SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

SRM Nagar, Kattankulathur-603203.

(Approved by AICTE, Affiliated to Anna University, 'A' Grade Accredited by NAAC, NBA Accredited, ISO 9001:2015 Certified)

CURRICULA AND SYLLABI

B.Tech – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

(REGULATIONS 2023)

SRM VALLIAMMAI ENGINEERING COLLEGE

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

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
REGULATIONS – 2023

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To afford the necessary background in the field of Artificial Intelligence and data Science to deal with engineering problems to excel as engineering professionals in industries.
2. To improve the qualities like creativity, leadership, teamwork and skill thus contributing towards the growth and development of society.
3. To develop ability among students towards innovation and entrepreneurship that caters to the needs of Industry and society.
4. To inculcate and attitude for life-long learning process through the use of Artificial Intelligence and Data Science sources.
5. To prepare then to be innovative and ethical leaders, both in their chosen profession and in other activities.

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, Bachelor of Technology in Artificial Intelligence and Data Science Graduates will exhibit ability to:

PO#	Graduate Attribute	Programme Outcomes
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for 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 public health and safety, and cultural, societal, and environmental considerations.

4	Conduct investigations of complex problems	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 modelling 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 the 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):

After the completion of Bachelor of Technology in Artificial Intelligence and Data Science programme the student will have following Program specific outcomes

1. Design and develop secured database applications with data analytical approaches of data preprocessing, optimization, visualization techniques and maintenance using state of the art methodologies based on ethical values.

2. Design and develop intelligent systems using computational principles, methods and systems for extracting knowledge from data to solve real time problems using advanced technologies and tools.

3. Design, plan and setting up the network that is helpful for contemporary business environments using latest software and hardware.
4. Planning and defining test activities by preparing test cases that can predict and correct errors ensuring a socially transformed product catering all technological needs.

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
I	3	3											3	3	3	
II			3		3	3	3		2					3		
III			3	3	3	3					1	2			3	3
IV												2	3			
V								3		3			3	3	3	3

MAPPING – UG –ARTIFICIAL INTELLIGENCE AND DATA SCIENCE ENGINEERING

S. No	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
			I YEAR																
1	Sem I	EN3111	Professional English - I	2.2	2.6	2.0	2.0	2.0	-	2.0	-	-	2.8	1.0	1.0	-	-	-	-
2		MA3122	Matrices and Calculus	3.0	2.0	2.0	1.0	-	-	-	-	-	-	-	1.0	-	-	1.0	-
3		PH3123	Engineering Physics	2.8	1.4	1.4	1.0	1.3	1.0	1.0	-	-	-	-	1.0	-	-	-	-
4		CH3124	Engineering Chemistry	2.8	1.8	2.2	1.5	1.0	1.0	2.0	-	-	-	-	2.0	-	-	-	-
5		GE3131	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
6		GE3111	தமிழர் மரபு / Heritage of Tamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7		GE3121	Physics and Chemistry Laboratory	2.5	1.7	1.8	1.0	1.1	-	1.0	-	-	-	-	1.0	-	-	-	-
8		GE3134	Engineering Practices Laboratory	3.0	2.0	2.3	2.0	2.3	1.0	-	-	1.0	-	1.0	1.0	1.7	2.0	2.5	2.0
9		EN3119	English Language Learning Laboratory	1.7	1.3	1.0	1.3	2.0	-	2.0	-	-	2.8	-	1.0	-	-	-	-
10	Sem II	EN3211	Professional English – II	2.0	2.0	1.4	2.0	2.0	-	2.0	-	-	2.8	1.0	1.0	-	-	-	-
11		MA3222	Statistics and Numerical Methods	3.0	3.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-
12		PH3222	Physics for Information Science	3.0	1.0	1.8	1.0	2.0	1.0	1.3	-	-	-	-	1.0	-	-	-	-
13		CH3222	Chemistry for Information Science	1.6	1.0	1.0	2.0	2.3	-	1.0	-	-	-	1.0	1.0	2.0	-	1.0	-

S. No	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
14	Sem II	GE3231	Problem solving and Python Programming	2.4	2.6	3.0	2.8	1.8	-	-	-	-	-	1.6	2.0	2.5	-	2.0	1.0
15		GE3211	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16		GE3233	Engineering Graphics and Design	2.0	-	3.0	-	1.0	-	-	-	1.0	3.0	-	2.0	2.0	1.0	1.0	1.0
17		GE3232	Problem solving and Python Programming Laboratory	2.6	2.6	3.0	2.8	2.2	-	-	-	-	-	2.0	2.0	1.0	3.0	1.7	2.0
18		GE3221	Engineering Sciences Laboratory	2.5	1.9	1.8	1.0	1.1	2.0	2.0	2.0	-	-	-	-	-	-	-	-
19		GE3251	NSS / YRC / NSO / Club Activities #	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II YEAR																			
20	Sem III	MA3322	Discrete Mathematics	3.0	3.0	2.4	-	-	-	-	-	1.0	-	-	1.0	-	-	1.0	-
21		AD3361	Data Exploration and Visualization	2.3	2.5	2.0	2.0	1.0	-	-	-	3.0	2.0	2.0	2.0	1.8	1.0	2.0	2.5
22		AD3362	Database Design and Management	2.3	2.5	2.3	2.0	1.0	-	-	-	1.0	1.5	1.0	2.0	1.2	1.5	2	1.0
23		AD3363	Digital Principles and Computer Organization	2.7	2.5	2.5	2.5	2.0	2.0	1.0	1.0	1.0	1.0	-	2.5	1.5	-	2.0	-
24		IT3361	Programming and Data Structures	3.0	2.8	2.6	-	-	-	-	-	-	-	-	-	3.0	2.0	-	-
25		CS3363	Software Engineering	2.0	2.0	3.0	3.0	-	2.5	-	-	-	2.0	3.0	2.0	2.0	2.0	1.5	-

S. No	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
26	Sem III	AD3364	Data Exploration and Visualization Laboratory	2.4	1.8	2.0	1.6	1.0	-	-	-	2.4	2.2	1.8	2.2	2.0	2.0	-	2.2
27		AD3365	Database Design and Management Laboratory	2.5	2.5	2.3	2.0	1.0	-	-	-	1.0	2.5	-	2.0	2.0	1.0	1.0	1.5
28		IT3363	Programming and Data Structures Laboratory	2.6	2.3	3.0	-	2.0	-	-	-	-	-	-	-	3.0	2.3	-	-
29	Sem IV	MA3428	Applied Mathematics for Data Science	3.0	3.0	3.0	-	-	-	-	-	-	-	-	-	-	-	1.0	-
30		AD3461	Artificial Intelligence - I	2.3	2.0	2.3	2.0	1.0	-	-	-	2.0	1.0	2.0	1.5	2.0	2.0	-	1.4
31		AD3462	Data and Information Security	3.0	2.5	2.0	2.0	1.7	-	-	-	3.0	-	1.0	3.0	2.0	-	1.8	2.0
32		AD3463	Data Communication and Networks	3.0	2.5	2.0	2.3	1.5	-	-	-	3.0	-	1.0	2.0	2.0	-	2.0	-
33		AD3464	Fundamentals of Data Science and Analytics	1.3	3.0	2.3	1.7	1.5	-	-	-	1.5	2.0	3.0	2.5	2.6	1.5	-	1.3
34		IT3461	Operating Systems	2.0	2.0	2.4	1.8	1.0	-	-	-	-	-	-	-	-	2.0	-	-
35		GE3451	NCC Credit Course Level – I																
36		AD3465	Artificial Intelligence - I Laboratory	2.7	2.0	3.0	2.3	1.0	-	-	-	1.5	2.0	2.0	2.0	2.0	2.2	-	2.0
37		AD3466	Data Communication and Networks	2.7	2.5	3.0	2.3	2.5	-	-	-	3.0	-	1.0	3.0	2.7	-	2.0	-
38		AD3467	Data Science and Analytics Laboratory	2.3	2.5	1.0	2.5	2.0	-	-	-	1.7	3.0	3.0	2.5	2.4	2.0	-	2.0

SRM VALLIAMMAI ENGINEERING COLLEGE
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REGULATIONS – 2023
CHOICE BASED CREDIT SYSTEM
B. Tech. ARTIFICIAL INTELLIGENCE and DATA SCIENCE
CURRICULA AND SYLLABI
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.	PH3222	Physics for Information Science	BSC	3	3	0	0	3
4.	CH3222	Chemistry for Information Science	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
THEORY CUM PRACTICALS								
7.	GE3233	Engineering Graphics and Design	ESC	5	1	0	4	3
PRACTICALS								
8.	GE3221	Engineering Sciences Laboratory	BSC	4	0	0	4	2
9.	GE3232	Problem solving and Python Programming Laboratory	ESC	4	0	0	4	2
10.	GE3251	NSS / YRC / NSO / Club Activities #	PCD	0*	0	0	0	0*
# Conducted after college hours			**TOTAL**	**30**	**17**	**1**	**12**	**24**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA3322	Discrete Mathematics	BSC	3	3	0	0	3
2.	AD3361	Data Exploration and Visualization	PCC	3	3	0	0	3
3.	AD3362	Database Design and Management	PCC	3	3	0	0	3
4.	AD3363	Digital Principles and Computer Organization	PCC	3	3	0	0	3
5.	IT3361	Programming and Data Structures	PCC	3	3	0	0	3
6.	CS3363	Software Engineering	PCC	3	3	0	0	3
PRACTICALS								
7.	AD3364	Data Exploration and Visualization Laboratory	PCC	3	0	0	3	1.5
8.	AD3365	Database Design and Management Laboratory	PCC	3	0	0	3	1.5
9.	IT3363	Programming and Data Structures Laboratory	PCC	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.	MA3428	Applied Mathematics for Data Science	BSC	2	2	0	0	2
2.	AD3461	Artificial Intelligence - I	PCC	3	3	0	0	3
3.	AD3462	Data and Information Security	PCC	3	3	0	0	3
4.	AD3463	Data Communication and Networks	PCC	3	3	0	0	3
5.	AD3464	Fundamentals of Data Science and Analytics	PCC	3	3	0	0	3
6.	IT3461	Operating Systems	PCC	3	3	0	0	3
7.	GE3451	NCC Credit Course Level – I *	PCD	3*	3*	0	0	3*
PRACTICALS								
8.	AD3465	Artificial Intelligence - I Laboratory	PCC	3	0	0	3	1.5
9.	AD3466	Data Communication and Networks Laboratory	PCC	3	0	0	3	1.5
10.	AD3467	Data Science and Analytics Laboratory	PCC	3	0	0	3	1.5
			TOTAL	**26**	**17**	**0**	**9**	**21.5**

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

SUMMARY

S.NO.	SUBJECT AREA	CREDITS PER SEMESTER								CREDITS TOTAL	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1.	HSMC	4	4				2	2		12	7.19%
2.	BSC	12	10	3	2					27	16.17%
3.	ESC	5	10			2				17	10.18%
4.	PCC			19.5	19.5	16.5	10.5	9		75	44.91%
5.	PEC					6	6	6		18	10.78%
6.	OEC							3		3	1.80%
7.	EEC	1					3	1	10	15	8.98%
8.	PCD		✓								-
9.	Non Credit / Mandatory						✓	✓			-
	Total	22	24	22.5	21.5	24.5	21.5	21	10	167	

ABBREVIATIONS:

HSMC   - HUMANITIES, SOCIAL SCIENCES AND MANAGEMENT

BSC   - BASIC SCIENCES

ESC   - ENGINEERING SCIENCES

PCC   - PROFESSIONAL CORE

PCD   - PERSONALITY CHARACTER DEVELOPMENT

PEC   - PROFESSIONAL ELECTIVES

OEC   - OPEN ELECTIVES

EEC   - EMPLOYABILITY ENHANCEMENT COURSES

MC   - MANDATORY COURSES

SEMESTER I

EN3111   **PROFESSIONAL ENGLISH – I**   **LT 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   9

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   9

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 favorite 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   9

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 (classified advertisement and display advertisement)

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   9

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   9

Listening: Listening to audio books and answering questions.

Speaking: Presentation on a non-technical topic.

Reading: Editorials 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able

- To strengthen the basics of grammar.
- To narrate informal and informal situations.
- To describe a process/product and express opinion.
- To interpret and analyze the content/information given.
- To write short essays, personal letters and emails in English.

TEXT BOOKS:

1. English for Science and Technology Cambridge University Press,2021. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deep Mary Francis, Dr.K.N.Shoba and Dr.Lourdes Joevani, Department of English, Anna University.

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

REFERENCE BOOKS:

1. Effective Communication Skill, Kulbhusan Kumar, R.S.Salaria, Khanna Publishing House.
2. Wings of Fire - An Autobiography by A.P.J Abdul Kalam with Arun Tiwari, Sangam Books Ltd, Edition: 50, 1999
3. World's Most Popular Short Stories Saki Maupassant, Anton Chekhov, O Henry Paperback
4. Professional Speaking skills, Aruna Koneru, Oxford University Press.
5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English,Anna University,2020.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	2	2	2	-	-	-	-	3	-	-	-	-	-	-
2	2	2	-	-	-	-	-	-	-	3	1	1	-	-	-	-
3	2	-	2	2	-	-	-	-	-	3	-	1	-	-	-	-
4	3	3	-	2	-	-	2	-	-	3	-	-	-	-	-	-
5	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	2.2	2.6	2.0	2.0	2.0	-	2.0	-	-	2.8	1.0	1.0	-	-	-	-

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:

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

- To apply the idea of reducing complex problems into simple form using matrix technique.

- Basic application of calculus in engineering problems and to tackle for different geometries.

- This course equips the students to have basic knowledge and understanding the Partial derivatives and maxima and minima by Lagrange's method.

- Basic application of Double and Triple integrals used in Engineering real life problems

- To study the vector differentiation and vector integration by using standard theorems.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.

2. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", S.Chand Private Ltd.,11th Edition, 2005.

3. 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. 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.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	1	-
2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	1	-
3	3	2	2	1	-	-	-	-	-	-	-	1	-	-	1	-
4	3	2	2	1	-	-	-	-	-	-	-	1	-	-	1	-
5	3	2	2	1	-	-	-	-	-	-	-	1	-	-	1	-
Average	3.0	2.0	2.0	1.0	-	-	-	-	-	-	-	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 application in the engineering field.
* To familiarize the basics of laser and their technical advances in scientific, industrial and health care areas.
* To understand the principle of fibre optical fibre and its applications.
* To explore basic concept of quantum and dual nature of particle.

UNIT-I   PROPERTIES OF MATERIALS   9

Elasticity - Hooke's law - Stress-strain and its uses - Poisson ratio - factors affecting elastic modulus and tensile strength.

Single crystalline, polycrystalline and amorphous materials - unit cell - space lattice - crystal systems - Bravais lattice - Miller indices - d-spacing - characteristics of unit cell - SC, BCC, FCC and HCP structure - - thermal and mechanical properties of materials - crystal growth techniques - Czochralski and Bridgmann.

UNIT-II: ULTRASONICS   9

Introduction - Properties - Production: **Magnetostriction method** and **Piezoelectric method -** Acoustical grating - **determination of ultrasonic velocity in liquid - Application:** Detection of flaw in materials (Non Destructive Testing) - ultrasonic soldering, welding - SONAR - diagnostic sonography - cars' air bag sensor-dispersion of fog - Probe sonication for 2D material formation.

UNIT-III: LASERS AND ITS APPLICATIONS   9

Basic concepts and characteristics - Einstein's A and B coefficients (derivation) - population inversion - Pumping methods - Nd-YAG laser - CO_2 laser - Semiconductor lasers: homo junction and heterojunction - applications: laser welding, laser cutting, laser cooling, pattern formation by laser etching, laser bar code scanner - LIDAR - Laser tissue interaction, laser surgery - Holography - NLO - electro-optic effect.

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 of energy, voltage and temperature - Electron diffraction - G.P.Thomson experiment - wave function and its physical significance - Schrödinger's wave equation - time independent and time dependent equations - Particle in a one-dimensional box- Normalization of wave function - Quantum Tunnelling - Scanning Tunnelling Microscope.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To understand the properties of materials, crystalline material and growth techniques.
- To understand the basics, generation and application of ultrasonics.
- To acquire knowledge on the concepts of lasers and their applications in industry and medical field.
- To conversant on principle behind the fibres and their applications in communication and devices made out of optical fibre.
- To get knowledge on advanced 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". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

4. Brijlal and Subramanyam, "Properties of Matter", S .Chand publishing, 2002.

5. M.N.Avadhanulu & P.G.Kshirasagar, "A Text Book of Engineering Physics" – IX Edition, S.Chand Publications, 2014.

6. V.Rajendiran, Engineering Physics, Tata McGraw-Hill, New Delhi. 2011.

REFERENCE BOOKS:

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

2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.

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

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	1	-	-	1	1	-	-	-	-	1	-	-	-	-
2	3	1	1	1	2	1	1	-	-	-		1	-	-	-	-
3	3	2	2	1	1	1	1	-	-	-	-	1	-	-	-	-
4	3	2	2	1	1	1	1	-	-	-	-	1	-	-	-	-
5	2	1	1	1	1	1	1	-	-	-	-	1	-	-	-	-
Average	2.8	1.4	1.4	1.0	1.3	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: 45 PERIODS

OUTCOMES

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

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

TEXTBOOKS:

1. Payal B. Joshi and Shashank Deep, "Engineering Chemistry", Oxford University Press, New Delhi, 2019.

2. Shikha Agarwal, "Engineering Chemistry"-Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.

3. P. C. Jain and Monica Jain, "Engineering Chemistry", 18th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2021.

REFERENCE BOOKS:

1. R. V. Gadag and A. Nithyananda Shetty, "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

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	3	2	-	1	3	-	-	-	-	2	-	-	-	-
2	3	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
3	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	2	3	2	1	-	1	-	-	-	-	2	-	-	-	-
Average	2.8	1.8	2.2	1.5	1.0	1.0	2.0	-	-	-	-	2.0	-	-	-	-

GE3131   BASIC ELECTRICAL AND ELECTRONICS ENGINEERING   L T P C

3 0 0 3

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

OUTCOMES:

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

- compute the electric circuit parameters for simple problems.

- explain the working principle and applications of electrical machines.

- analyze the characteristics of analog electronic devices.

- explain the basic concepts of digital electronics.

- 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, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai 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. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.

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

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

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள்- தமிழ் ஒரு செம்மொழி- தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம்- 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 –

சிற்பக் கலை 3

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

அலகு-III: நாட்டுபுறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

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

அலகு-IV: தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள்- தமிழர்கள் போற்றிய அறக்கோட்பாடு –தமிழ் சங்கம்-சங்கம் வளர்த்த தமிழ்- சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும்- சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி

அலகு-V: இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியா மற்றும் வெளிநாட்டின் பிற பகுதிகளின் தமிழ்ப் பண்பாட்டின் தாக்கம்- சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு

TOTAL: 15 PERIODS

TEXT CUM REFERENCES:

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

2. கணினித்தமிழ் – முனைவர். இல.சுந்தரம். (விகடன் பிரசுரம்)

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 ofArchaeology & 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 Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| GE3111 | HERITAGE OF TAMILS | L T P C |
| | | 1 0 0 1 |

UNIT-I: LANGUAGE AND LITERATURE   3

Language Families in India - Dravidian Languages – Tamil as a Classical Language- Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**UNIT-II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART –
                 SCULPTURE   3**

Hero stone to modernsculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -Massive Terracotta sculptures, Village deities.

UNIT-III: FOLK AND MARTIAL ARTS   3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT-IV: THINAI CONCEPT OF TAMILS   3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils –Tamil Sangam- Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Exportand Import during Sangam Age - Overseas Conquest of Cholas.

**UNIT-V: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT
                 AND INDIAN CULTURE   3**

Contributionof Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of TamilBooks.

TOTAL: 15 PERIODS

TEXT CUM REFERENCES:

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

2. கணினித்தமிழ் – முனைவர். இல.சுந்தரம். (விகடன் பிரசுரம்)

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 ofArchaeology & 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 Bookand 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**
0 0 4 2

(Common to all branches of B.E. / B.Tech Programmes)

OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- 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: PHYSICS LABORATORY (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:

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

- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.

- Use mathematical models as a medium for quantitative reasoning and describing physical reality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

REFERENCES:

1. Wilson J.D. and Hernaandez Hall 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.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
5	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:

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 water sample 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 ($Ag/Au/TiO_2/ZnO/CuO$).
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).

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-
2	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
3	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
4	2	1	1	1	2	-	-	-	-	-	-	1	-	-	-	-
5	2	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	2.0	1.0	1.0	1.0	1.2	-	1.0	-	-	-	-	1.0	-	-	-	-

GE3134　　　**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

GROUP A (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:

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

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

Carpentry works:

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise:

Wood work, joints by sawing, planning and cutting.

II MECHANICAL ENGINEERING PRACTICE 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

GROUP B (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, ELCB
   and Isolators with ratings and usage.

IV   **ELECTRONICS ENGINEERING PRACTICE**   **15**

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Carry out various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering
- Fabricate carpentry components and pipe connections including plumbing works and use welding equipment's to join the structures.
- Carry out the basic machining operations, make the models using sheet metal works. Illustrate on centrifugal pump, air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and measure the electrical quantities
- Elaborate on the electronics components, gates and soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: CIVIL

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

MECHANICAL

1. Arc welding transformer with cables and holders   5 Nos.
2. Welding booth with exhaust facility   5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.   5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other

| | welding outfit. | 2 Nos. |

5. Centre lathe   2 Nos.
6. Hearth furnace, anvil and smithy tools   2 Sets
7. Moulding table, foundry tools   2 Sets
8. Power Tool: Angle Grinder   2 Nos.
9. Study-purpose items: centrifugal pump, air-conditioner   One each
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. Multimeters   10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	-	-	1	-	-	-	-	-	1	2	-	3	-
2	-	1	2	-	3	-	-	-	-	-	1	-	-	-	2	-
3	-	-	-	3	2	-	-	-	-	-	-	1	1	-	-	2
4	-	2	3	1	2	-	-	-	-	-	-	-	-	2	-	-
5	-	3	2	2	-	-	-	-	1	-	-	-	2	-	-	-
Average	3.0	2.0	2.3	2.0	2.3	1.0	-	-	1.0	-	1.0	1.0	1.7	2.0	2.5	2.0

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-I: PRONUNCIATION   6

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

UNIT-II: 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-III: 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-IV: 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-V: 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:

- Pronounce the words correctly.

- Understand the nonverbal clues.
- Make an effective presentation.
- Adequate soft skills required for the workplace.
- 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.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	-	-	-	1	-	-	-	-	-	3	-	1	-	-	-	-
2	1	1	-	-	-	-	1	-	-	2	-	1	-	-	-	-
3	2	2	1	2	2	-	-	-	-	3	-	1	-	-	-	-
4	2	1	1	-	-	-	3	-	-	3	-	1	-	-	-	-
5	-	1	-	1	-	-	-	-	-	3	-	1	-	-	-	-
Average	1.7	1.3	1.0	1.3	2.0	-	2.0	-	-	2.8	-	1.0	-	-	-	-

SEMESTER II

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 WRITING   9

Listening: Anecdotes to be read from books like Chicken Soup books. Evaluative listening – 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: Job Application, 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 views about 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, 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

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

- To draft technical reports, letters and to express ideas creatively.

TEXT BOOKS:

1. English for Science and Technology Cambridge University Press,2021. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deep Mary Francis, Dr.K.N.Shoba and Dr.Lourdes Joevani, 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, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

4. Improve Your Writing ed. V.N Arora Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.

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

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	-	1	2	1	-	-	-	-	-	3	-	1	-	-	-	-
2	2	2	1	2	2	-	-	-	-	3	1	1	-	-	-	-
3	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-
4	2	3	2	3	-	-	2	-	-	3	-	-	-	-	-	-
5	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:

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

- 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.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
3	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
4	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
5	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Average	3.0	3.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-

PH3222   **PHYSICS FOR INFORMATION SCIENCE**   **LT P C**

For Second Semester-B.E. / B.Tech.   **3 0 0 3**

(CSE, IT, AI&DS and Cyber Security)

OBJECTIVES:

- To provide information on the free electron theories and to understand the electrical properties of conducting material.
- To teach the basic knowledge of semiconductors and their applications.
- To enhance the idea of magnetic materials in storage devices and also to enrich the basic knowledge of superconductors and their applications.
- To gain knowledge about the interaction of photons with materials and optoelectronic devices.
- To understand the fundamental concepts of nanomaterials and quantum computing.

UNIT–I: CONDUCTING MATERIALS   9

Classical free electron theory - postulates - Expression for electrical conductivity and thermal conductivity - Wiedemann-Franz law - Success and failures - Quantum free electron theory (qualitative) - Fermi distribution function - Density of energy states - Electron in periodic potential - Energy bands in solids - Low and high resistivity alloys.

UNIT–II: SEMICONDUCTOR PHYSICS   9

Properties - Intrinsic semiconductors - Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors - Extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of Fermi level with temperature and impurity concentration - Variation of carrier concentration with temperature for extrinsic semiconductors - Hall effect - Theory and experiment and applications.

UNIT–III: MAGNETIC MATERIALS AND SUPERCONDUCTOR   9

Basic definitions of magnetism - Classification (based on spin): Diamagnetism, Paramagnetism, Ferromagnetism, anti-Ferromagnetism and ferrimagnetism - Ferromagnetic domain theory - Energy involved in domains - Hysteresis curve - Temporary and permanent magnetic materials, examples and uses - Magnetic principles in computer data storage - Magnetic hard disc (GMR sensor).

Superconductors - properties - Applications (Magnetic levitation, Cryotron and SQUID).

UNIT–IV: OPTOELECTRONIC DEVICES   9

Classification of optical materials - Optical processes in semiconductors: optical absorption and emission - carrier injection and recombination - Photodiode - Solar cell - Light Emitting Diode - Organic Light Emitting Diode - Quantum dot laser - Optical data storage devices-plasmonics.

UNIT–V: NANODEVICES AND QUANTUM COMPUTING   9

Introduction - Quantum confinement - Quantum structures (qualitative) - Band gap of nanomaterial - Single Electron Transistor (SET): Tunnelling - Coulomb-blockade effect - Carbon nanotubes: Properties and applications.

Quantum cellular automata (QCA) - Quantum system for information processing - Characteristics and working of quantum computers - Advantages and disadvantages of quantum computing over classical computing.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To understand the classical and quantum-free electron theories, and energy bands in solids.
- To apply the concepts of semiconductor Physics and its applications in various devices.
- To apply the properties of magnetic materials and superconductors in various fields.
- To understand the basics of optical materials and apply knowledge to develop materials for optoelectronic devices.
- To know the concepts and applications of quantum structures and the basics of quantum computing.

TEXTBOOKS:

1. Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw Hill Education, 2007.
2. M. Arumugam, "Semiconductor Physics and optoelectronics", Anuradha agencies,2003.

3. Kittel, C., "Introduction to Solid State Physics", Wiley, 2005.

4. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials".Narosa Publishing House, 2009.

5. B. K. Pandey., S. Chaturvedi., "Engineering Physics", Cengage Learning, 2012.

6. V.Rajendiran, Engineering Physics, Tata McGraw-Hill, New Delhi. 2011.

REFERENCE BOOKS:

1. B. N. Sankar., S. O. Pillai., "Engineering Physics" New age international publishers, 2007.

2. Donald .A.Neamen., "Semiconductor Physics and devices" Tata Mc Graw-Hill, New Delhi. 2007

3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: Understanding small systems", CRC Press, 2014.

ONLINE RESOURCES:

1. "Optoelectronics - An introduction" -Jhon Wilson and Jhon Hawkes- Prentice Hall Europe- ISBN 0-13-1039M-X

2. "Quantum Computing -A Gentle Introduction"- Eleanor Rieffel and Wolfgang Polak -ISBN 978-0-262-01506-6

3. "An introduction to Quantum Computing", NPTEL - https://nptel.ac.in/courses/106106232

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-
2	3	1	2	-	1	-	-	-	-	-	-	1	-	-	-	-
3	3	-	1	-	2	1	1	-	-	-	-	1	-	-	-	-
4	3	-	2	1	3	-	1	-	-	-	-	1	-	-	-	-
5	3	1	2	1	2	1	2	-	-	-	-	1	-	-	-	-
Average	3.0	1.0	1.8	1.0	2.0	1.0	1.3	-	-	-	-	1.0	-	-	-	-

CH3222   **CHEMISTRY FOR INFORMATION SCIENCE**   **L T P C**

Second Semester-B.E./B.Tech.   **3 0 0 3**

(Common to AI & DS, CSE, CYS and IT)

OBJECTIVES:

- To make the students acquainted with various energy sources, storage devices, and battery technology.

- To acquaint the student with the principles of photochemistry, application of spectroscopy, and sample analyzing techniques.

- To understand the preparation, properties, and engineering applications of functional materials, nanoreactors, nanoelectronics, and sensors.

- To make the student conversant with the basics of composites, their properties, and applications in memory devices.

- To acquaint the students with the basics of biomolecule networks, metabolic pathways, drug design applications, drawing tools, and structure visualizations.

UNIT-I: ENERGY SOURCES AND STORAGE DEVICES   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 principles.

UNIT-II: PHOTOCHEMISTRY AND SPECTROSCOPY   9

Photochemistry: laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law, and Lambert-Beer Law, quantum efficiency - determination - Jablonski diagram: internal conversion, intersystem crossing, fluorescence, phosphorescence, chemiluminescence, and photo-sensitization - applications. Spectroscopy: electromagnetic spectrum - absorption of radiation - electronic, vibrational, and rotational transitions, UV-visible and IR spectroscopy: principles, instrumentation (block diagram) - applications.

UNIT-III: SMART MATERIALS   9

Introduction - organic functional materials: preparation, properties, and engineering applications of graphite, fullerenes, carbon nanotubes, smart materials: nanoporous zeolites, self-assembled nanoreactors, nanostructures for molecular recognition, the

chemistry of nanoelectronics: data memory, lighting, and displays, thin films, OLEDs, sensors: electrochemical sensors, neuro-electronic interfaces.

UNIT-IV: NANOCOMPOSITES & MEMORY DEVICES   9

Introduction - definition - need, constitution: matrix materials (polymer matrix, metal matrix) and reinforcement (fiber), properties and applications of metal matrix composites (MMC), and polymer matrix composites - micro and nanoelectromechanical systems, applications of nanomaterials in memory devices.

UNIT-V: CHEMINFORMATICS   9

Introduction - coordinate-bond, bond length, bond angles, torsional angles - chemical structure - confirmation - representation of structural information - sources - formats - graph theory - molecular numerology - storage of structural data - databases - types - fingerprint - similarity search - applications of cheminformatics in drug designing.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To apply the gained knowledge on different energy sources and storage devices.
- To recognize the principle and concepts in photochemistry and spectroscopy.
- To recommend smart materials and sensors for the development of innovative materials.
- To utilize the different composites and memory devices.
- To identify the structural information about different materials with help of software.

TEXT BOOKS:

1. Shikha Agarwal, "Engineering Chemistry"-Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.
2. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2019.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCE BOOKS:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.

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. O. G. Palanna, Engineering Chemistry, McGraw Hill Education (India) Pvt, Ltd, New Delhi, 2017.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	1	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-
2	1	1	-	3	3	-	-	-	-	-	-	-	-	-	-	-
3	1	-	1	-	2	-	-	-	-	-	-	1	-	-	1	-
4	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3	1	-	-	3	-	-	-	-	-	-	-	2	-	-	-
Average	1.6	1.0	1.0	2.0	2.3	-	1.0	-	-	-	1.0	1.0	2.0	-	1.0	-

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 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 PACKAGES   9

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 OBJECTS   9

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 computational problems using control flow statements.
- Decompose a Python program into functions, Modules and Packages.
- Represent compound data using Python lists, tuples, Strings, Set and dictionaries.
- Read and write data from/to files and Exception handling in Python Programs.
- Understand the concepts of Object Oriented Programming and to develop real time applications.

TEXT BOOKS:

1. Reema Thareja, **"Python Programming using Problem solving Approach"**, 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.

REFERENCE BOOKS:

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/

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	3	2	-	-	-	-	-	2	2	2	-	-	1
2	3	3	3	3	2	-	-	-	-	-	2	2	-	-	3	-
3	3	3	3	3	2	-	-	-	-	-	2	-	-	-	1	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	2	-
5	1	2	-	-	1	-	-	-	-	-	1	-	-	-	-	1
Average	2.4	2.6	3.0	2.8	1.8	-	-	-	-	-	1.6	2.0	2.5	-	2.0	1.0

அலகு-I: நெசவு மற்றும் பானைத் தொழில்நுட்பம்   3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு-II: வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்   3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு. சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக் கலை.

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 – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு-IV: வேளாண்மை மற்றும் நீர்ப்பாசனத்

தொழில்நுட்பம்   3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் 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 – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – 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. (விகடன் பிரசுரம்).

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 Nayaka Priod – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – 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 Kumizhi Thoompu of Chola Perio, 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.

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. (விகடன் பிரசுரம்).

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.)

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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.

GE3233   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, use BIS conventions, and specifications for engineering drawing.
- 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 section of solids and the development of surfaces.
- 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   10

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   16

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   16

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 **16**

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 **16**

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: (L=15; P=60) 75 PERIODS

COURSE OUTCOMES:

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

- To construct the conics curves and special curves, use BIS conventions, and specifications for engineering drawing.
- To construct the orthographic projection of lines and plane surfaces
- To construct the projections and solids and Isometric projection of simple solids
- To construct projections of section of solids and development of surfaces
- To construct free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids

TEXT BOOKS:

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

REFERENCE BOOKS:

1. T. Jeyapoovan, "Engineering Graphics Using Auto CAD", Vikas Publishing House Pvt. LTD, seventh Edition, 2015
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018

3. 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.

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

5. Basant Agarwal 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

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
2	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
3	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
4	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
5	2	-	3	-	1	-	-	-	1	3	-	2	2	1	1	1
Average	2.0	-	3.0	-	1.0	-	-	-	1.0	3.0	-	2.0	2.0	1.0	1.0	1.0

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

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

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: PHYSICS LABORATORY (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 to:

- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze the laboratory data and to solve problems individually and collaboratively.
- Use mathematical models as a medium for quantitative reasoning and describing physical reality.

- Access, process and analyze scientific information.
- 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.

CO	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
5	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 train the students in basic experimental skills in water contaminants such as copper and chromium.
- To familiarise the students with electroanalytical 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:

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:

*   To find the quality of water samples for copper and chromium present in water.
*   To recognize the amount of various ions present in the water sample through volumetric and instrumentation techniques.
*   To identify the molecular weight of the polymer using an Ostwald viscometer.
*   To recognize an environmental hazardous and threshold limit for industrial effluents.
*   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 Authortopic Pvt. Ltd., (1st Edition, 2022).

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
2	2	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-
3	2	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-
4	2	2	1	1	1	2	2	2	-	-	-	-	-	-	-	-
5	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	2.0	1.4	1.0	1.0	1.2	2.0	2.0	2.0	-	-	-	-	-	-	-	-

GE3232   PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

L T P C

0 0 4 2

OBJECTIVES:

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

- To implement Python programs with conditionals and loops.

- Use functions for structuring Python programs.

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

COURSE OUTCOMES

- Develop solutions to simple computational problems using Python programs.
- Solve problems using conditionals and loops in Python.
- Develop Python programs by defining functions and calling them.
- Use Python lists, tuples and dictionaries for representing compound data.
- Develop Python programs using files and OOPS concept.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	3	3	-	-	-	-	-	3	2	1	3	-	-
2	3	3	3	3	3	-	-	-	-	-	3	2	-	-	2	-
3	3	3	3	3	2	-	-	-	-	-	2	-	-	3	-	2
4	3	2	-	2	2	-	-	-	-	-	1	-	-	-	1	-
5	1	2	-	-	1	-	-	-	-	-	1	-	1	-	2	2
Average	2.6	2.6	3.0	2.8	2.2	-	-	-	-	-	2.0	2.0	1.0	3.0	1.7	2.0

GE3251   **NSS/NSO/YRC & CLUB ACTIVITIES**   **L T P C**
                                                                    0 0 0 0

UNIT–1:   NATIONAL SERVICE SCHEME (NSS)

OBJECTIVES:

- 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 of Youth 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   **L T P C**
0 0 0 0

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)

OUTCOMES:

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

                                                                       0 0 0 0

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)

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 மேடைப்பேச்சாளர்களாக உருவாக்குவது
- தாய்மொழியின் மேன்மையை பாதுகாப்பது..

பயிற்சித்திட்டம்

1. பேச்சுக்கலைப் பயிற்சி
2. கவிதை மற்றும் கட்டுரைகள் எழுதும் பயிற்சி
3. அறிவியல் பொறியியல் தொழில்நுட்பங்களைத் தமிழில் எழுதுதல்.
4. பட்டிமன்ற மேடைகளில் பேசும் பயிற்சி.
5. நாட்டுப்புறப்பாடல்கள் பாடுதல் மற்றும் கதைகள் எழுதும் பயிற்சி.

கற்றல் முடிவு

1. பேச்சுக்கலைப் தேர்ச்சி
2. நாட்டுப்புறப்பாடல்கள் பற்றிய புரிதல்

மேற்கோள்கள்

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

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

                                                         0 0 0 0

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)

OUTCOMES:

- To enable students to express themselves easily and coherently.
- To help students to speak the language using the right words and pronouncing them correctly.

REFERENCES:

1. https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill= pronunciation
2. https://www.quillsandquotes.ca/post/12-fun-games-to-get-students-public-speaking

CATALYSIS CLUB

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

ACTIVITIES   **5**

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)

OUTCOMES:

- To promote inquisitiveness among the students and inculcate Scientific mind mapping.
- To develop students, interest and participation in the practical applications of the knowledge related to environmental sciences.
- Take part in practical, hands-on science activities close to nature.

REFERENCES:

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/

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)**

OUTCOMES:

- To enable students to explore their mathematical reasoning skills.
- 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/

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 their 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)**

OUTCOMES:

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

SEMESTER III

MA3322   DISCRETE MATHEMATICS   **L T P C**

                                                                    3 0 0 3

OBJECTIVES:

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of Combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT-I: LOGICS   9L

Propositional logic – Propositional equivalences – Predicates and quantifiers – Rules of inference.

UNIT-II: ADVANCED COUNTING PRINCIPLE   9L

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations - Inclusion and exclusion principle and its applications.

UNIT-III: GRAPH THEORY   9L

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Definitions and Examples of Euler and Hamilton paths.

UNIT-IV: GROUP THEORY   9L

Algebraic systems - Groups – Subgroups – Homomorphism's – Cosets – Lagrange's theorem.

UNIT-V: LATTICES AND BOOLEAN ALGEBRA   9L

Partial ordering – Posets – Lattices as posets – Properties of lattices – Some special lattices – Boolean algebra.

                                                      TOTAL: 45L PERIODS

OUTCOMES:

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

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in counting principle on many levels.
- To understand the concepts of graphs and its applications in computer science.
- Be exposed to concepts and properties of algebraic structures like groups, subgroups and cosets.
- To understand the concepts of Lattices and Boolean algebra.

TEXTBOOKS:

6. Kenneth H. Rosen . Dr. Kamala Krithivasan, "Discrete Mathematics and Its Applications", (SIE) | 8th Edition, McGraw Hill, Special Indian Edition, 2021.
7. Tremblay, J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill Pub. Co. Ltd, New Delhi 2017.

REFERENCE BOOKS:

5. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
6. Veerarajan. T, "Discrete Mathematics ,with graph theory and Combinatorics", McGraw Hill Publication Pvt Ltd. 2018.
7. Sivarama Krishna Dass.P & Vijayakumari. C "Discrete Mathematics" Person Education, 2020.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	2	-	-	-	-	-	-	-	-	1	-	-	1	-
2	3	3	3	-	-	-	-	-	1	-	-	1	-	-	1	-
3	3	3	2	-	-	-	-	-	1	-	-	1	-	-	1	-
4	3	3	2	-	-	-	-	-	-	-	-	1	-	-	1	-
5	3	3	3	-	-	-	-	-	1	-	-	1	-	-	1	-
Average	3.0	3.0	2.4	-	-	-	-	-	1.0	-	-	1.0	-	-	1.0	-

AD3361   DATA EXPLORATION AND VISUALIZATION   L T P C

                                                              3 0 0 3

OBJECTIVES:

- To outline an overview of exploratory data analysis
- To implement data visualization using Matplotlib
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT-I: EXPLORATORY DATA ANALYSIS   9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data - Comparing EDA with classical and Bayesian analysis – Software tools for EDA – Visual Aids for EDA – Data transformation techniques – merging database, reshaping and pivoting, Transformation techniques – Grouping Datasets – data aggregation – Pivot tables and cross- tabulations.

UNIT-II: VISUALIZING USING MATPLOTLIB   9

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotations – customization - Three-dimensional plotting – Geographic Data with Base map – Visualization with seaborn.

UNIT-III: UNIVARIATE ANALYSIS   9

Introduction to Single variable: Distributions and variables – Numerical Summaries of Level and Spread – Scaling and Standardizing – Inequality – Smoothing Time Series.

UNIT-IV: BIVARIATE ANALYSIS   9

Relationship between Two variables – Percentage Tables – Analyzing Contingency Tables - Handling Several Batches – Scatterplots and Resistant Lines – Transformations.

UNIT-V: MULTIVARIATE AND TIME SERIES ANALYSIS   9

Introducing a Third Variable – Casual Explanations – Three-Variable Contingency Tables and Beyond – Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

                                                TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the fundamentals of exploratory data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016.
3. Catherine Marsh, Jane Elliott , "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Eric Pimpler, "Data Visualization and Exploration with R", Geospatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition , CRC press, 2015.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	3	3	-	-	-	-	-	-	2	-	2	-	-	2
2	2	3	-	3	-	-	-	-	-	2	-	-	-	1	-	-
3	2	-		1	1	-	-	-	3	-	-	2	2	-	2	-
4	-	2	2	1	-	-	-	-	-	2	-	-	1	-	-	3
5	3	-	1	-	1	-	-	-	-	-	-	-	2	-	-	-
Average	2.3	2.5	2.0	2.0	1.0	-	-	-	3.0	2.0	2.0	2.0	1.8	1.0	2.0	2.5

AD3362   **DATABASE DESIGN AND MANAGEMENT**   **L T P C**

                                                                3 0 0 3

OBJECTIVES:

- To introduce database development life cycle and conceptual modeling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization
- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT-I: CONCEPTUAL DATA MODELING   8

Database environment – Database system development lifecycle – Requirements collection – Database design -- Entity-Relationship model – Enhanced-ER model – UML class diagrams.

UNIT-II: RELATIONAL MODEL AND SQL   10

Relational model concepts - Integrity constraints - SQL Data manipulation – SQL Data definition – Views - SQL programming.

UNIT-III: RELATIONAL DATABASE DESIGN AND NORMALIZATION   10

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT-IV: TRANSACTION MANAGEMENT   8

Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two-phase locking techniques.

UNIT-V: OBJECT RELATIONAL AND NO-SQL DATABASES   9

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

                                                    TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the database development life cycle and apply conceptual modeling
- Apply SQL and programming in SQL to create, manipulate and query the database
- Apply the conceptual-to-relational mapping and normalization to design relational database
- Determine the serializability of any non-serial schedule using concurrency techniques
- Apply the data model and querying in Object-relational and No-SQL databases.

TEXT BOOKS:

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems – A Practical Approach to Design, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2017.

REFERENCE BOOKS:

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING AND DESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts'', 6th Edition, Tata Mc Graw Hill, 2011.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:The Complete Book", 2nd edition, Pearson.
5. Raghu Ramakrishnan, "Database Management Systems'', 4th Edition, Tata Mc Graw Hill, 2010.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	3	3	-	-	-	-	-	1	-	-	3	2	-	-
2	-	3	1	-	1	-	-	-	-	2	-	-	2	-	-	1
3	2	-	-	1	-	-	-	-	-	-	1	-	2	-	-	-
4	-	2	3	-	-	-	-	-	1	-	-	2	2	-	2	-
5	3	-	2	-	-	-	-	-	1	-	-	-	2	1	-	1
Average	2.3	2.5	2.3	2.0	1.0	-	-	-	1.0	1.5	1.0	2.0	1.2	1.5	2	1.0

AD3363   DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION   L T P C

3 0 0 3

OBJECTIVES:

- To analyze and design combinational circuits.
- To analyze and design sequential circuits.
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT-I: COMBINATIONAL LOGIC   9

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers - Demultiplexers.

UNIT-II: SYNCHRONOUS SEQUENTIAL LOGIC   9

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters..

UNIT-III: COMPUTER FUNDAMENTALS   9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT-IV: PROCESSOR   9

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT-V: MEMORY AND I/O   9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design various combinational digital circuits using logic gates
- Design sequential circuits and analyze the design procedures
- State the fundamentals of computer systems and analyze the execution of an instruction
- Analyze different types of control design and identify hazards
- Identify the characteristics of various memory systems and I/O communication.

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	3	2	2	1	1	-	-	-	-	1	-	2	-
2	3	-	3	-	-	-	-	-	1	1	-	-	2	-	-	-
3	-	3	-	-	-	2	-	-	-	1	-	3	1	-	2	-
4	-	2	-	2	-	-	-	-	-	-	-	-	2	-	-	-
5	2	-	2	-	-	2	1	-	1	-	-	2	1	-	2	-
Average	2.7	2.5	2.5	2.5	2.0	2.0	1.0	1.0	1.0	1.0	-	2.5	1.5	-	2.0	-

IT3361   **PROGRAMMING AND DATA STRUCTURES**   **L T P C**

                                                                         3 0 0 3

OBJECTIVES:

- To introduce the fundamentals of C programming language
- To learn the concepts of Arrays and Pointers in C
- To learn about the basics of data structure
- To know the concepts of linear data structures
- To get familiarize the concepts of non-linear data structures

UNIT-I: INTRODUCTION TO C PROGRAMMING   9

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Arrays – Single and Multi-Dimensional Arrays.

UNIT-II: ADVANCED CONCEPTS IN C   9

Functions – Recursive Functions, Parameter Passing Techniques, Pointer - Pointer to Structure, Structures.

UNIT-III: LINEAR DATA STRUCTURES   9

Introduction to Data Structures- Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.

UNIT-IV: NON LINEAR DATA STRUCTURES - TREES   9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – binary search tree ADT – applications of trees. Implementation of Binary search tree and its operations, tree traversal methods, finding height of the tree using C, AVL Trees.

UNIT-V: NON LINEAR DATA STRUCTURES – GRAPHS   9

Definition – Representation of Graph – Breadth-first traversal - Depth-first traversal – Topologial Sort – Dynamic programming Technique – Warshall's and Floyd's algorithm – Greedy method – Dijkstra's algorithm – applications of graphs. Implementation of graph, graph traversal methods, finding shortest path using Dijkstra's algorithm in C.

                                                        TOTAL: 45 PERIODS

OUTCOMES:

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

- Develop C programs for any real world or technical problem.

- Apply the advanced features of C in problem solving.

- Apply the different linear data structures to problem solutions.

- Apply the different non-linear data structures to problem solutions.

- Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.

TEXT BOOKS:

1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0. (Unit-I and Unit-II)

2. Reema Thareja, "Data Structures Using C", Second Edition , Oxford University Press, 2011 (Unit-III, IV and V).

REFERENCE BOOKS:

1. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6. (Unit-I and Unit-II)

2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983. (Unit-III, IV and V)

3. Byron Gottfried, Jitender Chhabra, "Programming with C" (Schaum's Outlines Series), Mcgraw Hill Higher Ed., III Edition, 2010. (Unit-I and Unit-II)

4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008. (Unit-III, IV and V)

5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002 (Unit-III).

CO	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
1	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-	-
2	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-	-
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-	-
4	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-	-
5	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-	-
Average	**3.0**	**2.8**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**2.0**	**-**	**-**

CS3363   **SOFTWARE ENGINEERING**   **L T P C**

                                                               3 0 0 3

OBJECTIVES:

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering
- To Understand Analysis Modeling.
- To understand the various software design methodologies.
- To learn various testing and maintenance measures.

UNIT-I: SOFTWARE PROCESS AND AGILE DEVELOPMENT   9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process   Models –Introduction to Agility-Agile process-Extreme programming-XPProcess-Quality management-SQA-SQA plan

UNIT-II: REQUIREMENTS ANALYSIS AND SPECIFICATION   9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets-Data Dictionary.

UNIT-III: SOFTWARE DESIGN   9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT-IV: TESTING AND MAINTENANCE   9

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNIT-V: PROJECT MANAGEMENT   9

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the key activities in managing a software project, project schedule, estimate project cost and effort required.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition,2010.
2. Ian Sommerville, "SoftwareEngineering", 9th Edition, Pearson Education Asia, 2011.

REFERENCE BOOKS:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Pvt Limited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited,2007.
5. http://nptel.ac.in/.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	3	3	-	-	-	-	-	-	-	2	2	-	-	-
2	2	-	3	3	-	2	-	-	-	-	-	-	-	2	-	-
3	-	-	3	3	-	-	-	-	-	-	3	-	-	-	2	-
4	-	2	-	-	-	-	-	-	-	2	-	-	-	2	-	-
5	-	2	-	-	-	3	-	-	-	-	3	-	-	-	1	-
Average	2.0	2.0	3.0	3.0	-	2.5	-	-	-	2.0	3.0	2.0	2.0	2.0	1.5	-

AD3364   DATA EXPLORATION AND VISUALIZATION LABORATORY   L T P C
                                                                                                 0 0 3 1.5

OBJECTIVES:

- To understand the key techniques behind data visualization
- To learn about various visualization structures
- To evaluate the information visualization systems
- To design and build data visualization systems
- To analyze and identify trends in data sets

LIST OF EXPERIMENTS:

1. Install data Analysis and Visualization tools: R/Python/Tableau Public/Power BI.
2. Perform Exploratory Data Analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot Features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualizations techniques.
6. Perform Data Analysis and representation on a Map using Map data sets with Mouse Rollover effect, user interaction, etc.
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualizations techniques and present an analysis report.

                                                                                 TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the fundamentals of exploratory data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.

- Use Data exploration and visualization techniques for multivariate and time series data.

Hardware:

Standalone Desktops

Software:

Tools: R. Python, Tableau Public, Power BI, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly

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

AD3365   DATABASE DESIGN AND MANAGEMENT LABORATORY   L T P C

0 0 3 1.5

OBJECTIVES:

- To understand the database development life cycle
- To learn database design using conceptual modeling, Normalization
- To implement database using Data definition, Querying using SQL manipulation and SQL Programming
- To implement database applications using IDE/RAD tools
- To learn querying Object-relational databases

LIST OF EXPERIMENTS:

1. Database Development Life cycle:
    a. Problem definition and Requirement analysis
    b. Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach
    a. Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming
    a. Stored Procedures/Functions
    b. Constraints and security using Triggers
6. Database design using Normalization – bottom-up approach
7. Develop database applications using IDE/RAD tools (Eg. NetBeans,VisualStudio)
8. Database design using EER-to-ODB mapping / UML class diagrams
9. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
10. Querying the Object-relational database using Objet Query language

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the database development life cycle
- Design relational database using conceptual-to-relational mapping, Normalization

- Apply SQL for creation, manipulation and retrieval of data
- Develop a database applications for real-time problems
- Design and query object-relational databases

HARDWARE:
- Standalone Desktops

SOFTWARE:
- PostgreSQL

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	3	-	-	-	-	-	-	-	-	-	2	-	-	1
2	-	2	-	-	1	-	-	-	-	2	-	-	1	-	-	-
3	-	-	3	1	-	-	-	-	-	3	-	2	2	-	-	-
4	2	-	-	-	-	-	-	-	1	-	-	-	2	-	1	2
5	-	3	1	3	1	-	-	-	1	-	-	2	3	1	-	-
Average	2.5	2.5	2.3	2.0	1.0	-	-	-	1.0	2.5	-	2.0	2.0	1.0	1.0	1.5

IT3363   PROGRAMMING AND DATA STRUCTURES LABORATORY   L T P C
<div align="right">0 0 3 1.5</div>

OBJECTIVES:

- To develop C programs using basic constructs
- To implement Linear Data Structures
- To implement Non-Linear Data Structures
- To implement Tree Traversal Algorithms
- To implement Graph Traversal Algorithms

LIST OF EXPERIMENTS:

1. Implement C program using I/O Statements, Operators and Expressions
2. a. Decision-making constructs: if-else, goto, switch-case, break-continue

   b. Loops: for, while, do-while
3. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
4. Array implementation of Stack, Queue and Circular Queue ADTs
5. Implementation of Singly Linked List
6. Linked list implementation of Stack and Linear Queue ADTs
7. Implementation of Polynomial Manipulation using Linked list
8. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
9. Implementation of Binary Search Trees
10. Implementation of Tree Traversal Algorithms
11. Implementation of Graph Traversal Algorithms
12. Implementation of Dijkstra's Algorithm

<div align="right">TOTAL: 45 PERIODS</div>

OUTCOMES:

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

- Develop C programs for real world problems
- Implement Linear Data Structures and its applications
- Implement Non-Linear Data Structures and its applications.
- Implement Binary Search tree operations.
- Implement graph algorithms.

HARDWARE:

- Standalone Desktops

SOFTWARE:

- Turbo C

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	-	2	-	-	-	-	-	-	-	3	2	-	-
2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	-	-
3	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
4	3	-	-	-	-	-	-	-	-	-	-	-	3	2	-	-
5	3	3	3	-	2	-	-	-	-	-	-	-	3	2	-	-
Average	2.6	2.3	3.0	-	2.0	-	-	-	-	-	-	-	3.0	2.3	-	-

MA3428   **APPLIED MATHEMATICS FOR DATA SCIENCE**   **L T P C**

2 0 0 2

OBJECTIVES:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To introduce the concepts of estimation theory
- To acquaint the knowledge of non- parametric tests which plays an important role in real life problems.
- To acquaint the knowledge of statistical quality control

UNIT-I: RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS   6L

Discrete and continuous random variables – Binomial, Poisson and Normal distribution

UNIT-II: TWO- DIMENSIONAL RANDOM VARIABLES   6L

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression.

UNIT-III: ESTIMATION THEORY   6L

Unbiased estimators - Efficiency - Consistency - Sufficiency - Robustness - Method of moments - Method of maximum Likelihood

UNIT-IV: NON- PARAMETRIC TESTS   6L

Introduction- Rank - sum tests - The U test - The H test -- The Kolmogorov Tests

UNIT-V: STATISTICAL QUALITY CONTROL   6L

Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 30L PERIODS

OUTCOMES:

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

- Understand the fundamental knowledge of the concepts of one dimensional random variables and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of two dimensional random variables and apply them to model engineering problems.

- Understand and apply the concept of estimation theory
- Demonstrate accurate and efficient use of non-parametric tests.
- Apply the basic concepts of statistical quality control used in engineering and management problems.

TEXT BOOKS:

1. Richard I. Levin, David S. Rubin, Masood H. Siddiqui, Sanjay Rastogi, "Statistics for Management", Pearson Education, 8th Edition, 2017.
2. Johnson. R.A., Miller. I.R and Freund. J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
3. John E. Freund, "Mathematical Statistics", Prentice Hall, 5th Edition, 1992.

REFERENCE BOOKS:

1. Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
3. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014
4. Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5 th Edition, Elsevier, 2014.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-
2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-
3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-
4	3	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-
5	3	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-
Average	3.0	3.0	3.0	-	-	-	-	-	-	-	-	-	-	-	1.0	-

AD3461   ARTIFICIAL INTELLIGENCE I   L T P C

3 0 0 3

OBJECTIVES:

The objective of this course is to enable the students to

- Understand the basic concepts of Intelligent agents
- Develop general-purpose problem solving agents.
- Understand the Game theory and Constraint Satisfaction Problems
- Learn about logical reasoning agents, and agents that reason under uncertainty
- Employ AI techniques to represent Knowledge and Planning

UNIT-I: INTELLIGENT AGENTS   9

Introduction to AI – Agents and Environments – Concept of Rationality – Nature of Environments – Structure of Agents – Problem solving agents – Search Algorithms – Uninformed Search Strategies.

UNIT-II: PROBLEM SOLVING   9

Informed (Heuristic) Search Strategies – Heuristic functions - Local search and optimization problems – Local search in continuous space – Search with non-deterministic actions – Search in partially observable environments – Online search agents and Unknown environments.

UNIT-III: GAME PLAYING AND CSP   9

Game theory – Optimal decisions in games – Alpha-beta search – Monte-carlo tree search – Stochastic games – Partially observable games – Constraint Satisfaction Problems – Constraint propagation – Backtracking search for CSP – Local search for CSP – Structure of CSP.

UNIT-IV: LOGICAL AGENTS   9

Knowledge-based agents – Propositional logic – Propositional theorem proving – Propositional model checking – Agents based on propositional logic – First-order logic – Syntax and semantics – Knowledge representation and engineering – Inferences in first-order logic – Forward chaining – Backward chaining – Resolution.

UNIT-V: KNOWLEDGE REPRESENTATION AND PLANNING   9

Ontological engineering – Categories and objects – Events – Mental objects and modal logic – Reasoning systems for categories – Reasoning with default information – Classical

planning – Algorithms for classical planning – Heuristics for planning – Hierarchical planning – Non-deterministic domains – Time, schedule, and resources – Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain Intelligent agents that make effective decisions
- Choose appropriate algorithms for solving given AI problems
- Solve problems in Games and Constraint Satisfaction Problems
- Design and implement logical reasoning agents
- Design methods to represent Knowledge and Planning

TEXT BOOK:

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCE BOOKS:

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert System", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)
5. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases - by Dennis Rothman, 2018

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	3	3	-	-	-	-	2	-	-	-	-	1	-	1
2	2	2	-	-	1	-	-	-	-	-	3	-	-	2	-	2
3	2	-	2	1	-	-	-	-	2	-	-	3	2	2	-	1
4	-	-	2	2	-	-	-	-	2	1	2	2	-	3	-	3
5	-	2	-	-	1	-	-	-	-	-	1	-	2	2	-	1
Average	2.3	2.0	2.3	2.0	1.0	-	-	-	2.0	1.0	2.0	1.5	2.0	2.0	-	1.4

AD3462   DATA AND INFORMATION SECURITY   **L P T C**

                                                                 3 0 0 3

OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT-I: INTRODUCTION   9

History, what is Information Security? Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT-II: SECURITY INVESTIGATION   9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT-III: DIGITAL SIGNATURE AND AUTHENTICATION   9

Digital Signature and Authentication Schemes: Digital signature-Digital Signature Schemes and their Variants- Digital Signature Standards-Authentication: Overview-Requirements Protocols - Applications - Kerberos -X.509 Directory Services 83.

UNIT-IV: E-MAIL AND IP SECURITY   9

E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview-Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.

UNIT-V: WEB SECURITY   9

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure Communication-Protocols - Transport Level Security. Secure Electronic Transaction-Entities DS Verification-SET processing.

                                                    TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the basics of data and information security
- Understand the legal, ethical and professional issues in information security
- Understand the various authentication schemes to simulate different applications.
- Understand various security practices and system security standards
- Understand the Web security protocols for E-Commerce applications

TEXT BOOKS:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", 6th Edition, 2017.
2. Stallings William. "Cryptography and Network Security: Principles and Practice", Seventh Edition, Pearson Education, 2017

REFERENCE BOOKS:

1. Micki Krause Nozaki, Harold F. Tipton, "Information Security Management Handbook", Vol 6, 6th Edition, 2016.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, Seventh Edition, 2012.
3. Matt Bishop, "Computer Security Art and Science", Addison Wesley Reprint Edition, 2015.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	2	-	-	-	-	-	-	-	3	3	-	1	-
2	-	2	-	2	2	-	-	-	-	-	-	-	3	-	3	-
3	-	-	3	-	1	-	-	-	3	-	1	-	1	-	2	2
4	-	3	1	-	-	-	-	-	-	-	-	3	1	-	1	-
5	3	-	-	-	2	-	-	-	-	-	-	-	2	-	2	2
Average	3.0	2.5	2.0	2.0	1.7	-	-	-	3.0	-	1.0	3.0	2.0	-	1.8	2.0

AD3463   DATA COMMUNICATION AND NETWORKS   L T P C

3 0 0 3

OBJECTIVES:

• To understand the concept of layering in networks.

• To know the functions of protocols of each layer of TCP/IP protocol suite

• To visualize the end-to-end flow of information.

• To learn the functions of network layer and the various routing protocols

• To familiarize the functions and protocols of the Transport layer

UNIT-I: INTRODUCTION AND APPLICATION LAYER   10

 Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP

UNIT-II: TRANSPORT LAYER   9

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service.

UNIT-III: NETWORK LAYER   7

Switching: Packet Switching - Internet protocol - IPV4 – IP Addressing – Sub netting - IPV6, ARP, RARP, ICMP, DHCP.

UNIT-IV: ROUTING   7

Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP – PIM.

UNIT-V: DATA LINK AND PHYSICAL LAYERS   12

Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.

TOTAL: 45 PERIODS

OUTCOMES:

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

• Explain the basic layers and its functions in computer networks.

- Understand the basics of how data flows from one node to another.
- Analyze routing algorithms.
- Describe protocols for various functions in the network.
- Analyze the working of various application layer protocols.

TEXT BOOKS:

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Eighth Edition, Pearson Education, 2021.
2. Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP Protocol Suite", Sixth Edition TMH, 2022

REFERENCE BOOKS:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, "Computer and Communication Networks", Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	2	3	-	-	-	-	-	-	-	-	3	-	1	-
2	3	2	-	-	2	-	-	-	-	-	-	-	3	-	3	-
3	-	-	3	-	1	-	-	-	3	-	1	2	1	-	3	-
4	-	-	1	3	-	-	-	-	-	-	-	-	1	-	1	-
5	3	3	-	1	-	-	-	-	-	-	-	2	2	-	2	-
Average	3.0	2.5	2.0	2.3	1.5	-	-	-	3.0	-	1.0	2.0	2.0	-	2.0	-

AD3464   FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS   L T P C
                                                                                3 0 0 3

OBJECTIVES:

- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications
- To understand inferential data analytics
- To analysis and build predictive models from data

UNIT-I: INTRODUCTION TO DATA SCIENCE   8

Need for data science - benefits and uses - facets of data - data science process - setting the research goal - retrieving data - cleansing, integrating, and transforming data - exploratory data analysis - build the models - presenting and building applications.

UNIT-II: DESCRIPTIVE ANALYTICS   10

Frequency distributions - Outliers - interpreting distributions – graphs - averages – describing variability - interquartile range - variability for qualitative and ranked data - Normal distributions - z scores – correlation - scatter plots – regression - regression line - least squares regression line - standard error of estimate - interpretation of r2 - multiple regression equations - regression toward the mean.

UNIT-III: INFERENTIAL STATISTICS   9

Populations – samples - random sampling - Sampling distribution - standard error of the mean - Hypothesis testing - z-test - z-test procedure - decision rule – calculations - decisions - interpretations - one-tailed and two-tailed tests – Estimation - point estimate - confidence interval - level of confidence - effect of sample size.

UNIT-IV: ANALYSIS OF VARIANCE   9

t-test for one sample - sampling distribution of t - t-test procedure - t-test for two independent samples - p-value - statistical significance - t-test for two related samples. F-test – ANOVA – Two-factor experiments - three f-tests - two-factor ANOVA - Introduction to chi-square tests.

UNIT-V: **PREDICTIVE ANALYTICS**   **9**

Linear least squares - implementation - goodness of fit - testing a linear model - weighted resampling. Regression using Stats Models - multiple regression - nonlinear relationships - logistic regression - estimating parameters - Time series analysis - moving averages - missing values - serial correlation - autocorrelation. Introduction to survival analysis.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the data analytics pipeline
- Describe and visualize data
- Perform statistical inferences from data
- Analyze the variance in the data
- Build models for predictive analytics

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCE BOOKS:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, "Fundamentals of Data Science", CRC Press, 2022.
3. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.
4. Vineet Raina, Srinath Krishnamurthy, "Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice", Apress, 2021.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	1	-	2	1	-	-	-	-	-	-	-	2	3	-	-	1
2	1	-	2	-	2	-	-	-	2	2	-	-	3	1	-	-
3	-	-	3	-	1	-	-	-	-	-	-	-	2	-	-	1
4	-	3	-	3	-	-	-	-	-	-	3	3	3	2	-	-
5	2	-	-	1	-	-	-	-	1	-	-	-	2	-	-	2
Average	1.3	3.0	2.3	1.7	1.5	-	-	-	1.5	2.0	3.0	2.5	2.6	1.5	-	1.3

IT3461   OPERATING SYSTEMS   L T P C

3 0 0 3

OBJECTIVES:

- To learn the basic concepts and functions of operating systems.
- To analyze scheduling algorithms and Deadlock.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with Mobile OS and Linux OS

UNIT-I: INTRODUCTION   9

Introduction to Operating System: Operating System Operations- Operating System Structures: Operating System-Services - User Operating System Interface - System Calls – System programs – Operating System Structure (monolithic, layered, modular, micro-kernel models).

UNIT-II: PROCESS MANAGEMENT   9

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Process Synchronization - The Critical-Section problem –Semaphores, Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT-III: MEMORY MANAGEMENT   9

Main Memory: Swapping- Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Virtual Memory - Demand Paging – Copy on Write – Page Replacement - Allocation of Frames –Thrashing.

UNIT-IV: STORAGE MANAGEMENT   9

File-System Interface -File concept - Access methods - Directory Structure – Protection. - File System Implementation - File System Structure – File System Operations - Directory implementation - Allocation Methods - Free Space Management; Mass Storage system – Disk Structure - Disk Scheduling –Disk Management- Swap-Space Management.

UNIT-V: MOBILE OS AND CASE STUDIES   9

Mobile OS - iOS and Android. The Linux System: Design Principles-Kernel Modules-

Process Management-Scheduling-Memory Management-File Systems - Input and Output- Inter process communication.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze various main concepts, key ideas, strengths and limitations of operating systems.
- Design various scheduling algorithms.
- Design and implement memory management schemes
- Understand various file management systems
- Understand the Mobile OS and Linux

TEXT BOOKS:

1. Silberschatz Abraham, Greg Gagne, Peter B. Galvin, "Operating System Concepts", Ninth Edition, Wiley, 2014.(Unit-I-V)
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.(Unit-II,III,IV).

REFERENCE BOOKS:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	2	2	-	-	-	-	-	-	-	-	-	2	-	-
2	2	2	3	1	-	-	-	-	-	-	-	-	-	2	-	-
3	1	3	2	2	1	-	-	-	-	-	-	-	-	2	-	-
4	1	3	3	3	-	-	-	-	-	-	-	-	-	2	-	-
5	3	1	2	1	1	-	-	-	-	-	-	-	-	2	-	-
Average	2.0	2.0	2.4	1.8	1.0	-	-	-	-	-	-	-	-	2.0	-	-

GE3451   **NCC Credit Course Level - I**   **L T P C**

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

OBJECTIVES:

- To know the basic structure of NCC and Role of NCC
- To improve the cadet's personality skill and leadership quality
- To make the interest of cadets to involve in social activities
- Preventing the potential damage and suffering
- 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 mark sheet, however the same shall not be considered for the computation of CGPA

OUTCOMES:

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

- Understand their roles and responsibilities
- Demonstrate the knowledge of human values and morals
- Actively participate in social service and development activities
- Understand the importance of disaster management
- 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 BOOKS:

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

AD3465   ARTIFICIAL INTELLIGENCE – I LABORATORY   L T P C

0 0 3 1.5

OBJECTIVES:

- Understand simple PEAS descriptions for given AI tasks.

- Apply and implement simulated annealing and genetic algorithms.

- Solve problems using searching and backtracking.

- Design and Implement simple reasoning systems using inference mechanisms.

- Understand the Implementation of inference mechanisms and planning algorithms.

LIST OF EXPERIMENTS:

1. Develop PEAS descriptions for given AI tasks
2. Study of PROLOG
3. Implement basic search strategies for selected AI applications
4. Implement A* and memory bounded A* algorithms
5. Implement genetic algorithms for AI tasks
6. Implement simulated annealing algorithms for AI tasks
7. Implement alpha-beta tree search
8. Implement backtracking algorithms for CSP
9. Implement local search algorithms for CSP
10. Implement propositional logic inferences for AI tasks
11. Implement resolution based first order logic inferences for AI tasks
12. Implement classical planning algorithms

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Implement simple PEAS descriptions for given AI tasks.

- Develop programs to implement simulated annealing and genetic algorithms.

- Demonstrate the ability to solve problems using searching and backtracking.

- Ability to Implement simple reasoning systems using inference mechanisms.

- Will be able to choose and implement planning algorithms.

SOFTWARE:

- Python, PROLOG, C++ or Java Software

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	-	3	-	-	-	-	-	-	-	1	2	2	-	-
2	-	2	-	3	-	-	-	-	-	2	-	-	1	3	-	-
3	3	-	3	-	1	-	-	-	1	-	-	-	-	1	-	3
4	-	-	-	1	1	-	-	-	2	-	-	-	-	2	-	1
5	3	-	-	-	1	-	-	-	-	-	2	3	3	3	-	-
Average	2.7	2.0	3.0	2.3	1.0	-	-	-	1.5	2.0	2.0	2.0	2.0	2.2	-	2.0

AD3466   DATA COMMUNICATION AND NETWORKS LAB   L T P C

                                                        0 0 3 1.5

OBJECTIVES:

- To understand examine the network protocol and analyser
- To learn to implement TCP sockets
- To visualize the Simulation of DNS
- To build simulating ARP /RARP protocols
- To study Network simulator

LIST OF EXPERIMENTS:

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyser and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like: a) Echo client and echo server b) Chat
4. Simulation of DNS using UDP sockets.
5. Use a tool like Wireshark to capture packets and examine the packets
6. Write a code simulating ARP / RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC).

                                                      TOTAL: 45 PERIODS

List of Equipment: (30 Students per Batch)

    Java, HTML5, NS2 simulator (Open source software)

OUTCOMES:

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

- Understand and examine the network protocol and analyzer

- Learn and implement TCP sockets.

- Visualize the Simulation of DNS.

- Build simulating ARP /RARP protocols

- Experience the Network simulator.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	-	3	-	-	-	-	-	-	-	-	3	-	1	-
2	-	2	-	2	2	-	-	-	-	-	-	-	3	-	3	-
3	2	-	3	-	1	-	-	-	3	-	1	-	-	-	3	-
4	-	3	-	3	-	-	-	-	-	-	-	3	-	-	1	-
5	3	-	-	1	2	-	-	-	-	-	-	-	2	-	2	-
Average	2.7	2.5	3.0	2.3	2.5	-	-	-	3.0	-	1.0	3.0	2.7	-	2.0	-

AD3467   **DATA SCIENCE AND ANALYTICS LABORATORY**   **L T P C**

                                                            0 0 3 1.5

OBJECTIVES:

- To develop data analytic code in python
- To be able to use python libraries for handling data
- To develop analytical applications using python
- To perform data visualization using plots

LIST OF EXPERIMENTS:

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

1. Working with Numpy arrays
2. Working with Pandas data frames
3. Basic plots using Matplotlib
4. Frequency distributions, Averages, Variability
5. Normal curves, Correlation and scatter plots, Correlation coefficient
6. Regression
7. Z-test
8. T-test
9. ANOVA
10. Building and validating linear models
11. Building and validating logistic models
12. Time series analysis

                                                     TOTAL: 45 PERIODS

OUTCOMES:

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

- Write python programs to handle data using Numpy and Pandas
- Perform descriptive analytics
- Perform data exploration using Matplotlib
- Perform inferential data analytics
- Build models of predictive analytics

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	-	3	-	-	-	-	-	-	-	-	3	2	-	-
2	-	2	-	-	2	-	-	-	1	-	3	-	3	2	-	1
3	2	-	-	2	-	-	-	-	3	-	-	2	2	3	-	-
4	-	3	-	-	2	-	-	-	-	3	-	-	2	1	-	3
5	3	-	1	-	2	-	-	-	1	-	-	3	2	2	-	-
Average	2.3	2.5	1.0	2.5	2.0	-	-	-	1.7	3.0	3.0	2.5	2.4	2.0	-	2.0