENCE AND LABORATORY**

<div align="right">

L T P C
0 0 3 1.5

</div>

OBJECTIVES

- Students will be able to identify the types of rocks and minerals.
- Students should be able to verify various quality aspects of soil and water studied in theory by performing experiments in lab.
- To provide hands on experience on the textural analysis of soil.
- Students should be able to determine the organic carbon and gypsum requirements.
- Students should be able to perform in situ tests on soil samples.

LIST OF EXPERIMENTS

1. Identification of rocks and minerals

2. Collection and processing of soil samples

3. Determination of soil moisture, EC and pH

4. Field density determination by Core Cutter and Sand Replacement method

5. Determination of Specific Gravity

6. Textural analysis of soil by International Pipette method

7. Grain size analysis by using Mechanical shaker

8. Determination of Organic carbon

9. Estimation of Gypsum requirements

<div align="right">

TOTAL: 30 PERIODS

</div>

OUTCOMES

- Learn about the identification of minerals referred under theory.
- Knowledge of field investigations including collection of soil sampling, Processing and storage through observation of soil.
- Understanding of the physical properties of soil and different laboratory methods
- Be able to perform test to identify the organic carbon and application of soil amendments through chemical analysis of soil.
- Students know the techniques to determine various physical and chemical properties of soil that are applicable for agriculture and irrigation by conducting appropriate tests.

TEXT BOOK:

1. Punmia, B.C., "Soil Mechanics and Foundation", Laxmi Publishers, New Delhi, 16th edition. 2017. ISBN-13: 978-8170087915.

2. Laboratory Manual, Centre for Water Resources, Anna University, Chennai,2012.

REFERENCE BOOK:

1. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7Th Reprint edition. 2019.

AG336	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	1	-	-	2	-	-	-	-	1	1	-	1	2	-	3	1
CO2	2	2	1	-	2	1	1	-	1	-	-	2	2	2	2	2
CO3	1	1	-	-	-	1	-	-	1	-	-	-	2	2	2	1
CO4	1	1	-	2	-	1	-	-	1	-	-	-	2	2	2	1
CO5	1	1	-	-	-	1	-	-	1	-	-	-	2	2	2	1
Average	1.2	1.3	1.0	2.0	2.0	1.0	1.0	-	1.0	1.0	-	1.5	2.0	2.0	2.2	1.2

CE3366   **SURVEYING AND LEVELLING LABORATORY**   **L T P C**
                                                                    0 0 4 2

COURSE OBJECTIVES:

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

• To train the student to acquire skill on chain and compass surveying.

• To train students to gain experience on plane table surveying.

• To have hands on experience on operating theodolite.

• To gain practical knowledge on levelling.

• To gain practical knowledge on total station.

Chain Survey

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset

Compass Survey

2. Compass Traversing – Measuring Bearings & arriving included anglesLevelling - Study of levels and levelling staff

3. Fly levelling using Dumpy level &Tilting level

4. Check leveling

Theodolite - Study of Theodolite

5. Measurements of horizontal angles by reiteration and repetition and vertical angles

6. Determination of elevation of an object using single plane method when base is Accessible/inaccessible.

Tacheometry – Tangential system – Stadia system

7. Determination of Tacheometric Constants

8. Heights and distances by stadia Tacheometry

9. Heights and distances by Tangential Tacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles

10**.** Traverse using Total station and Area of Traverse

11. Determination of distance and difference in elevation between two inaccessible points using Total station

12. Settingout works – Foundation marking using tapes single Room

                                                                    TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

• Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments.

• Able to use levelling instrument for surveying operations.

• Able to use theodolite for various surveying operations.

• Able to carry out necessary surveys for social infrastructures.

- Able to prepare planimetric maps.

REFERENCES:

1. T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 24th Reprint, 2015.
2. Dr. B. C. Punmia, Ashok K. JainandArun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition, 2016.
3. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001.
4. Bannisterand S. Raymond, Surveying, Seventh Edition, Longman 2004 a. David Clark, Plane and Geodetic Surveying for Engineers, Volume I, Constable and Company Ltd, London, CBS, 6th Edition, 2004.
5. David Clark and James Clendinning, Plane and Geodetic Surveying for Engineers, Volume II, Constable and Company Ltd, London, CBS, 6th Edition, 2004.
6. S. K. Roy, Fundamentals of Surveying, Second Edition, Prentice 'Hall of India 2004.
7. K. R. Arora, Surveying Vol. I & II, Standard Book house, Eleventh Edition, 2013.

CE3366	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	-	1	1	3	-	3	3	3	2	2	3	1	3	3
CO2	2	3	-	-	1	2	-	1	3	2	-	3	3	1	3	2
CO3	3	3	-	-	1	2	-	1	3	2	-	3	3	3	3	2
CO4	2	2	-	-	1	1	-	-	3	3	2	3	3	1	2	3
CO5	3	3	2	3	2	2	2	1	3	2	2	2	2	2	2	3
Average	2.6	2.7	2	2	1.2	2	2	1.5	3	2.4	2	2.6	2.8	1.6	2.6	2.6

SEMESTER IV

MA3426 APPLIED MATHEMATICS FOR AGRICULTURAL ENGINEERING

LT P C
2 0 0 2

OBJECTIVES:
- To understand and apply the ordinary differential equations
- To familiarize the student with probability distributions
- To understand the concept of estimation theory.
- To acquaint the student with mathematical tools needed in evaluating integrals.
- To familiarize the student with multiple integrals and their usage in find the area and volume of two- and three-dimensional objects.

UNIT-I: ORDINARY DIFFERENTIAL EQUATIONS   6
Higher order linear differential equations with constant coefficients – Method of variation of parameters.

UNIT-II: SPECIAL DISTRIBUTIONS   6
Bernoulli, Binomial, Poisson, uniform, exponential and normal distributions.

UNIT-III: ESTIMATION & SAMPLING DISTRIBUTION   6
Population, sample, parameters, point estimation, unbiasedness, consistency. Comparing two estimators

UNIT-IV: CORRELATION & REGRESSION   6
Simple linear regression, curve fitting. Covariance correlation tests for slope and correlation, analysis of variance, regression analysis.

UNIT-V: STATISTICAL QUALITY CONTROL `   6
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.   .

TOTAL: 30 PERIODS

OUTCOMES:
- Understand how to solve the given ordinary differential equations.
- Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon
- The concept of estimation and Sampling theory is studied.

- Understand the basic concepts of two-dimensional random variables and correlation regression and apply them to model engineering problems
- Understand the control charts and apply in quality control.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.3. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", S.Chand Private Ltd., 11th Edition, 2005.

2. Veerarajan.T, "Engineering Mathematics", McGrawHill Education (India) Private Ltd 2019.

REFERENCE BOOKS:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt. Ltd., 2011.

2. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume I, Second Edition, Pearson Publishing, 2017.

3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

MA3426	PROGRAM OUTCOMES												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO5	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
Average	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-

AG3461   **TRACTORS AND FARM ENGINES**

L T P C
3 0 0 3

OBJECTIVES:

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

- To understand the mechanics involved in farm tractors.
  To learn the engine components and operations involved inside the engine.
- To introduce concept of different engine systems and tractor control.
- To impart the knowledge of power transmission to tractor drawn implements.
- To acquaint the procedure for testing and selection of tractors with cost analysis.

UNIT I   TRACTORS   9
Sources of farm power-Classification of tractors - Tractor engines – Types- CI and SI engines, operating principles and function- two stroke and four stroke engine, Comparison - 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
Valve system, Valves-inlet and outlet valves – valve timing diagram. Air cleaner, types and performance characteristics- exhaust – silencer. Cooling systems - lubricating systems - fuel injection system, injection pump, types, working principle- Nozzles, types and working principles – governor types and characteristics- 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 and hitching system - draft control - weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability - longitudinal and lateral. Controls - visibility - operators seat.

UNIT V   POWER TILLER, BULLDOZER AND TRACTOR TESTING   9
Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism, components – operations performed by bulldozers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers – Selection of tractor.

TOTAL: 45PERIODS

COURSE OUTCOMES:
     On completion of the course, the student is expected to

- Get an idea on different types of tractors and tractor mechanics
- Calculate the valve timing of an IC engine and represent by a drawing
- Gain knowledge on the engine control system of a tractor
- Understand the power transmission, hydraulic system and power outlet in a tractor.
- Gain knowledge on testing and evaluation of farm tractor with different procedure.

TEXTBOOK:

1. Jain, S.C. and C.R. Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi, 1999.
2. Senthilkumar, T., R.Kavitha, V.M.Duraisamy and B.Suthakar.Text Book of Farm Machinery, Thannambikkai publishers, Coimbatore, 2019.

REFERENCES:

1. Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.
2. Domkundwar A.V. A course in internal combustion engines. DhanpatRai& Co. (P) Ltd., Educational and Technical Publishers, Delhi,1999.
3. Black, P.O. Diesel engine manual. Taraporevala Sons& Co., Mumbai, 1996.
4. Grouse, W.H. and Anglin, D.L. Automative mechanics. Macmillan McGraw- Hill, Singapore, Indian Standard Codes for Agricultural Implements Published by ISI, New Delhi, 1993.
5. JagadeeshwarSahay, Elements of Agricultural Engineering, Standard Publishers Co., New Delhi, 2010.

AG3461	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	2	1	1	-	1	-	1	-	-	1	2	2	1	2	-
CO2	2	-	-	1	2	-	-	-	1	-	-	-	-	-	-	-
CO3	1	-	1	-	-	1	-	-	-	-	1	-	-	1	1	-
CO4	-	2	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO5	2	2	-	1	-	-	-	-	-	-	2		2	1	1	-
Average	2.0	2.0	-	1.0	-	-	-	-	-	-	2.0		2.0	1.0	1.0	-

AG3462   **IRRIGATION AND DRAINAGE ENGINEERING**
                                                           L T P C
                                                           3 0 0 3

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

- To understand the necessity of planning an irrigation system to provide water at the right time and right place.
- To understand the basic concepts for planning, design and management of land drainage works in cultivated areas.
- To have vast knowledge on Agricultural farm development works.
- To understand the role of farmers' committee in water distribution and system operation.
- To learn in detail about agricultural drainage and recycling of drainage water for irrigation.

UNIT-I: IRRIGATION REQUIREMENTS   **9**
Pump terminology – selection of pump capacity. Types of pumps and impellers - Priming — cavitation — specific speed —characteristic curves. Turbines – jet assembly - Hydraulicram. Duty and delta - Rooting characteristics - Moisture use of crop - Evapotranspiration plot - Crop water requirement - Effective rainfall - Scheduling Irrigation requirement - Irrigation frequency, Irrigation efficiencies.

UNIT-II: METHODS OF IRRIGATION   **9**
Methods of Irrigation - Hydraulics and design - Erodible and non-erodible, Kennedy's and Lacey's theories, Materials for lining water courses and field channel - Underground pipeline irrigation system.

UNIT-III: DIVERSION AND IMPOUNDING STRUCTURE   **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 dissipators - Tank Irrigation.

UNIT-IV: CANAL IRRIGATION AND COMMAND AREA DEVELOPMENT   **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 - Excess irrigation and waterlogging problem - Command area - Components of Command Area Development Programme - On Farm Development works, Farmer's committee - its role for water distribution and system operation - Rotational irrigation system.

UNIT-V: AGRICULTURAL DRAINAGE   9

Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy's law – infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigation and drainage water quality - recycling of drainage water for irrigation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- The students will have knowledge and skills on Planning, design, operation
- and management of reservoir system.
- The student will gain knowledge on different methods of irrigation.
- To understand about diversion and impounding structures.
- To have an insight of canal classification, alignment and design of canals.
- Imparts the knowledge on agricultural drainage.

TEXT BOOKS:

1. BalramPanigrahi "A Handbook on Irrigation and Drainage", Nipa Publishers, New Delhi, 2021
2. Dilip Kumar Majumdar., "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
3. Garg, S.K, "Irrigation Engineering," Laxmi Publications, New Delhi, 2008.
4. Michael, A.M, "Irrigation Engineering", Vikas Publishers, New Delhi, 2008.

REFERENCES:

1. K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.
2. Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.
3. Bhattacharya, A.K, and Michael, A.M, "Land Drainage – Principles, Methods and Applications", Konark Publishers Pvt. Ltd., New Delhi, 2003.

AG3462	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	-	2	2	3	1	2	1	-	-	1	2	3	1	-	1
CO2	-	-	1	3	1	2	1	2	1	-	1	3	2	1	2	-
CO3	1	-	3	1	1	2	3	1	2	1	-	-	1	2	3	3
CO4	2	-	-	-	2	1	3	1	2	1	1	-	2	1	3	-
CO5	1	1	2	-	-	-	3	1	3	-	2	-	1	3	-	2
Average	1.3	1.0	2.5	1.0	1.5	1.5	3.0	1.0	2.3	1.0	1.5	-	1.3	2.0	3.0	2.5

AG3463   **PRINCIPLES AND PRACTICES OF CROP PRODUCTION**

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the students to the principles of agricultural and horticultural crop production.
- Students will gain knowledge on how to select a crop and its establishment.
- To understand the production practices of agricultural and horticultural crops.
- To impart knowledge on nutrient use and weed management.
- To define the role of agricultural engineers in various fields of Crop production practices

UNIT-I: AGRICULTURE AND CROP PRODUCTION   **9**

Introduction to agriculture and its crop production sub-sectors ,Factors affecting crop growth and production-climate and weather parameters – Soil fertility and productivity 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**

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**

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**

Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal, pulses, legumes, oil seeds , cash crops, and fiber crops, and special purpose crops such as those grown for green manure.

UNIT-V: PRODUCTION PRACTICES OF HORTICULTURAL CROPS   **9**

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: 45 PERIODS

COURSE OUTCOMES:

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

- On completion of course, students will be able to understand the basics of agriculture and crop production.
- To gain knowledge on crop selection and establishment.
- To have insight on crop nutrition management.
- To exploit the production practices of agricultural crops.
- To exploit the production practices of horticultural crops.

TEXT BOOKS:

1. Rajendra Prasad, "Text Book of Field Crop Production", Directorate of Information and Publication, Krishi 02 AnusandhanBhavan, Pusa, New Delhi, 2005.
2. Reddy T., Sankara G.H. YellamandaReddi, "Principles of Agronomy", Kalyani Publishers, New Delhi, 1995.
3. M. Mohamed Amanullah, K. Rajendran, S. Marimuthu "Crop Production Technology I (Kharif Crops)",2023.

REFERENCES:

1. Kumar, N., "Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 1993.
2. "Production Technology of Vegetable Crops Practical Manual" Field Crop (Kharif), TNAU Tamil Nadu. 2017.
3. Crop Production Guide Agricultural crops, Tamil Nadu Agricultural University Publication, Coimbatore. 2020.
4. Crop Production Guide Horticultural crops, Tamil Nadu Agricultural University Publication, Coimbatore. 2020

AG3463	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO 1	1	3	-	2	1	3	3	-	1	-	2	2	3	2	2	2
CO 2	3	2	-	2	1	2	1	-	1	-	2	2	3	3	2	2
CO 3	3	2	-	2	-	3	3	1	2	-	2	2	2	2	2	2
CO 4	1	1	2	2	-	2	2	-	1	-	2	2	2	2	2	2
CO 5	1	1	2	2	-	2	2	-	1	-	2	2	2	2	2	2
Average	1.8	1.8	2	2	1	2.4	2.2	1	1.2	-	2	2	2.4	2.2	2	2

AG3431 STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING

L T P C
3 0 0 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.
- To have understanding on the analysis of plane trusses.
- To gain knowledge on transverse loading and stresses in beam.
- To introduce the concept of torsion in shafts.
- To impart knowledge on deflection of beams.

UNIT ISTRESS, 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 - Volumetric strains - Thin shells Circumferential and longitudinal stresses in thin cylinders

UNIT-II:ANALYSIS OF PLANE TRUSSES   9
Determinate and indeterminate plane trusses - Determination of member forces by method of joints, method of sections and method of tension coefficient.

UNIT-III:TRANSVERSE LOADING 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 - Shear stress distribution - Flitched beams - Carriage springs.

UNIT-IV: DEFLECTION OF BEAMS   9
Computation of slopes and deflections in determinate beams - Area moment method - Conjugate beam method – Application in Agricultural Structures.

UNIT-V: TORSION   9
Torsion formula - 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- Upon completion of this course, the students can be able to apply mathematical knowledge to calculate the deformation behaviour of simple structures.

- To know about framework, typically consisting of rafters, posts, and struts, supporting a roof, bridge, or other structure.
- To find the deflection of beams through various methods.
- Students will be able to determine the torsion, stresses and deformation in circular and hollow shafts.
- Critically analyse problem and solve the problems related to structural 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. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2007
2. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series,2007.

AG3431	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	1	1	1	-	1	-	-	-	-	1	1	3	3	1	2
CO2	3	2	2	1	-	1	-	-	-	-	-	1	3	3	1	2
CO3	3	2	2	1	-	1	-	-	-	-	1	1	3	3	1	2
CO4	3	1	2	1	-	1	-	-	-	-	1	1	3	3	1	2
CO5	3	2	2	1	-	1	-	-	-	-	1	1	3	3	1	2
Average	3	1.6	1.8	1	-	1	-	-	-	-	1	1	3	3	1	2

AG3432   **THERMODYNAMICS FOR AGRICULTURE**
                   ENGINEERING   **L   T   P   C**
                                                          3   0   0   3

OBJECTIVES:
The main learning objective of this course is to impart knowledge on
- Basic concepts of Engineering thermodynamics and application to the first law of thermodynamics.
- Steam power cycles and their application in the steam power plants .
- Concepts of steam nozzles and turbine and to solve problems.
- Concepts of thermodynamic in different air standard cycles and to solve problems.
- Fundamental concept and principles in conductive and convective heat transfer
                        (Use of standard Steam Tables and Mollier diagram)

UNIT-I   FIRST LAW OF THERMODYNAMICS   9
Internal energy – Law of conservation of energy – First law of thermodynamics – Energy - Application of first law of thermodynamics to a non-flow or closed system – Application of first law to steady flow process – Engineering applications of steady flow energy equation (S.F.E.E.).

UNIT-II   BASIC STEAM POWER CYCLES   9
Carnot cycle – Rankine cycle – Modified Rankine cycle – Regenerative cycle – Reheat cycle.

UNIT-III   STEAM NOZZLES AND STEAM TURBINES   9
Introduction – Steam flow through nozzles – Nozzle efficiency – Classification of the steam turbine – Advantages of the steam turbine over steam engines – Methods of reducing wheel – Impulse turbine – Turbine Efficiency.

UNIT-IV   GAS POWER CYCLES   9
Air Standard Cycles – Otto Cycle - Diesel cycle - Dual cycle – Calculation of mean effective pressure - Air standard efficiency - Comparison of cycles.

UNIT-V   HEAT TRANSFER   9
Modes of heat transfer – Heat transfer by conduction – Heat transfer by convection – Heat exchangers.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Upon coupling of this course, the students will be able to:
- Execute the basic concepts of Engineering thermodynamics and application to the first law of thermodynamics.
- Solve problems in Steam power cycles .
- Solve problems in steam nozzles and turbine.
- Explain the concepts of thermodynamic in different air standard cycles and solve problems.
- Appraise the fundamental concept and principles in conductive and convective heat transfer.

TEXTBOOKS:
1. Rajput, R.K., "Thermal Engineering" Tenth Edition, Laxmi Publication (P) LTD, 2017.
2. Kothandaraman, C.P., "A Course in Thermal Engineering", Fifth Edition,"DhanpatRai and Co, 2004.

REFERENCE BOOKS:
1. Ganesan, V. "Internal Combustion Engines", Third Edition, Tata Mcgraw-Hill 2012.
2. Ballaney, P.L. "Thermal Engineering", Khanna publishers, 24th Edition 2012.
3. Ganesan, V. "Gas Turbines" Third Edition, Tata McGraw -Hill 2017.
4. Rudramoorthy, R. "Thermal Engineering", "Tata McGraw-Hill, New Delhi, 2003.
5. Sarkar, B.K, "Thermal Engineering", Tata McGraw-Hill Publishers, 2007.

AG3432	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1	-
2	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1	-
3	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1	-
4	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1	-
5	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1	-
Average	2.0	2.0	1.0	-	-	-	-	-	-	-	-	1.0	1.0	-	1.0	-

GE 3451   **NCC Credit Course Level - I**   **L T P C**

                              (Common to Army, Navy & Air)   3 0 0 3

Objective:

1. To know the basic structure of NCC and Role of NCC
2. To improve the cadet's personality skill and leadership quality
3. To make the interest of cadets to involve in social activities
4. Preventing the potential damage and suffering
5. to destruction of the enemy's ability to fight and will to fight

Unit - I :Introduction to NCC   9

Aims, Objectives & Organization of NCC, Incentives, Duties of NCC Cadet, NCC Camps and Types National Integration: Importance & Necessity, Factors Affecting National Integration, Unity in Diversity & Role of NCC in Nation Building, Threats to National Security.

Unit -II :Personality Development   9

Personal Transformation, Personal Productivity Skills - time management, organizational and planning skills, problem solving and decision-making abilities, basics of psychology, Leadership, Meditation

Unit - III :Social Service and Community Development   9

Basics, Rural Development Programmes, NGOs, Contribution of Youth, Protection of Children and Women Safety, Road / Rail Travel Safety, New Initiatives, Cyber and Mobile Security Awareness

Unit - IV :Disaster Managements and its Awareness   9

Importance of Hazards and Disaster, Types of disasters, Earthquakes and its types, flood types and its management, landside and its managements case studies of disasters in Sikkim, Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management

Unit – V :War and Peace in Contemporary World 9

Conceptual framework of War and Peace, Concepts of theories and approaches, Modern /war fare: Conventional, nuclear, Guerilla and Irregular Warfare, Limited and Specialized Warfare with reference to mountain, desert and jungle warfare, terrorism as a new mode of conflict, War as an Economic Problem, Defence and Development, Defence and Development, Defence and Development

TOTAL: 45 PERIODS

Note: NCC Credit Course Level – I is offered for NCC students only. The grades earned by the students will be recorded in the marksheet, however the same shall not be considered for the computation of CGPA

Course outcome:

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

1. Understand their roles and responsibilities
2. Demonstrate the knowledge of human values and morals
3. Actively participate in social service and development activities
4. Understand the importance of disaster management
5. Analyse the issues related to war and its effects.

Text Books

1. R. Gupta's NCC Handbook of NCC Cadets 'A', 'B' and 'C' certificate Examiantions

Reference book:

1. V. B. RAO, Personality Development and Soft Skills, BS Publications
2. Harish K. Gupta, Disaster Management, Universities press.

AG3464   **CROP HUSBANDRY LABORATORY**   **L   T   P   C**

                                                                              0   0   4   2

OBJECTIVES:

- To provide hands on experience to students to prepare land for cultivation.
- To introduce the different crop production practices in wetland,dry land and garden land through hands on experience and demonstrations.
- To have hands on experience on nutrient management.
- Experimental study on water management and irrigation scheduling.
- To introduce about the harvesting tools and their techniques.

LIST OF EXPERIMENTS:

1. Identification of field and horticultural crops and field preparation studies.
2. Seed moisture - estimation of seed rate, germination of seeds, Seed selection and seed treatment procedures.
3. Seed bed and nursery preparation, Sowing/Transplanting.
4. Fertilizers-type, estimation of recommended dose.
5. Water management and irrigation scheduling
6. Weeds, identification of major weed type, demonstration on simple weeding implements. Herbicide uses and caution.
7. Pest identification and control, demonstration of IPM methods
8. Harvesting methods for various field and horticultural crops and implements used.
9. Post harvesting Practices.
10. Biometric observations.

                                                                    TOTAL:60PERIODS

COURSE OUTCOMES:

1. On completion of course, the students will be able to prepare field for cultivation.
2. Students will be able to select quality of seeds.
3. Students will have basic knowledge on preparing seed bed and nursery.

4. Students will have hands on experience Water management and irrigation scheduling

5. Students will be capable of performing irrigation from sowing till harvesting.

AG3464	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	2	1	1	1	2	2	2	1	2	3	3	2	3	2
2	3	1	-	3	2	1	3	-	-	-	2	2	2	2	2	1
3	2	2	2	1	1	1	2	2	2	2	1	2	3	2	3	2
4	3	1	-	3	2	1	3	-	-	-	2	2	2	2	2	1
5	3	1	-	3	2	1	3	-	-	-	2	2	2	2	2	1
Average	2.6	1.4	2	2.2	1.6	1	2.6	2	2	1.5	1.8	2.2	2.4	2	2.4	1.4

AG3465   IRRIGATION FIELD LABORATORY   L T P C
                                                                  0 0 3 1.5

OBJECTIVES:

- Students should be able to study various Meteorological instruments.
- To practically determine the uniformity coefficient of the various irrigation systems.
- To study about the flow properties in open channels.
- To design various types of irrigation system.
- To understand the working principle of various instruments that is available in metrological Laboratory.

LIST OF EXPERIMENTS

1. To study various instruments in the Meteorological Laboratory.
2. To study the characteristics of Centrifugal pump, Submersible pump and Reciprocating pump.
3. Evaluation of surface irrigation
4. Determination of infiltration rate using double ring and digital infiltrometer.
5. Determination of soil moisture wetting pattern for irrigation scheduling.
6. Measurement of flow in open channels using flumes.
7. Layout of Drip irrigation system.
8. Determination of uniformity coefficient for drip irrigation system
9. Layout of Sprinkler irrigation system
10. Determination of uniformity coefficient for sprinkler system - catch can method.
11. Study of Greenhouse irrigation system design.

TOTAL: 30 PERIODS

OUTCOMES:

1. On the completion of the course the student will have the knowledge on various meteorological instruments
2. Having a practical knowledge of different irrigational systems.
3. Evaluating the infiltration rate using various methods.
4. Evaluating uniformity coefficient of the various irrigation systems.
5. Measuring the flow in the channel and also conducting the experiment for micro irrigation system.

REFERENCEBOOKS:

1. Michael, A.M, "Irrigation Theory and Practice", Vikas Publishing House, NewDelhi,1999.
2. Asawa, G.L, "Irrigation Engineering", New Age International Private

Limited, NewDelhi,1996.
3. Laboratory Manual,Centre for Water Resources, AnnaUniversity, Chennai.

AG3465	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	1	3	-	1	2	-	-	2	1	3	2	1	3	1
CO 2	2	1	1	2	3	1	1	-	1	2	1	2	1	2	1	3
CO 3	3	2	2	3	3	-	-	2	2	3	3	2	2	2	3	1
CO 4	2	2	2	1	-	-	-	2	2	3	3	2	2	1	2	3
CO 5	1	3	2	1	1	-	-	-	-	2	1	2	1	1	2	2
Average	2.0	2.0	1.6	2.0	2.3	1.0	1.5	2.0	1.7	2.4	1.8	2.2	1.6	1.4	2.2	2.0

AG3433   **STRENGTH OF MATERIALS LABORATORY**

L T P C
0 0 3 1.5

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:
- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS
1. Tension test on steel rod.
2. Compression test on wood.
3. Double shear test on metal.
4. Torsion test on mild steel rod.
5. Impact test on metal specimen (Izod and Charpy).
6. Hardness test on metals (Rockwell and Brinell Hardness Tests).
7. Deflection test on metal beam.
8. Compression test on helical spring.
9. Deflection test on carriage spring.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of this course, learners will be able to:
1. Find the stress distribution and strains in regular and composite structures subjected to axial loads.
2. Assess the shear force, bending moment and bending stresses in beams
3. Apply torsion equation in design of circular shafts and helical springs

REFERENCES:
1. Strength of Materials Laboratory Manual, Anna University,Chennai - 600 025.
2. IS1786-2008 (Fourth Revision, reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.

AG3433	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2	2	1	-	1	-	-	-	-	2	1	3	3	1	-
CO2	3	1	2	1	-	1	-	-	-	-	2	1	3	3	1	-
CO3	3	2	2	1	-	1	-	-	-	-	2	1	3	3	1	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2.7	1.7	2.0	1.0	-	1.0	-	-	-	-	2.0	1.0	3.0	3.0	1.0	-