

**St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING
Chunkankadai, Nagercoil – 629 003.**

AUTONOMOUS COLLEGE AFFILIATED TO ANNA UNIVERSITY

ACADEMIC REGULATIONS 2022

B. TECH. ARTIFICIAL INTELLIGENCE & DATA SCIENCE CURRICULUM

CHOICE BASED CREDIT SYSTEM

Inconsonance to the vision of our College,

An engineering graduate we form would be a person with optimal human development, i.e. physical, mental, emotional, social and spiritual spheres of personality.

He/she would be also a person mature in relationships, especially knowing how to treat everyone with respect, including persons of complementary gender with equality and gender sensitivity guided by clear and pro-social values.

He would be patriotic and would hold the Indian Constitution and all the precepts it outlays close to his heart and would have a secular spirit committed to safeguard and cherish the multi-cultural, multi-religious and multi-linguistic ethos of Indian Society.

Academically, he/she would be a graduate with a strong engineering foundation with proficient technical knowledge and skills. He would have enough exposure and experience into the ethos of relevant industry and be industry ready to construct a successful career for himself and for the benefit of the society.

He would have been well trained in research methodology and would have established himself as a researcher having taken up many research projects, with sound ethical standards and social relevance. He would be a person with a passion for technical innovations committed to lifelong learning and research.

He would be well prepared and confident to develop ingenious solutions to the problems people face as an individual and as a team and work for the emancipation of our society with leadership and courage.

Artificial Intelligence and Data Science is a demanding programme due to the fastest growing industries in the world today. This curriculum aims to create accomplished, innovative and ethical data scientist who will lead the way in finding problems and solving them when they move into the industry or as entrepreneurs.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

1. Utilize their proficiencies in the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to build systems that require management and analysis of large volumes of data.
2. Advance their technical skills to pursue pioneering research in the field of AI and Data Science and create disruptive and sustainable solutions for the welfare of ecosystems.
3. Think logically, pursue lifelong learning and collaborate with an ethical attitude in a multidisciplinary team.
4. Design and model AI based solutions to critical problem domains in the real world.
5. Exhibit innovative thoughts and creative ideas for effective contribution towards economy building.

II. PROGRAMME OUTCOMES (POs)

PO	Graduate Attribute
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of 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 modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

III. PROGRAMME SPECIFIC OUTCOMES (PSOs)

Graduates should be able to:

- Evolve AI based efficient domain specific processes for effective decision making in several domains such as business and engineering problems.
- Create, select and apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve wicked societal problems
- Develop fundamental research to cater the critical needs of the society through cutting edge technologies of AI.

PEO's – PO's & PSO's MAPPING:

PEO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I.	3	2											3		
II.	3	3	3	2								2		3	2
III.			3			1		1	1			3		3	
IV.			3		1	2	3						3		3
V.				3				1	1	2	2	1	1	2	2

PROGRAMME ARTICULATION MATRIX

Year	Seme ster	Course name	PO												PSO			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
I	I	MA22101	3	2	-	-	-	-	-	-	-	-	-	-	1	-	-	3
		PH22101	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
		CH22101	3	2	2	1	-	-	2	-	-	-	-	1	-	-	-	
		CS22101	3	3	3	3	-	-	-	-	-	-	-	1	-	-	3	
		HS22102	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-	
		EN22101	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-	
		BS22101	3	1	-	-	-	2	2	-	2	1	-	1	-	-	-	
		CS22102	3	3	3	3	2	-	-	-	-	-	-	1	3	-	-	
		HS22101	3	2	2	1	-	-	1	-	1	-	1	1	-	-	2	
I	II	MA22201	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3	
		ES22202	2	1	-	-	-	-	-	-	2	1	-	1	-	-	-	
		AD22201	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-	
		ME22201	3	1	-	-	-	-	-	-	-	2	-	-	-	2	-	
		EN22201	-	-	-	-	-	-	-	-	-	2	3	-	2	-	-	

		PH22203	2	2	-	-	-	1	-	-	-	-	-	1	2	2	-		
		CH22201	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-		
		AD22202	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-		
		ES22203	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-		
		GE3152	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-		
II	I	MA22302	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3		
		AD22301	3	2	2	2	2	-	-	-	2	2	2	2	2	2	2	2	
		AD22302	2	2	2	2	1	-	-	-	2	2	1	1	2	2	2	2	
		AD22303	3	3	3	3	3	2	-	-	2	1	2	3	3	2	2	1	
		AD22304	2	1	2	2	1	-	-	-	2	2	2	2	2	2	2	2	2
		SD22301	3	2	2	-	1	1	1	1	2	3	1	2	2	2	2	2	2
		HS22301	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-	-	-
		AC22301	-	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-
		GE3252	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
II	II	MA22401	3	2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	
		AD22401	2	2	2	2	1	-	-	-	2	2	2	2	2	2	1	2	2
		AD22402	2	1	2	2	1	-	-	-	2	2	2	2	2	2	2	2	2
		AD22403	1	1	2	2	2	-	-	-	3	2	2	2	3	2	2	1	1
		AD22404	3	3	3	3	1	2	1	1	1	1	1	1	2	1	2	2	1
		SD22401	3	2	2	-	1	1	1	1	2	3	1	2	2	2	2	2	2
		AC22401	2	1	2	-	-	2	1	-	-	-	-	-	1	-	2	-	-
III	I	AD22501	3	3	3	3	-	2	-	-	-	-	-	-	3	-	-	-	
		AD22502	3	3	3	3	-	2	-	-	-	-	-	-	3	-	-	-	
		AD22504	-	-	-	-	-	-	-	-	3	3	2	2	-	2	-	-	-
		AD22505	3	3	3	3	3	2	2	1	3	3	3	2	3	2	2	2	2
		SD22501	3	2	2	-	2	-	-	-	-	-	-	-	2	2	-	2	2
		AC22501	-	-	-	-	-	-	-	-	2	2	3	3	2	-	2	-	-

		HS22501	-	-	-	-	-	-	2	3	2	-	-	2	-	2	-
III	II	HS22601	-	-	-	-	-	-	-	2	2	3	3	2	-	2	-
		AD22601	3	3	3	-	1	-	-	-	-	-	-	-	3	-	-
		AD22602	3	1	1	-	3	-	-	-	-	-	-	-	3	-	-
		SD22601	3	2	2	-	2	-	-	-	-	-	-	-	2	-	1
IV	I	MS22701	-	-	-	-	-	-	-	2	2	3	3	2	-	2	-
		AD22701	3	3	3	3	3	2	2	1	3	3	3	2	3	2	2
		SD22701	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
IV	II	AD22801	3	3	3	3	3	2	2	1	3	3	3	2	3	2	2

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDI TS
				L	T	P		
THEORY COURSES								
1.	MA22101	Matrices and Calculus	BSC	3	1	0	4	4
2.	PH22101	Engineering Physics	BSC	3	0	0	3	3
3.	CH22101	Engineering Chemistry	BSC	3	0	0	3	3
4.	CS22101	Problem Solving and Python Programming	ESC	3	0	0	3	3
5.	HS22102	Universal Human Values: Understanding Harmony and Ethical Human Conduct	HSMC	2	0	0	2	2
THEORY COURSES WITH PRACTICAL COMPONENT								
6.	EN22101	Communicative English	HSMC	2	0	2	4	3
PRACTICAL COURSES								
7.	BS22101	Physics & Chemistry Laboratory	BSC	0	0	4	4	2
8.	CS22102	Python Programming Laboratory	ESC	0	0	4	4	2
MANDATORY COURSES								
9.	IP22101	Induction Programme	-	-	-	-	-	0
10.	HS22101	Higher Order Thinking	MC	1	0	0	1	1
TOTAL				17	1	10	28	23

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDI TS
				L	T	P		
THEORY COURSES								

1	MA22201	Statistics and Numerical Methods	BSC	3	1	0	4	4
2	ES22202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
3	AD22201	Data Structures and Algorithms using C	ESC	3	1	0	4	4
4	ME22201	Engineering Graphics	ESC	2	0	2	4	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	EN22201	Technical English	HSMC	2	0	2	4	3
6	PH22203	Physics for Information Science	BSC	2	0	2	4	3
7	CH22201	Environment and Sustainability	BSC	2	0	2	4	3
PRACTICAL COURSES								
8	AD22202	Data Structures and Algorithms using C Laboratory	ESC	0	0	4	4	2
9	ES22203	Engineering Practices Laboratory	ESC	0	0	4	4	2
MANDATORY COURSES								
10	GE3152	Heritage of Tamil	MC	1	0	0	1	1
TOTAL				18	2	16	36	28

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22302	Discrete Mathematics	BSC	3	1	0	4	4
THEORY COURSES WITH PRACTICAL COMPONENT								
2	AD22301	Design and Analysis of Algorithms	PCC	3	0	2	5	4
3	AD22302	Database Management Systems	PCC	3	0	2	5	4
4	AD22303	Web Technology	PCC	3	0	2	5	4
5	AD22304	Data Exploration and Visualization	PCC	3	0	2	5	4
EMPLOYABILITY ENHANCEMENT COURSES								

6	SD22301	Coding Skills and Soft Skills Training – Phase I	EEC	0	0	4	4	2
MANDATORY COURSES								
7	HS22301	Value Education	MC	1	0	0	1	0
8	AC22301	Constitution of India	AC	2	0	0	2	0
9	GE3252	Tamils and Technology	MC	1	0	0	1	1
TOTAL				19	1	12	32	23

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDI TS
				L	T	P		
THEORY COURSES								
1	MA22401	Probability and Statistical Techniques	BSC	3	1	0	4	4
THEORY COURSES WITH PRACTICAL COMPONENT								
2	AD22401	Operating Systems	PCC	3	0	2	5	4
3	AD22402	AI Methodologies	PCC	3	0	2	5	4
4	AD22403	Fundamentals of Data Science and Analytics	PCC	3	0	2	5	4
5	AD22404	Digital Principles and Computer Organization	PCC	3	0	2	5	4
EMPLOYABILITY ENHANCEMENT COURSES								
6	SD22401	Coding Skills and Soft Skills Training – Phase II	EEC	0	0	4	4	2
MANDATORY COURSES								
7	AC22401	Industrial Safety Engineering	AC	2	0	0	2	0
TOTAL				17	1	12	30	22

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDI TS
				L	T	P		
THEORY COURSES								
1	AD22501	Machine Learning	PCC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
2	AD22502	Introduction to Computer Networks	PCC	3	0	2	5	4
3		Professional Elective I	PEC	2	0	2	4	3
4		Professional Elective II	PEC	2	0	2	4	3
PRACTICAL COURSES								
5	AD22503	Machine Learning Laboratory	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
6	AD22504	Technical Seminar	EEC	0	0	2	2	1
7	AD22505	In plant / Industrial Training	EEC	-	-	-	-	1
8	SD22501	Coding Skills and Soft Skills Training – Phase III	EEC	0	0	4	4	2
MANDATORY COURSES								
9	AC22501	Entrepreneurship Development	AC	2	0	0	2	0
10	HS22501	Value Education	MC	1	0	0	1	0
TOTAL				13	0	16	29	19

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	HS22601	Professional Ethics	HSMC	3	0	0	3	3
2		Open Elective – I	OEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
3	AD22601	Deep Learning	PCC	3	0	2	5	4
4		Professional Elective III	PEC	2	0	2	4	3
5		Professional Elective IV	PEC	2	0	2	4	3
PRACTICAL COURSES WITH THEORY COMPONENT								
6	AD22602	Embedded Systems and IoT Laboratory	PCC	1	0	4	5	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	SD22601	Coding Skills, Logical Reasoning and Quantitative Aptitude Training – Phase I	EEC	0	0	4	4	2
TOTAL				14	0	14	28	21

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MS22701	Principles of Management	HSMC	3	0	0	3	3
2		Open Elective – II	OEC	3	0	0	3	3
3		Open Elective – III	OEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
4		Professional Elective V	PEC	2	0	2	4	3
5		Professional Elective VI	PEC	2	0	2	4	3
EMPLOYABILITY ENHANCEMENT COURSES								
6	AD22701	Mini Project	EEC	0	0	6	6	3
7	SD22701	Coding Skills, Logical Reasoning and Quantitative Aptitude Training – Phase II	EEC	0	0	4	4	2
TOTAL				13	0	14	27	20

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
EMPLOYABILITY ENHANCEMENT COURSES								
1	AD22801	Project Work / Internship	EEC	0	0	16	16	8
TOTAL				0	0	16	16	8

TOTAL CREDITS =164

* On successful completion of the final year, students will be able to apply theoretical and practical knowledge which leads to employability.

SUMMARY

B. TECH. ARTIFICIAL INTELLIGENCE & DATA SCIENCE										
S. No	Subject Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	5	3				3	3		14
2	BSC	12	10	4	4					30
3	ESC	5	14							19
4	PCC			16	16	9	7			48
5	PEC					6	6	6		18
6	OEC						3	6		9
7	EEC			2	2	4	2	5	8	23
8	MC	1	1	1		√				3
9	AC			√	√	√				0
Total		23	28	23	22	19	21	20	8	164

PROFESSIONAL ELECTIVE COURSES

LIST OF VERTICALS	
1.	DATA ANALYTICS
2.	DESIGN AND DEVELOPMENT
3.	CREATIVE MEDIA
4.	COMPUTING TECHNIQUES

Semester	VERTICAL 1	VERTICAL 2	VERTICAL 3	VERTICAL 4
		Data Analytics	Design and Development	Creative Media
5	Health Care Analytics	UI and UX Design	Augmented Reality/Virtual Reality	Parallel Computing
5	Engineering Predictive Analytics	Web Services and API Design	Multimedia and Animation	Cloud Computing Methods
6	Social Media Web Analytics	Mobile Application Development	Video Creation and Editing	Optimization Techniques

6	Text Analytics	Devops and Micro services	Visual Effects	Bio-inspired Optimization Techniques
7	Audio Analytics	Software Development Processes	Multimedia Data Compression and Storage	AI and Robotics
7	Business Data Analytics	Agile Methodologies	Digital Forensics	Artificial Neural Networks and its Applications

VERTICAL 1: DATA ANALYTICS

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	AD22511	Health Care Analytics	PEC-1	2	0	2	4	3
2.	AD22512	Engineering Predictive Analytics	PEC-2	2	0	2	4	3
3.	AD22611	Social Media Web Analytics	PEC-3	2	0	2	4	3
4.	AD22612	Text Analytics	PEC-4	2	0	2	4	3
5.	AD22711	Audio Analytics	PEC-5	2	0	2	4	3
6.	AD22712	Business Data Analytics	PEC-6	2	0	2	4	3

VERTICAL 2: DESIGN AND DEVELOPMENT

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	AD22521	UI and UX Design	PEC-1	2	0	2	4	3
2.	AD22522	Web Services and API Design	PEC-2	2	0	2	4	3
3.	AD22621	Mobile Application Development	PEC-3	2	0	2	4	3

4.	AD22622	Devops and Micro services	PEC-4	2	0	2	4	3
5.	AD22721	Software Development Processes	PEC-5	2	0	2	4	3
6.	AD22722	Agile Methodologies	PEC-6	2	0	2	4	3

VERTICAL 3: CREATIVE MEDIA

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	AD22531	Augmented Reality/Virtual Reality	PEC-1	2	0	2	4	3
2.	AD22532	Multimedia and Animation	PEC-2	2	0	2	4	3
3.	AD22631	Video Creation and Editing	PEC-3	2	0	2	4	3
4.	AD22632	Visual Effects	PEC-4	2	0	2	4	3
5.	AD22731	Multimedia Data Compression and Storage	PEC-5	2	0	2	4	3
6.	AD22732	Digital Forensics	PEC-6	2	0	2	4	3

VERTICAL 4: COMPUTING TECHNIQUES

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	AD22541	Parallel Computing	PEC-1	2	0	2	4	3
2.	AD22542	Cloud Computing Methods	PEC-2	2	0	2	4	3
3.	AD22641	Optimization Techniques	PEC-3	2	0	2	4	3
4.	AD22642	Bio-inspired Optimization Techniques	PEC-4	2	0	2	4	3

5.	AD22741	AI and Robotics	PEC-5	2	0	2	4	3
6.	AD22742	Artificial Neural Networks and its Applications	PEC-6	2	0	2	4	3

OPEN ELECTIVE TO BE OFFERED TO OTHER DEPARTMENT

OPEN ELECTIVE – I

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1	AD22681	Algorithm Analysis and Data Structures	OEC	3	0	0	3	3
2	AD22682	Introduction To AI And ML	OEC	3	0	0	3	3

OPEN ELECTIVE – II

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1	AD22781	Database Design and Indexing	OEC	3	0	0	3	3
2	AD22782	Introduction To Big Data	OEC	3	0	0	3	3

OPEN ELECTIVE – III

SI. No	Course code	Course Title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1	AD22783	Java Programming	OEC	3	0	0	3	3
2	AD22784	Local Economic Development	OEC	3	0	0	3	3

Syllabus

SEMESTER I

MA22101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To develop the use of matrix algebra techniques that is needed by engineers for practical applications 					
<ul style="list-style-type: none"> • To familiarize the students with differential calculus 					
<ul style="list-style-type: none"> • To familiarize the student with functions of several variables. This is needed in many branches of engineering 					
<ul style="list-style-type: none"> • To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications 					
<ul style="list-style-type: none"> • To make the students understand various techniques ODE 					
UNIT I	MATRICES	12			
Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Problem solving using Cayley-Hamilton method – Orthogonal transformation of a symmetric matrix to Diagonal form – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature, rank, index.					
UNIT II	DIFFERENTIAL CALCULUS	12			
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules: sum, product, quotient, chain rules - Implicit differentiation – Logarithmic differentiation – Applications: Maxima and Minima of functions of one variable.					
UNIT III	FUNCTIONS OF SEVERAL VARIABLES	12			
Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange’s method of undetermined multipliers.					
UNIT IV	MULTIPLE INTEGRALS	12			
Double integrals – Double integrals in Cartesian and polar coordinates –Area enclosed by plane curves - Change of order of integration – Triple integrals – Volume of solids: cube, rectangular parallelopiped.					
UNIT V	ORDINARY DIFFERENTIAL EQUATIONS	12			
Linear differential equations of second and higher order with constant coefficients when the R.H.S is e^{ax} , x^n , $\sin ax$, $\cos ax$, $e^{ax} x^n$, $e^{ax} \sin bx$, $e^{ax} \cos bx$ – Linear differential equations of second and third order with variable coefficients: Cauchy’s and Legendre’s linear equations –					

Method of variation of parameter .												
TOTAL: 60 PERIODS												
COURSE OUTCOMES:												
At the end of the course, the students will be able to:												
CO1:	Define the basic concepts of matrices, limit and continuity of a function, differentiation, ODE and integration											
CO2:	Explain the properties of matrices and nature of the quadratic form											
CO3:	Interpret the techniques of differentiation, partial differentiation, ODE and integration											
CO4:	Apply diagonalization of matrices in quadratic form and apply Cayley Hamilton theorem to find the inverse of matrices											
CO5:	Solve problems on differentiation, partial differentiation, integration and ODE using different methods											
TEXT BOOKS:												
1.	Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, Reprint 2017.											
2.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.											
REFERENCES:												
1.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.											
2.	Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.											
3.	Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.											
4.	Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.											
5.	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.											

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3

Table of Specification for End Semester Question Paper

MA22101- MATRICES AND CALCULUS

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Matrices	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)-CO4	-
Unit-II: Differential Calculus	2	1 either or	-	2(2)-CO3	1 either or (16)-CO5	-
Unit-III: Functions of several variables	2	1 either or	-	2(2)-CO3	1 either or (16)-CO5	-
Unit-IV: Multiple integrals	2	1 either or	-	2(2)-CO3	1 either or (16)-CO5	-
Unit-V: Ordinary differential equations	2	1 either or	-	2(2)-CO3	1 either or (16)-CO5	-
Total Qns.	10	5 either or	1(2)	9(2)	5 either or (16)	-
Total Marks	20	80	2	18	80	-
Weightage	20%	80%	2%	18%	80%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	2	2	16	16	64	
Weightage	2%	2%	16%	16%	64%	

PH22101	ENGINEERING PHYSICS				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology 								
<ul style="list-style-type: none"> To help the students to interrelate the topics such as properties of matter, thermal physics, 								

ultrasonics, quantum theory and crystals, learned in the course		
<ul style="list-style-type: none"> To motivate students to compare and contrast the available equipment in the respective fields 		
<ul style="list-style-type: none"> To induce the students to design new devices that serve humanity by applying the knowledge gained during the course 		
UNIT I	PROPERTIES OF MATTER	9
Elasticity – Types of Elastic moduli – Factors affecting elasticity - Stress-strain diagram and its uses - beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: determination of young’s modulus – I shaped Girders - twisting couple - torsion pendulum: determination of rigidity modulus and moment of inertia – torsion springs - other states of matter		
UNIT II	THERMAL PHYSICS	9
Modes of Heat transfer – Thermal conductivity – Newton’s law of cooling – Linear heat flow – Thermal conductivity in compound media - Lee’s Disc method – Radial heat flow – Rubber tube method – Solar water heater - Thermodynamics – Isothermal and adiabatic process – Otto cycle – Diesel cycle		
UNIT III	ULTRASONICS	9
Sound waves – ultrasonics – properties - production: magnetostriction method - piezoelectric method – cavitation - acoustic grating: wavelength and velocity of ultrasonic waves in liquids – applications: welding, machining, cleaning, soldering and mixing (qualitative) - SONAR – ultrasonic flaw detector - ultrasonography.		
UNIT IV	QUANTUM PHYSICS	9
Black body radiation – Planck’s radiation law – Deduction of Wien’s displacement law and Rayleigh Jean’s law - Compton effect, Photoelectric effect (qualitative) – matter waves – concept of wave function and its physical significance – Schrödinger’s wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – scanning tunneling microscope.		
UNIT V	CRYSTAL PHYSICS	9
Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, Crystal planes, directions and Miller indices – Characteristics of crystal structures: SC, BCC, FCC and HCP structures - crystal imperfections: point, line and surface defects – crystal growth : epitaxial and lithography techniques		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Recall the basics of properties of matter, thermal physics and ultrasonics, to improve their engineering knowledge.	
CO2:	Define the advanced physics concepts of quantum theory and the characteristics of crystalline materials.	

CO3:	Illustrate Bending of beams, thermal behavior and ultrasonic devices to assess societal and safety issues.
CO4:	Summarize the dual aspects of matter, crystal structures and imperfections of crystals.
CO5:	Apply the moduli of elasticity of different materials, thermal energy, ultrasonics, scanning tunneling microscope and crystal growth techniques in engineering fields.
TEXT BOOKS:	
1.	Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.
2.	Shatendra Sharma & Jyotsna Sharma, Engineering Physics, Pearson India Pvt Ltd., 2018
REFERENCES:	
1.	Halliday.D, Resnick, R. & Walker. J, “Principles of Physics”, Wiley, 2015.
2.	Bhattacharya, D.K. & Poonam.T., Engineering Physics, Oxford University Press, 2015.
3.	Pandey.B.K, & Chaturvedi.S, Engineering Physics, Cengage Learning India. 2012.
4.	Malik H K & Singh A K, “Engineering Physics”, McGraw Hill Education (India Pvt. Ltd.) 2 nd edition 2018.
5.	Serway.R.A. & Jewett, J.W, “Physics for Scientists and Engineers”, Cengage Learning India. 2010.

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-

Table of Specification for End Semester Question Paper

ENGINEERING PHYSICS (PH22101)

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit I - Properties of Matter	2	1 either or	1(2)-CO1	1(2)-CO3	1 either or (16)- CO5	-

Unit II - Thermal Physics	2	1 either or	1(2)-CO1	1(2)- CO3	1 either or (16)- CO5	-
Unit III - Ultrasonics	2	1 either or	2(2)-CO1	-	1 either or (16)- CO5	-
Unit IV - Quantum Physics	2	1 either or	1(2)-CO2	1 (2)- CO4 1 either or (16)- CO4	-	-
Unit V - Crystal Physics	2	1 either or	2(2)-CO2	1 either or (16)- CO4	-	-
Total Qns.	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	8	6	4	34	48	
Weightage	8%	6%	4%	34%	48%	

CH22101	ENGINEERING CHEMISTRY				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To make the students conversant with water treatment methods and electrochemistry concept To gain basic knowledge of corrosion and protection methods To understand the basic concepts and synthesis of various engineering materials, nano materials and fuels To familiarise the students with the principles, working process and application of energy storage devices 								
UNIT I	WATER TREATMENT							9
Water: Sources, impurities - Hardness of water: Types - Estimation of hardness (EDTA method) - Disadvantages of hard water in boilers (Scale, Sludge) – Softening methods: Internal treatment (Calgon, Sodium Aluminate) and External treatment (Demineralisation process). Domestic water treatment – Desalination of brackish water: RO and Solar desalination method.								

UNIT II	ELECTROCHEMISTRY AND CORROSION	12
<p>Electrochemical cell – Free energy and emf – Nernst equation and applications – Oxidation and reduction potential – Standard electrodes: Standard Hydrogen electrode, Saturated calomel electrode, Glass electrode – pH measurement – Conductometric titration (acid-base, precipitation) and Potentiometric titrations: Redox titration ($\text{Fe}^{2+} \times \text{Cr}_2\text{O}_7^{2-}$).</p> <p>Corrosion – Types: Chemical corrosion and Electrochemical corrosion – Corrosion control methods: Sacrificial anodic and Impressed current Cathodic protection method</p>		
UNIT III	FUELS AND COMBUSTION	8
<p>Fuels - classification of fuels – Comparison of solid, liquid and gaseous fuel - Solid fuel - coal - analysis of coal (proximate only) – Liquid fuel - Petroleum – Refining of petroleum - manufacture of synthetic petrol (Bergius process) – Biodiesel – preparation, properties and uses. Gaseous fuel – CNG, LPG.</p> <p>Combustion – Calorific value – Types (Gross and Net calorific value) – Dulong’s formula – GCV and LCV calculation using Dulong’s formula. Flue gas – Analysis of flue gas by Orsat method.</p>		
UNIT IV	ENERGY STORAGE DEVICES	8
<p>Batteries – Types (Primary and Secondary) - Lead acid battery, Lithium ion battery - Super capacitors – Storage principle, types and examples – Electric vehicle – working principle - Fuel cells – microbial fuel cell and polymer membrane fuel cell.</p> <p>Nanomaterials in energy storage – CNT –Types, properties and applications.</p>		
UNIT V	ENGINEERING MATERIALS	8
<p>Abrasives – Types: Natural and Artificial – SiC – preparation, properties and uses. Refractories – Types Acidic, Basic, Neutral – Refractoriness, RUL. Cement – Manufacture – Special cement – white cement and water proof cement. Glass – Manufacture, properties and uses</p>		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Recall the basic concepts of water softening, nano materials and batteries	
CO2:	Summarize the types of corrosion, fuels and energy storage devices	
CO3:	Explain the basic principles of electrochemistry and engineering materials	
CO4:	Identify suitable methods for water treatment, fuel and corrosion control	
CO5:	Apply the knowledge of engineering materials, fuels and energy storage devices for material selection and also in energy sectors	
TEXT BOOKS:		
1.	P. C. Jain and Monika Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.	
2.	S. S. Dara and S. S. Umare, “A Textbook of Engineering Chemistry”, S. Chand & Company LTD, New Delhi, 2015.	
REFERENCES:		
1.	Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.	
2.	Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge	

	University Press, Delhi 2015.
3.	Sivasankar B. "Engineering chemistry", Tata McGraw Hill Publishing company Ltd, New Delhi, 2008.
4.	B.S.Murty, P.Shankar, Baldev Raj, B B Rath and James Murday, "Text book of nano science and technology", Universities press.
5.	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	2	1	-	-	1	-	-	-	-	1	-	-	-
CO4	3	2	2	1	-	-	2	-	-	-	-	1	-	-	-
CO5	3	2	2	1	-	-	2	-	-	-	-	1	-	-	-
CO	3	2	2	1	-	-	2	-	-	-	-	1	-	-	-

**Table of Specification for End Semester Question Paper
ENGINEERING CHEMISTRY (CH22101)**

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate (Ev)
			No. of Qns. (marks) and CO			
Unit I – Water Treatment	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)- CO4	-
Unit II- Electrochemistry and Corrosion	2	1 either or		1(2)-CO2 1(2)- CO3 1 either or (16) – CO3	-	-
Unit III – Fuels and Combustion	2	1 either or		2(2)- CO2	1 either or (16)- CO5	-
Unit IV– Energy Storage Devices	2	1 either or	1(2)-CO1	1 (2)- CO2	1 either or (16)- CO5	-
Unit V – Engineering Materials	2	1 either or	1(2)-CO1	1(2)- CO3 1 either or (16)- CO3	-	-
Total Qns.	10	5 either or	3 (2)	4 (2) 2 either or (16)	3 either or (16)	-

Total Marks	20	80	6	46	48	-
Weightage	20%	80%	6%	46%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	6	10	36	16	32	
Weightage	6%	10%	36%	16%	32%	

CS22101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand the basics of algorithmic problem solving To learn to solve problems using Python conditionals and loops To define Python functions and use function calls to solve problems To use Python data structures - lists, tuples, and dictionaries to represent complex data 					
UNIT I	INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING STRATEGIES	9			
Introduction- Components and functions of a computer system- Hardware and Software. Problem solving strategies- Program design tools: Algorithms, Flow charts, Pseudo code					
UNIT II	DATA TYPES, EXPRESSIONS, STATEMENTS AND CONTROL FLOW	9			
Features of Python -Variables and Identifiers – Data types: Numbers, Strings, Boolean, Tuples, List, Dictionary, Sets - Input operation - Comments, Reserved words, Indentation - Operators and Expressions – Type Conversion - Selection / Conditional Branching Statements - Basic Loop Structures / Iterative Statements - Nested Loops – break statement – continue statement – pass statement					
UNIT III	FUNCTIONS AND STRINGS	9			
Functions: Function Definition, function call- variable scope and lifetime – return statements. Strings: Definition, operations (concatenation, appending, multiply, slicing) - immutability, comparison, iterations, string methods					
UNIT IV	LIST, TUPLES AND DICTIONARIES	9			
Lists: Access, updating values- nested, cloning- list operations- list methods- looping in list. Tuples: Tuple operations- nested tuple; Dictionaries- Creating, Accessing, adding, modifying, deleting items					
UNIT V	FILES, EXCEPTIONS AND PACKAGES	9			
Files: Types of files, Opening and closing Files, Reading and writing files, File positions, Renaming and deleting files. Exceptions: Errors and exceptions, Handling exceptions, Packages					

TOTAL: 45 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Describe the algorithmic solutions to simple and complex computational problems
CO2:	Apply functions, modules and packages in Python program and use conditionals and loops for solving problems
CO3:	Analyze conditional branching statements
CO4:	Evaluate python programs
CO5:	Develop programs using compound data types and files
TEXT BOOKS:	
1.	Reema Thareja, “Python Programming Using Problem Solving Approach”, 13th Edition, Oxford University Press, 2022.
2.	Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2 nd Edition, O’Reilly Publishers, 2016.
REFERENCES:	
1.	Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1 st Edition, BCS Learning & Development Limited, 2017.
2.	Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1 st Edition, 2021.
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021.
4.	Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2 nd Edition, No Starch Press, 2019.
5.	Martin C. Brown, “Python: The Complete Reference”, 4 th Edition, Mc-Graw Hill, 2018.

Course Outcomes	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	-	-	-	-	1	-	-	-	3
CO4	3	3	3	3	-	-	-	-	-	-	-	1	-	-	-	3
CO5	3	3	3	3	-	-	-	-	-	-	-	1	-	-	-	3
CO	3	3	3	3	-	-	-	-	-	-	-	1	-	-	-	3

Table of Specification for End Semester Question Paper

CS22101 PROBLEM SOLVING AND PYTHON PROGRAMMING

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level					
			Remem ber (Kn)	Underst and (Un)	Apply (Ap)	Analyse (An)	Evaluate (Ev)	Create (Cr)
			No. of Qns. (marks) and CO					
Unit-I: Introduction to Computers and Problem Solving Strategies	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-	-	-
Unit-II: Data Types, Expressions, Statements and Control Flow	2	1 either or	1(2)-CO2	1(2)-CO2	-	1 either or (16)-CO3	-	-
Unit-III: Functions and Strings	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO2	-	-	-
Unit-IV: List, Tuples and Dictionaries	2	1 either or	1(2)-CO4	1(2)-CO4	-	-	1 either or (16)-CO4	-
Unit-V: Files, Exceptions and Packages	2	1 either or	1(2)-CO5	1(2)-CO5	-	-	-	1 either or (16)-CO5
Total Qns.	10	5 either or	5(2)	5(2) 1 either or (16)	1 either or (16)	1 either or (16)	1 either or (16)	1 either or (16)
Total Marks	20	80	10	26	16	16	16	16
Weightage	20%	80%	10%	26%	16%	16%	16%	16%
Weightage for COs								
	CO1	CO2	CO3	CO4	CO5			
Total Marks	20	20	20	20	20			
Weightage	20%	20%	20%	20%	20%			

HS22102	UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
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		2	0	0	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education. 					
<ul style="list-style-type: none"> To facilitate the students to understand harmony at all the levels of human living, and live accordingly. 					
<ul style="list-style-type: none"> To create an awareness on Engineering Ethics and Human Values. 					
<ul style="list-style-type: none"> To understand social responsibility of an engineer. 					
UNIT I	INTRODUCTION TO VALUE EDUCATION				6
Value Education - Definition, Concept and Need for Value Education, Basic Guidelines - The Content and Process of Value Education - Basic Guidelines for Value Education - Self exploration as a means of Value Education - Happiness and Prosperity as parts of Value Education.					
UNIT II	HARMONY IN THE HUMAN BEING				6
Human Being is more than just the Body- Harmony of the Self ('I') with the Body - Understanding Myself as Co-existence of the Self and the Body - Understanding Needs of the Self and the needs of the Body - Understanding the activities in the Self and the activities in the Body.					
UNIT III	HARMONY IN THE FAMILY, SOCIETY AND HARMONY IN THE NATURE				6
Family as a basic unit of Human Interaction and Values in Relationships - The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love - Comprehensive Human Goal: The Five Dimensions of Human Endeavour - Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.					
UNIT IV	SOCIAL ETHICS				6
The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.					
UNIT V	PROFESSIONAL ETHICS				6
Universal Human Values - Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies - Production System and Management Models.					
TOTAL: 30 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Illustrate the significance of value inputs in a classroom and start applying them in their life and profession.				
CO2:	Explain the role of a human being in ensuring harmony in society and nature.				
CO3:	Demonstrate the value of harmonious relationship based on trust and respect in their life and profession.				

CO4:	Compare values, skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO5:	Classify ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
TEXT BOOKS:	
1	R R Gaur, R Sangal, G P Bagaria, “Human Values and Professional Ethics”, Excel Books, New Delhi, 2010.
2	A.N. Tripathy, “Human Values”, New Age International Publishers, New Delhi, 2004.
REFERENCES:	
1.	Gaur. R.R., Sangal. R, Bagaria. G.P, “A Foundation Course in Value Education”, Excel Books, 2009.
2.	Gaur. R.R., Sangal. R, Bagaria. G.P, “Teachers Manual” Excel Books, 2009.
3.	Gaur R R, R Sangal, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2009.
4.	William Lilly, “Introduction to Ethic” Allied Publisher.
5.	Nagarajan, R.S., Professional Ethics and Human values, New Age International Publishers, 2006.

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-
CO2	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-
CO3	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-
CO4	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-
CO5	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-
CO	1	-	-	-	-	2	2	3	1	1	-	1	-	3	-

Table of Specification for End Semester Question Paper

HS22102 UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate (Ev)
Unit-I: Introduction to	2	16 or	2(2)-CO1	16(16)-CO1	-	-

Value Education						
Unit-II: Harmony in the Human Being	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-III: Harmony in the Family, Society and Harmony in the Nature	2	1either or	1(2)-CO3	1(2)-CO3	-	-
				1either or (16)-CO3		
Unit-IV: Social Ethics	2	1either or	1(2) - CO4	1(2)-CO4	1either or (16)-CO4	-
Unit-V: Professional Ethics	2	1either or	1(2)-CO5	1(2)-CO5	1either or (16)-CO5	-
Total Qns.	10	5either or	7 (2)	3 (2) 3 either or (16)	2 either or (16)	-
Total Marks	20	80	14	54	32	
Weightage	20%	80%	14%	54%	32%	

Weightage for Cos

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EN22101	COMMUNICATIVE ENGLISH				L	T	P	C
					2	0	2	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> • To guide the learners on the basics of language including vocabulary and grammar • To develop the receptive skills of the learners: Reading and Listening • To develop the productive skills of the learners: Writing and Speaking • To make the learners realize the importance of accuracy and fluency • To help the learners use the language in real situations 								

UNIT I	VOCABULARY AND LANGUAGE STUDY	6
Vocabulary – Synonyms and Antonyms, Word building – Prefixes and Suffixes – Word formation- Definitions - One word substitutes - Reading for vocabulary and language development- Note making and Summarising - Developing Hints.		
UNIT II	READING AND LANGUAGE DEVELOPMENT	6
Parts of speech, Types of sentences – Statement, Interrogative, Imperative, Exclamatory, Wh-questions, Yes or No questions and tag questions, Formal Letters – Academic, Official, and Business Letters		
UNIT III	GRAMMAR AND LANGUAGE DEVELOPMENT	6
Tense and Voice, Auxiliary verbs (be, do, have), Modal verbs - <i>Types of Reading</i> : Intensive Reading and Extensive Reading- <i>Strategies</i> : Predicting- Skimming and Scanning -Reading for facts - Understanding the parts of paragraph- Learning the transitional signals used in the passage to classify the text		
UNIT IV	FUNDAMENTALS OF WRITING	6
Punctuation and Capitalization- Sentence formation : Word order-Completion of sentences- Conjunctions-Transitional signals- sentence and sentence structures- Informal Letters.		
UNIT V	EXTENDED WRITING	6
Degrees of Comparison – Reported speech - Paragraph writing -Topic sentence, supporting sentences and concluding sentence-Informal and Formal expressions		
TOTAL : 30 PERIODS		
PRACTICAL EXERCISES		
Listening (Receptive skill) <i>Intensive Listening: Effective and Attentive Listening</i>		
Exercises		
1.	Listening for gist from recorded speeches	
2.	Listening for specific information from recorded conversations	
3.	Listening for strengthening vocabulary skills.	
4.	Listening to variety of situations and voices- Listening for language development	
5.	Listening for pronunciation: syllables, stress and intonation.	
Speaking (Productive Skill)		
Exercises		
1.	Introducing oneself and others	
2.	Asking for / giving personal information	
3.	Practicing dialogues in pairs	
4.	Giving directions-Informal and formal dialogues	
5.	Speaking in connected speech	
6.	Responding to questions	
7.	Short presentations	
8.	Speaking in small and big groups	
9.	Learning and practicing the essential qualities of a good speaker	
TOTAL: 30 PERIODS		

TOTAL(T+P): 60 PERIODS

COURSE OUTCOMES:

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

- | | |
|-------------|---|
| CO1: | Apply and practice the correct usages of language |
| CO2: | Receive the language effectively and meaningfully through receptive skills |
| CO3: | Produce the language appropriate to the needs and situations exercising productive skills |
| CO4: | Transfer or interpret any piece of information with accuracy and fluency |
| CO5: | Apply the language intellectually and confidently |

TEXT BOOKS:

- | | |
|----|--|
| 1. | Shobha. K.N, Rayen, Joavani, Lourdes, “Communicative English”, Cambridge University Press, 2018. |
| 2. | Sudharshana.N.P and Saveetha. C, “English for Technical Communication”, Cambridge University Press: New Delhi, 2016. |

REFERENCES:

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| 1. | Kumar, Suresh. E., “Engineering English”, Orient Blackswan, Hyderabad, 2015. |
| 2. | Means, L. Thomas and Elaine Langlois, “English & Communication for Colleges”, Cengage Learning, USA: 2007. |
| 3. | Greendaum, Sydney and Quirk, Randolph, “A Student’s Grammar of the English Language”, Pearson Education. |
| 4. | Wood F.T, “Remedial English Grammar”, Macmillan, 2007. |
| 5. | Kumar, Sanjay and Pushp Lata, “Communication Skills: A Workbook”, New Delhi: OUP, 2018. |

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	1	1	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	1	1	-	2	-	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-

Table of Specification for End Semester Question Paper

EN22101 COMMUNICATIVE ENGLISH

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level		
			Remember (Kn)	Understand (Un)	Apply (Ap)
			No. of Qns. (marks) and CO		
Unit-I: Vocabulary and Language Study	2	1 compulsory	2(2)-CO1	1 Compulsory (16)- CO1	-
Unit-II: Reading and Language Development	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-
Unit-III: Grammar and Language Development	2	1 either or	1(2)- CO3	1(2)- CO3	1 either or (16)- CO3
Unit-IV: Fundamentals of Writing	2	1 either or	1(2)-CO4	1(2)- CO4	1 either or (16)- CO4
Unit-V: Extended writing	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16)- CO5
Total Qns.	10	1 Compulsory & 4 either or	7(2)	3(2) 1 Compulsory & 1 either or (16)	3 either or (16)
Total Marks	20	80	14	38	48
Weightage	20%	80%	14%	38%	48%
Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

BS22101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2
PHYSICS LABORATORY					
OBJECTIVES:					
<ul style="list-style-type: none"> 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. 					

<ul style="list-style-type: none"> To learn problem solving skills related to physics principles and interpretation of experimental data. 	
<ul style="list-style-type: none"> To determine error in experimental measurements and techniques used to minimize such error. 	
<ul style="list-style-type: none"> To make the student an active participant in each part of all lab exercises. 	
LIST OF EXPERIMENTS	
1.	Non-uniform bending – Determination of Young’s modulus.
2.	SHM of Cantilever – Determination of Young’s modulus.
3.	Poiseuille’s flow – Coefficient of viscosity of liquid
4.	Torsional pendulum - Determination of Rigidity modulus.
5.	Newton’s ring – Radius of curvature of convex lens.
6.	Lee’s Disc – Determination of coefficient of thermal conductivity of bad conductor.
TOTAL: 30 PERIODS	
CHEMISTRY LABORATORY	
OBJECTIVES	
<ul style="list-style-type: none"> To inculcate experimental skills to test basic understanding of water quality parameters such as, acidity, alkalinity and hardness. 	
<ul style="list-style-type: none"> To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions. 	
LIST OF EXPERIMENTS	
1.	Determination of total hardness of water by EDTA method.
2.	Conductometric titration of strong acid and strong base.
3.	Determination of strength of given hydrochloric acid using pH meter.
4.	Conductometric precipitation titration using BaCl ₂ and Na ₂ SO ₄ .
5.	Determination of alkalinity in water sample.
6.	Estimation of iron content of the given solution using potentiometer.
TOTAL: 30 PERIODS	
TOTAL: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Determine different moduli of elasticity used in day to day engineering applications
CO2:	Calculate the viscosity of liquids and radius of curvature of convex lens
CO3:	Estimate the coefficient of thermal conductivity of bad conductors
CO4:	Determine the water quality parameters of the given water sample.
CO5:	Analyze quantitatively the metals (Fe, Ni,) in the any sample volumetrically as well as by using spectroanalytical methods.

Course	PO	PSO
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Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	2	1	-	1	-	-	-
CO2	3	1	-	-	-	-	-	-	2	1	-	1	-	-	-
CO3	3	1	-	-	-	-	-	-	2	1	-	1	-	-	-
CO4	3	1	-	-	-	2	2	-	1	-	-	-	-	-	-
CO5	3	1	-	-	-	2	2	-	1	-	-	-	-	-	-
CO	3	1	-	-	-	2	2	-	2	1	-	1	-	-	-

CS22102	PYTHON PROGRAMMING LABORATORY				L	T	P	C
					0	0	4	2
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To understand the problem solving approaches To learn the basic programming constructs in Python To practice various computing strategies for Python-based solutions to real world problems To use Python data structures - lists, tuples, dictionaries To do input/output with files in Python 								
LIST OF EXPERIMENTS								
1.	Identification and solving of simple real life or scientific or technical problems, and developing algorithms and flow charts for the same							
2.	Python programming using simple statements and expressions							
3.	Scientific problems using Conditionals and Iterative loops							
4.	Implementing real-time/technical applications using Lists, Tuples							
5.	Implementing real-time/technical applications using Sets, Dictionaries							
6.	Implementing programs using Functions							
7.	Implementing programs using Strings							
8.	Implementing real-time/technical applications using File handling							
9.	Implementing real-time/technical applications using Exception handling							
10.	Exploring Pygame tool							
11.	Developing a game activity using Pygame like bouncing ball							
TOTAL: 60 PERIODS								
COURSE OUTCOMES:								
At the end of the course, the students will be able to:								
CO1:	Develop algorithmic solutions to simple computational problems							
CO2:	Develop and execute simple Python programs							
CO3:	Implement programs in Python using conditionals, loops and functions for solving problems							
CO4:	Process compound data using Python data structures							

CO5:	Utilize Python packages in developing software applications
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Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	1	3	-	-
CO	3	3	3	3	2	-	-	-	-	-	-	1	3	-	-

HS22101	HIGHER ORDER THINKING	L	T	P	C	
		1	0	0	1	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> Teaching the students the sources and dynamics of thinking. Teaching the students the basics of systematic and scientific thinking. Initiating the students into critical thinking and to use critical thinking in practical life Initiating students into creative thinking 						
UNIT I	INTRODUCTION TO COGNITION, KNOWLEDGE AND THINKING					3
Cognition - Different Cognitive functions - Cognition and intelligence - Cognitive development: till adolescence and post adolescence - possibility of true knowledge - The sources of Knowledge. Sensation, perception. Reality of perception - Concept formation, abstraction. Memory and retrieving - Introduction to thinking and types of thinking. Systematic thinking						
UNIT II	LOGIC AND REASONING					3
Commonsense and scientific knowledge. Pursuit of truth.- Syllogistic Logic. Greek and Indian. - Exercises						
UNIT III	CRITICAL THINKING SKILLS AND DISPOSITIONS					3
Critical Thinking Skills & Dispositions. Critical Thinking Exercises						
UNIT IV	ANALYSIS OF ARGUMENTS					3
Propositions and fallacies. - Analyzing arguments. - Exercises.						
UNIT V	CREATIVE THINKING AND INNOVATIVE THINKING					3
Evolution of Scientific Thinking and Paradigm Shift. - Dynamics of Thoughts: Hegel. - Convergent thinking and divergent thinking (out of the box thinking). - Problem solving and Planning.						
TOTAL: 15 PERIODS						
COURSE OUTCOMES:						

At the end of the course, the students will be able to:	
CO1:	Demonstrate the sources of knowledge and the process of thinking
CO2:	Demonstrate critical thinking skills and dispositions of critical thinking
CO3:	Confidently engage in creative thinking and problem solving
REFERENCES:	
1	Introduction to Logic, Irving M. Copi, Carl Cohen and Kenneth McMahon, Fourteenth Edition, Pearson Education Limited, 2014.
2	Teaching Thinking Skills: Theory and Practice, Joan Boykoff Baron and Robert J. Sternberg, W.H. Freeman and Company, New York.
3	Cognitive Psychology, Robert J. Sternberg, Third Edition, Thomson Wadsworth, UK

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	2
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	2
CO3	3	2	2	1	-	-	1	-	1	-	1	1	-	-	2
CO	3	2	2	1	-	-	1	-	1	-	1	1	-	-	2

Table of Specification for End Semester Question Paper

HS22101 HIGHER ORDER THINKING

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate (Ev)
Unit-I: Introduction to Cognition, Knowledge and Thinking	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-II: Logic and Reasoning	2	1either or	2(2)-CO1	1either or (16)-CO1	-	-
Unit-III: Critical Thinking Skills and Dispositions	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-
Unit-IV: Analysis of Arguments	2	1either or	2(2)-CO2	1either or (16)-CO2	-	-

Unit-V: Creative Thinking and Innovative Thinking	2	1 either or	2(2)-CO3	-	1 either or (16)-CO3	-
Total Qns.	10	5 either or	10 (2)	4 either or (16)	1 either or (16)	
Total Marks	20	80	20	64	16	
Weightage	20%	80%	20%	64%	16%	

Weightage for Cos

	CO1	CO2	CO3
Total Marks	40	40	20
Weightage	40%	40%	20%

SEMESTER II

MA22201	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To provide the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology. 					
<ul style="list-style-type: none"> To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems. 					
<ul style="list-style-type: none"> To introduce the basic concepts of solving algebraic and transcendental equations. 					
<ul style="list-style-type: none"> To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines. 					
<ul style="list-style-type: none"> To acquaint the knowledge of various numerical methods of solving ordinary differential equations. 					
UNIT I	TESTING OF HYPOTHESIS	12			
Sampling distributions - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean and variance - Contingency table (test for independent) - Goodness of fit.					
UNIT II	DESIGN OF EXPERIMENTS	12			

One way and two-way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.		
UNIT III	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	12
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method.		
UNIT IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	12
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.		
UNIT V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	12
Single step methods: Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods: Milne’s and Adams - Bash forth predictor corrector methods for solving first order equations.		
TOTAL: 60 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Define the basic concepts of statistical tests, ANOVA, solution of equations, interpolations and ODE.	
CO2:	Discuss the techniques of statistical tests and design of experiments.	
CO3:	Explain the solution of equations, ODE, interpolations, differentiation and integration.	
CO4:	Apply the concept of testing of hypothesis and design of experiment in real life.	
CO5:	Solve equations, ODE, interpolation, differentiation and integration using numerical techniques.	
TEXT BOOKS:		
1	Grewal. B.S. and Grewal. J.S., “Numerical Methods in Engineering and Science ”, 10 th 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.	
REFERENCES:		
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. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.	
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum’s Outlines on Probability and Statistics, Tata McGraw Hill Edition, 2004.	
5.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., “Probability and Statistics for	

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	-	3

Table of Specifications for End Semester Question Paper

MA22201- STATISTICS AND NUMERICAL METHODS

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Testing of hypothesis	2	1 either or	1(2)-CO1	1(2)-CO2	1either or (16)-CO4	-
Unit-II: Design of experiments	2	1 either or	2(2)-CO1	-	1either or (16)-CO4	-
Unit-III: Numerical solution of equations	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Unit-IV: Interpolation, Numerical differentiation and integration	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Unit-V: Numerical solution of ordinary differential equations	2	1 either or	1(2)-CO1	1(2)-CO3	1either or (16)-CO5	-
Total Qns.	10	5 either or	6(2)	4(2)	5 either or (16)	-

Total Marks	20	80	12	8	80	-
Weightage	20%	80%	12%	8%	80%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	12	2	6	32	48	
Weightage	12%	2%	6%	32%	48%	

ES22202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING				L	T	P	C
					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> • To introduce the basic circuit components • To educate on the working principles and applications of electrical machine • To explain the construction and working of semiconductor devices • To educate on logic gates, flip flops and registers • To introduce the functional elements and working of measuring instruments 								
UNIT I	INTRODUCTION TO ELECTRICAL ENGINEERING							9
Introduction-Conductors, semiconductors and Insulators-Electrostatics – Electric Current-Electromotive Force-Electric Power- Ohm’s Law-Basic circuit components-Electromagnetism related laws-Kirchhoff’s Laws.								
UNIT II	ELECTRICAL MACHINES							9
Construction, working principle and types of DC Generator – Motor- single phase Transformer - single phase and three phase Induction motor –Applications.								
UNIT III	ANALOG ELECTRONICS							9
Classification of Semiconductors– Construction , Characteristics and working -PN Junction Diode-Zener Diode - Bipolar Junction Transistor-IGBT- SCR- MOSFET.								
UNIT IV	DIGITAL ELECTRONICS							9
Review of number systems, binary codes- Boolean Algebra-Logic gates-Implementation of Boolean expression using K-map –Types of flip flops, Registers.								
UNIT V	MEASUREMENTS AND INSTRUMENTATION							9
Functional elements of an instrument –Static and dynamic characteristics of instruments, Errors, Principles of electrical indicating instruments- Types of indicating instruments -Moving Coil and								

Moving Iron instruments- DSO -Transducers-Resistive Transducers.	
TOTAL: 45 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Apply the basic laws to determine circuit parameters
CO2:	Explain the construction, working and application of electrical machines.
CO3:	Explain the construction and working of semiconductor devices.
CO4:	Interpret the function of combinational and sequential circuits.
CO5:	Interpret the operating principles of measuring instruments.
TEXT BOOKS:	
1.	M .S.Sukhja ,T.K.Nagsarkar —Basic Electrical and Electronics Engineering, Oxford Higher Education First Edition, 2018.
2.	S. Salivahanan, R.Rengaraj —Basic Electrical and Instrumentation Engineering, McGraw Hill Education, First Edition, 2019.
REFERENCES:	
1.	Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, Fourth Edition, McGraw Hill Education, 2019.
2.	H.S. Kalsi, _Electronic Instrumentation’, Tata McGraw-Hill, New Delhi, 2010.
3.	V. K. Mehta, Rohit Mehta —Basic Electrical Engineeringl, S.Chand & Company Pvt. Ltd, New Delhi, 2012.
4.	S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015.
5.	B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co, 2008.

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	-	-	1	-	-	-	-	-	1	2	2	-
CO2	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO3	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO4	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO5	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO	2	2	-	-	-	1	-	-	-	-	-	1	2	2	-

Table of Specifications for End Semester Question Paper

ES22202 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Unit No. and Title	Total 16 Marks Qus.	Cognitive Level			
		Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate(Ev)
Unit-I Introduction to Electrical Engineering	1either or	2 compulsory	-	1either or (16)-CO1	-
Unit-II Electrical Machines	1either or	2 compulsory	1either or (16)-CO2	-	-
Unit-III Analog Electronics	1either or	2 compulsory	1either or (16)-CO3	-	-
Unit-IV Digital Electronics	1either or	2 compulsory	1either or (16)-CO4	-	-
Unit-V Measurements and Instrumentation	1either or	2 compulsory	1either or (16)-CO5	-	-
Total Qns.	5either or	2 compulsory	4 either or (16)	1 either or (16)	-
Total Marks	80	20	64	16	-
Weightage	80%	20%	64%	16%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

AD22201	DATA STRUCTURES AND ALGORITHMS USING C	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To introduce the basics of algorithm analysis. To learn the concepts of list ADTs. 					

<ul style="list-style-type: none"> To understand the concepts of stack and queue ADTs. To know the concepts of non-linear data structure and hashing. To familiarize the concepts of sorting and searching techniques. 		
UNIT I	ALGORITHM ANALYSIS (10+2 SKILL)	12
Mathematical Background- Model- Maximum subsequence problem- solution - Running Time Calculations- for loop- nested for loops-consecutive statements- if/else- logarithms in the running time- Euclid's algorithm.		
UNIT II	LINEAR DATA STRUCTURES – LIST (10+2 SKILL)	12
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly-Linked Lists – Circular Linked List – Applications.		
UNIT III	LINEAR DATA STRUCTURES – STACK & QUEUE (10+2 SKILL)	12
Stack ADT – Stack Model- Implementation of Stack – Applications – Queue ADT – Queue model- Queue Implementation – Applications.		
UNIT IV	NON-LINEAR DATA STRUCTURES (10+2 SKILL)	12
Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.		
UNIT V	SORTING AND SEARCHING TECHNIQUES (10+2 SKILL)	12
Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.		
TOTAL: 60 PERIODS		
SKILL DEVELOPMENT ACTIVITIES (Group Seminar/ Mini Project/ Assignment/ Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc.)		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Analyze the basics of algorithm.	
CO2:	Apply linear/non-linear data structure operations for solving a given problem.	
CO3:	Identify sort and search algorithms for a given application.	
CO4:	Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.	
TEXT BOOKS:		
1.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2016.	
2.	ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.	
REFERENCES:		
1.	Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1 st Edition, Pearson Education, 2013.	
2.	Paul J. Deitel, Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Education, 2013.	
3.	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2016.	
4.	Ellis Horowitz, SartajSahni and Susan Anderson, “Fundamentals of Data Structures”,	

	Galgotia, 2018.
5.	Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
List of Open Source Software/ Learning website:	
1.	https://www.coursera.org/specializations/data-structures-algorithms
2.	https://nptel.ac.in/courses/112107243
3.	https://nptel.ac.in/courses/112105598

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-

**Table of Specifications for End Semester Question Paper
AD22201 DATA STRUCTURES AND ALGORITHMS USING C**

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: C Programming Fundamentals	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: C Programming - Advanced Features	2	1 either or	1(2)-CO2	1(2)-CO2 1 either or (16) CO2	-	-
Unit-III: Linear Data Structures	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO3	-
Unit-IV: Non-Linear Data Structures	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4	-

Unit-V: Sorting and Searching Techniques	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16)-CO5	-
Total Qns.	10	5 either or	5(2)	5(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

ME22201	ENGINEERING GRAPHICS				L	T	P	C	
					2	0	2	3	
COURSE OBJECTIVES									
<ul style="list-style-type: none"> • To draw the engineering curves. • To draw orthographic projection of points and lines • To draw orthographic projection of solids and section of solids. • To draw the development of surfaces • To draw the isometric projections of simple solids and freehand sketch of simple objects. 									
CONCEPTS AND CONVENTIONS									
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							12	
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.									
UNIT II	PROJECTION OF POINTS, LINES AND PLANES							12	
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to any one principal plane.									
UNIT III	PROJECTION OF SOLIDS							12	

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to any one of the principal planes by rotating object method.		
UNIT IV	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	12
Sectioning of solids (Prisms, pyramids cylinders and cones) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.		
UNIT V	ISOMETRIC PROJECTIONS AND FREEHAND SKETCHING	12
Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids & cylinders, in simple vertical positions.		
Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.		
Practicing three dimensional modeling of projection of simple objects by CAD Software (Demonstration purpose only).		
TOTAL: 60 PERIODS		
COURSE OUTCOMES		
Upon completion of the course, the students will be able to		
CO1:	Recall the existing national standards and interpret a given three dimensional drawing	
CO2:	Interpret graphics as the basic communication and methodology of the design process	
CO3:	Acquire visualization skills through the concept of projection	
CO4:	Develop the sectioned solids and discover its true shape	
CO5:	Develop imagination of physical objects to be represented on paper for engineering communication.	
TEXT BOOKS		
1.	Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.	
2.	Jeyapoovan T., “Engineering Graphics using AutoCAD”, Vikas Publishing House, 7 th Edition, 2015.	
REFERENCES		
1.	Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited 2008.	
2.	Julyes Jai Singh S., “Engineering Graphics”, SRM tri sea publishers, Nagercoil, 7 th Edition, 2015.	
3.	Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.	

4.	Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
5.	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.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	-	2	-	-	-	2	-
CO2	3	1	-	-	-	-	-	-	-	2	-	-	-	2	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	3	1	-	-	-	-	-	-	-	2	-	-	-	2	-
CO5	3	1	-	-	-	-	-	-	-	2	-	-	-	2	-
CO	3	1	-	-	-	-	-	-	-	2	-	-	-	2	-

Table of Specification for End Semester Question Paper

ME 22201 ENGINEERING GRAPHICS

Unit No. and Title	Total 20 Marks Qus.	Cognitive Level			
		Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I Plane Curves	1either or	-	1either or (20)-CO1	-	-
Unit-II Projection of Points, Lines	1either or	-	1either or (20)-CO2	-	-
Unit-III Projection of Plane Surfaces and Solids	1either or	-	-	1either or (20)-CO3	-
Unit-IV Section of Solids and Development of Surfaces	1either or	-	-	1either or (20)-CO4	-

Unit-V Isometric Projections and Freehand Sketching	1 either or	-	-	1 either or (20)-CO5	-
Total Qns.	5 either or	-	2 either or (20)	3 either or (20)	-
Total Marks	100	-	40	60	-
Weightage	100%	-	40%	60%	-

Weightage for COs

	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

EN22201	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To widen strategies and skills to augment ability to read and comprehend engineering and technology texts • To develop writing skill to make technical presentations • To draft convincing job applications and effective reports • To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization • To cultivate speaking skills both technical and general. 					
UNIT I	LANGUAGE STUDY	12			
Technical Vocabulary- synonyms, antonyms, prefix and suffix, word formation, Homonyms and Homophones - puzzles,- Reading: skimming a reading passage – scanning for specific information- Instruction- Interpreting – Writing: Recommendation- Checklist.					
UNIT II	READING AND STUDY SKILLS	6			

Active and Passive voice- Extended Definitions- Imperatives- Numerical Adjectives- Purpose Statement – Reading: Critical reading- Newspaper articles- journal reports- editorials and opinion blogs - Report Writing: Fire Accident, Industrial visit, Project report, feasibility report, survey report, business report.		
UNIT III	WRITING SKILLS- INTRODUCTION TO PROFESSIONAL WRITING	6
Error Spotting/Common Errors- Concord-Compound words- Abbreviations and Acronyms- Discourse Markers - Finding key information – shifting facts from opinion- interpreting visual material- making inference from the reading passage - Interpretation of charts- - Minutes of the meeting- Paraphrasing- Proposal writing.		
UNIT IV	TECHNICAL WRITING AND GRAMMAR	6
If Conditional Clauses- Prepositional Phrases- Fixed and semi fixed expressions- -e-mail communication- reading the attachment files having a poem /joke / proverb/sending their responses through e-mail.- Job application letter and Resume/CV/ Bio-data.		
UNIT V	EXTENDED WRITING AND LANGUAGE STUDY	6
Articles- Cause and Effect expressions- Collocations- Sequencing words- Reading longer technical texts and taking down notes- Structure of Essay- Types of Essay: Narrative essay- Descriptive Essay- Analytical Essay- Cause and Effect Essay – Compare and contrast essays.		
TOTAL – 30 PERIODS		
PRACTICAL EXERCISES		
Listening Skills – Listening for professional Development		
Listening to UPSC Toppers Mock Interviews- Listening to debates/discussions/different viewpoints /scientific lectures/event narrations/documentaries/telephonic conversations		
Speaking Skills –emphasizing communicative establishment		
Seeking Information -asking and giving directions- narrating personal experiences/ events- answering interview questions- picture description- presenting a product and giving instruction to use a product – mini presentations-role plays- speaking in formal and informal situations-speaking about one’s locations - speaking about great personalities –describing a simple process- telephone skills and etiquette		
TOTAL: 30 PERIODS		
TOTAL (T+P) = 60 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Infer advanced technical texts from varied technical genres to expand engineering knowledge and explore more ideas.	
CO2:	Analyze technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.	

CO3:	Present reports and job letters utilizing the required format prescribed on par with international standards using the exact vocabulary to make their works worthy to be read .
CO4:	Employ the language tones and styles appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world
CO5:	Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.
TEXT BOOKS:	
1.	Mike Markrl, “Technical Communication”, Palgrave Macmillan, London, 2012.
2.	Sumant, S and Joyce Pereira, “Technical English II”, Chennai: Vijay Nicole Imprints Private Limited, 2014.
REFERENCES:	
1.	Raman, Meenakshi & Sangeetha Sharma, “Communication Skills”, New Delhi: OUP, 2018.
2.	Rizvi M, Ashraf, “Effective Technical Communication”, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007.
3.	Kumar, Sanjay and Pushp Lata, “Communication Skills: A Workbook”, New Delhi: OUP, 2018.
4.	Means, L. Thomas and Elaine Langlois, “English & Communication for Colleges”, Cengage Learning, USA: 2007.
5.	Greendaum, Sydney and Quirk, Randolph, “A Student’s Grammar of the English Language”, Pearson Education.

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-

Table of Specification for End Semester Question Paper

EN22201 TECHNICAL ENGLISH

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level		
			Remember (Kn)	Understand (Un)	Apply (Ap)

			No. of Qns. (marks) and CO		
Unit-I: Language Study	2	1 compulsory	1(2)-CO1	1(2)-CO1 1 Compulsory (16)- CO1	-
Unit-II: Reading and Study Skills	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-
Unit-III: Writing Skills	2	1 either or	1(2)- CO3	1(2)- CO3	1 either or (16)- CO3
Unit-IV: Technical Writing and Grammar	2	1 either or	1(2)-CO4	1(2)- CO4	1 either or (16)- CO4
Unit-V: Extended Writing and Language Study	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16)- CO5
Total Qns.	10	1 Compulsory & 4 either or	6(2)	4(2) 1 Compulsory & 1 either or (16)	3 either or (16)
Total Marks	20	80	12	40	48
Weightage	20%	80%	12%	40%	48%
Weightage for COs					
	CO1	CO2	CO3	CO4	CO5
Total Marks	20	20	20	20	20
Weightage	20%	20%	20%	20%	20%

PH22203	PHYSICS FOR INFORMATION SCIENCE			L	T	P	C
				2	0	2	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the concepts of light, electron transport properties and the essential principles of semiconductors 							
<ul style="list-style-type: none"> To become proficient in magnetic properties of materials and the functioning of optical devices 							
<ul style="list-style-type: none"> To know the basics of quantum structures and Single electron transistor 							
<ul style="list-style-type: none"> To induce the students to design new devices that serve humanity by applying the knowledge gained during the course 							
UNIT I	PHOTONICS						6

Interference – Air wedge – LASER – population inversion - Einstein coefficient's –NdYAG Laser - CO2 laser – semiconductor laser – Optical fibre – Total internal reflection – propagation of light – Numerical Aperture and Acceptance angle – Fiber optic communication system – Endoscopy.		
UNIT II	ELECTRICAL PROPERTIES OF MATERIALS	6
Classical free electron theory - Expression for electrical conductivity and Thermal conductivity, Wiedemann-Franz law – Success and failures - Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Band theory of solids - Electron effective mass – concept of hole.		
UNIT III	SEMICONDUCTING MATERIALS	6
Semiconductors –direct and indirect band gap semiconductors – Intrinsic semiconductors Carrier concentration, band gap in intrinsic semiconductors – extrinsic semiconductors - N-type & P-type semiconductors – Variation of carrier concentration and Fermi level with temperature - Hall effect - measurement of Hall coefficient – applications		
UNIT IV	MAGNETIC PROPERTIES OF MATERIALS	6
Magnetic dipole moment – atomic magnetic moment, permeability, susceptibility- Magnetic material classification: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism – Domain Theory- B-H curve – Hard and soft magnetic materials – Magnetic storage devices: Magnetic hard disc with GMR sensor		
UNIT V	OPTOELECTRONIC AND NANODEVICES	6
Carrier generation and recombination processes - Photo diode – solar cell - Organic LED – Optical data storage - Quantum confinement – Quantum structures - single electron phenomena and single electron transistor - Quantum dot laser		
TOTAL: 30 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Relate the concepts of light, electron transport properties of conductors and basic principles of semiconductors.	
CO2:	Define the magnetic properties of materials and the principles of optoelectronic and nano devices.	
CO3:	Illustrate laser and fiber optics, classical and quantum concepts of conducting materials, physics of semiconducting materials.	
CO4:	Summarize the functioning of various magnetic, optoelectronic and nano devices.	
CO5:	Demonstrate the concepts of optics, fibre optics, moduli of elasticity and thermal energy, behavior of conductors, semiconductors and functioning of magnetic, optical and nano devices in various engineering applications.	
TEXT BOOKS:		
1.	Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.	
2.	Kasap,S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education,	

	2017.
REFERENCES:	
1.	Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
2.	Kittel, C. Introduction to Solid State Physics. Wiley, 2017.
3.	Garcia, N. & Damask, A. Physics for Computer Science Students, Springer-Verlag, 2012.
4.	Hanson, G.W. —Fundamentals of Nanoelectronics, Pearson Education, 2009.
5.	Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems, CRC Press, 2014.
LIST OF EXPERIMENTS	
1.	Uniform bending – Determination of Young’s modulus
2.	Air-wedge – Thickness of thin wire
3.	Spectrometer – Grating
4.	LASER – Wavelength and particle size determination
5.	Optical fibre – Acceptance angle and Numerical aperture
6.	Band gap determination
	TOTAL: 30 PERIODS
	TOTAL (T+P) = 60 PERIODS

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	-	-	1	-	-	-	-	-	1	2	2	-
CO2	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO3	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO4	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO5	2	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO	2	2	-	-	-	1	-	-	-	-	-	1	2	2	-

**Table of Specifications for End Semester Question Paper
Physics for Information Science (PH 22203)**

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate (Ev)
			No. of Qns. (marks) and CO			
Unit I - Photonics	2	1 either or	1(2)-CO1	1(2)-CO3	1 either or (16)- CO5	-

Unit II - Electrical Properties of Materials	2	1 either or	1(2)-CO1	1(2)- CO3 1 either or (16)- CO3	-	-
Unit III - Semiconducting Materials	2	1 either or	2(2)- CO1	-	1 either or (16)- CO5	-
Unit IV - Magnetic Properties of Materials	2	1 either or	1(2)-CO2	1 (2)- CO4 1 either or (16)- CO4	-	-
UNIT V - Optoelectronic and Nanodevices	2	1 either or	2(2)-CO2	-	1 either or (16)- CO5	-
Total Qns.	10	5 either or	7(2)	3(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	14	38	48	-
Weightage	20%	80%	14%	38%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	8	6	20	18	48	
Weightage	8%	6%	20%	18%	48%	

CH22201	ENVIRONMENT AND SUSTAINABILITY	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand the concept of ecosystem and biodiversity To conversant with various types of pollution and its effects To obtain knowledge on natural resources and its exploitation To understand the social issues related to environment and methods to protect To gain knowledge on sustainability and environment 					
UNIT I	ECOSYSTEM AND BIODIVERSITY	6			
Environment – Ecosystem – Structure and function of an ecosystem – Energy flow in an ecosystem – Food chain and food web – Biodiversity – Types – Values, threats and conservation of biodiversity – Endangered and endemic species – Hot spot of biodiversity – Biodiversity at state level, national level and global level.					
UNIT II	NATURAL RESOURCES	6			
Introduction – Forest resources – Uses and Overexploitation - Deforestation – causes and consequences – Water resources – effect of over utilisation of water – Food resources – Impacts of modern agriculture (pesticides, fertilizers, water logging, salinity) – Sustainable Energy resources – Wind, Solar, hydroelectric power, geothermal – Land resources – Desertification, soil erosion – Role of an individual in the conservation of natural resources. Case study – Deforestation, water conflicts, fertilizer and pesticide problem.					
UNIT III	ENVIRONMENTAL POLLUTION AND MANAGEMENT	7			
Definition, causes, effects and control measures of air pollution, water pollution, noise pollution, thermal pollution and marine pollution – Waste water treatment - Waste management – solid waste, bio waste, e-waste - Disaster management – Flood, cyclone, earthquake					
UNIT IV	SOCIAL ISSUES AND HUMAN HEALTH	6			
Population explosion and its effects on environment — variation of population among nations - Environmental issues and Human health – Food adulteration – Risk of food adulteration – Detection and prevention of food adulteration - COVID-19 – Human rights – Value education					
UNIT V	SUSTAINABLE DEVELOPMENT AND ENVIRONMENT	5			
Sustainable development – needs and challenges — Goals – Aspects of sustainable development – Assessment of sustainability - Environmental ethics – Green chemistry – Eco mark, Eco products – EIA – Regional and local environmental issues and possible solutions - Role of engineering in environment and human health					
TOTAL: 30PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Recall the basic concepts of environment and sustainable development.				
CO2:	Summarize the types of pollution, various natural resources and food adulterants.				

CO3:	Explain the methods for waste management and detection of adulterants.
CO4:	Apply the gained knowledge to overcome various issues related to health and environment.
CO5:	Identify suitable methods for local environmental issues and sustainability.
TEXT BOOKS:	
1.	Benny Joseph, “Environmental Science and Engineering”, Tata McGraw Hill, New Delhi, 2017.
2.	Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, 2 nd Edition, Pearson Education, 2015.
REFERENCES:	
1.	Erach Bharucha, “Text book of Environmental studies” Universities Press (I) PVT LTD, Hyderabad, 2015.
2.	Rajagopalan. R, “Environmental Studies - From Crisis to Cure”, Oxford University Press, 2015.
3.	Tyler Miller G and Scott E. Spoolman, “Environmental Science”, Cengage Learning India PVT LTD, 2014.
4.	Ruth F. Weiner and Robin A. Matthews. Butterworth, “Environmental Engineering”, Heineman Publications, 4 th Edition.
5.	Dash M.C, “Concepts of Environmental Management for Sustainable Development”, Wiley Publications, 2019.
EXPERIMENTS	
1.	Determination of DO content of waste water sample (Winkler’s method).
2.	Determination of chloride content of water sample by Argentometric method
3.	Estimation of copper content in water by Iodometry.
4.	Determination of Ca / Mg in waste water sample
5.	Detection of adulterant in ghee/edible oil/coconut oil.
6.	Detection of adulterant in sugar/honey/chilli powder.
	TOTAL:30 PERIODS
	TOTAL (T+P) = 60 PERIODS

Course Outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-
CO2	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-
CO3	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-
CO4	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-
CO5	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-
CO	3	-	-	-	-	-	3	-	1	1	-	1	-	2	-

**Table of Specification for End Semester Question Paper
Environment and Sustainability (CH22201)**

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(Ev) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit I – Ecosystem and Biodiversity	2	1 either or	1(2)-CO1	1(2)-CO2	1 either or (16)- CO4	-
Unit II – Natural Resources	2	1 either or	1(2)-CO1	1(2)- CO2	1 either or (16)- CO4	-
Unit III – Environmental Pollution and Management	2	1 either or	-	1(2)- CO2 1(2)- CO3 1 either or (16)- CO3	-	-
Unit IV – Social Issues and Human Health	2	1 either or	-	1(2)- CO2 1(2)- CO3	1 either or (16)- CO4	-
Unit V – Sustainable Development and Environment	2	1 either or	2(2)-CO1	-	1 either or (16)- CO5	-
Total Qns.	10	5 either or	4 (2)	6 (2) 1 either or (16)	4 either or (16)	-
Total Marks	20	80	8	28	64	-
Weightage	20%	80%	8%	28%	64%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	8	8	20	48	16	
Weightage	8%	8%	20%	48%	16%	

AD22202	DATA STRUCTURES AND ALGORITHMS USING C LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To develop applications in C. • To implement linear and non-linear data structures. • To understand the different operations of search trees. • To get familiarized to sorting and searching algorithms. 					
LIST OF EXPERIMENTS					

1.	C programming using statements, expressions, decision making and iterative statements.
2.	C programming using Functions and Arrays.
3.	C programs using Pointers and Structures.
4.	Array implementation of List ADT.
5.	Array implementation of Stack and Queue ADTs.
6.	Linked list implementation of List, Stack and Queue ADTs.
7.	Applications of List, Stack and Queue ADTs.
8.	Binary Trees and operations of Binary Trees.
9.	Binary Search Trees.
10.	Searching techniques.
11.	Sorting algorithms: Insertion Sort, Quick Sort, Merge Sort.
12.	Hashing – any two collision techniques.
TOTAL: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Develop Sorting and searching algorithms for a given application.
CO2:	Apply functions to implement linear and non-linear data structure operations.
CO3:	Identify linear / non-linear data structure operations for a given problem.
CO4:	Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval.
CO5:	Choose different constructs of C and develop applications.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-

ES22203	ENGINEERING PRACTICES LABORATORY	L	T	P	C
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		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in commonhousehold wood work. 					
<ul style="list-style-type: none"> • Wiring various electrical joints in common household electrical wire work. 					
<ul style="list-style-type: none"> • Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work. 					
<ul style="list-style-type: none"> • Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB. 					
GROUP – A (CIVIL & MECHANICAL)					
PART I	CIVIL ENGINEERING PRACTICES				15
PLUMBING WORK:	<ul style="list-style-type: none"> ❖ Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household. ❖ Preparing plumbing line sketches. ❖ Laying pipe connection to the suction side of a pump ❖ Laying pipe connection to the delivery side of a pump. ❖ Connecting pipes of different materials: Metal, plastic and flexible pipes used inhousehold appliances. 				
WOOD WORK:	<ul style="list-style-type: none"> ❖ Sawing, ❖ Planning and ❖ Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint. 				
PART II	MECHANICAL ENGINEERING PRACTICES				15
WELDING WORK:	<ul style="list-style-type: none"> ❖ Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. ❖ Practicing gas welding. 				
BASIC MACHINING WORK:	<ul style="list-style-type: none"> ❖ Perform turning operation in the given work piece. ❖ Perform drilling operation in the given work piece. ❖ Performing tapping operation in the given work piece. 				
ASSEMBLY WORK	<ul style="list-style-type: none"> ❖ Assembling a centrifugal pump. ❖ Assembling a household mixer. 				
SHEET METAL WORK:	<ul style="list-style-type: none"> ❖ Making of a square tray 				
GROUP – B (ELECTRICAL AND ELECTRONICS)					

PART-I	ELECTRICAL ENGINEERING PRACTICES	15
<ul style="list-style-type: none"> ❖ One lamp controlled by one switch. ❖ Series and parallel wiring. ❖ Staircase wiring. ❖ Fluorescent Lamp wiring. ❖ Residential wiring. ❖ Iron Box wiring and assembly. 		
PART-II	ELECTRONIC ENGINEERING PRACTICES	15
<ul style="list-style-type: none"> ❖ Introduction to electronic components and equipment's ❖ Calculation of resistance using colour coding ❖ Verify the logic gates AND, OR, EX-OR and NOT. ❖ Measurement of AC signal parameters using CRO ❖ Soldering simple electronic circuits on a small PCB and checking continuity. 		
TOTAL: 60 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Prepare various pipe and furniture fittings used in common household.	
CO2:	Perform the given metal joining and metal removal operation in the given work piece as per the dimensions.	
CO3:	Apply the fundamental concepts involved in Electrical Engineering	
CO4:	Explain the basic electrical wiring procedures.	
CO5:	Assemble basic electronic components.	

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO2	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO3	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO4	2	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO5	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-

GE3152	jkpou; kuG	L	T	P	C
		1	0	0	1
COURSE OBJECTIVES:					

	<ul style="list-style-type: none"> • jkpo; nkhopapd; kjpg;Gfs;> ,e;jpahtpy; cs;s mbg;gil nkhopf;FLk;gq;fs; kw;Wk; jkpo; ,yf;fpa tiffis khzth;fs; Ghpe;Jnfhs;s cjTjy;. 	
	<ul style="list-style-type: none"> • khzth;fs; ghiw Xtpaq;fs;> rpw;gf;fiyfs; kw;Wk; ,irf;fUtpfspd; top jkpo; ghuk;ghpaj;ijg; Ghpe;Jnfhs;s trjp nra;jy; 	
	<ul style="list-style-type: none"> • jkpoh;fspd; fiy kw;Wk; tPu tpisahl;Lfisg; Ghpe;J nfhs;tjw;F khzth;fSf;F cjTjy;. 	
	<ul style="list-style-type: none"> • jkpoh;fspd; jpizf; fUj;Jf;fs; kw;Wk; mth;fspd; tho;f;if newpfig; gw;wp khzth;fSf;F tpopg;Gzh;it Vw;gLj;Jjy; 	
	<ul style="list-style-type: none"> • ,e;jpa fyhr;rhu;jjpy; jkpoh;fspd; gq;fspg;igAk; mjd; jhf;fj;ijAk; khzth;fs; Ghpe;Jnfhs;s nra;jy;. 	
myF I	nkhop kw;Wk; ,yf;fpak;	3
	,e;jpa nkhopf; FLk;gq;fs; – jpuhtpl nkhopfs; – jkpo; xU nrk;nkhop – jkpo; nrt;tpyf;fpaq;fs; – rq;f ,yf;fpaj;jpd; rkar;rhu;gw;w jd;ik – rq;f ,yf;fpaj;jpy; gfpu;jy; mwk; – jpUf;Fwspy; Nkyhz;ikf; fUj;Jf;fs; – jkpo;f; fhg;gpaq;fs;> jkpofj;jpy; rkz ngsj;j rkaq;fspd; jhf;fk; – gf;jp ,yf;fpak;> Mo;thu;fs; kw;Wk; ehad;khu;fs; – rpw;wpyf;fpaq;fs; – jkpopy; etPd ,yf;fpaj;jpd; tsu;r;rp – jkpo; ,yf;fpa tsu;r;rpapy; ghujpahu; kw;Wk; ghujpjhrd; MfpNahupd; gq;fspg;G.	
myF II	kuG – ghiw Xtpaq;fs; Kjy; etPd Xtpaq;fs; tiu – rpw;gf; fiy.	3
	eLfy; Kjy; etPd rpw;gq;fs; tiu – [k;nghd; rpiyfs; – goq;Fbapdu; kw;Wk; mtu;fs; jahupf;Fk; iftpidg; nghUl;fs;> nghk;ikfs; – Nju; nra;Ak; fiy – RLkz; rpw;gq;fs; – ehl;Lg;Gwj; nja;tq;fs; – FkupKidapy; jpUts;Stu; rpiy – ,irf; fUtpfs; – kpUjq;fk;> giw> tPiz> aho;> ehj];tuk; – jkpou;fspd; r%f nghUshjhu tho;tpy; Nfhpty;fspd; gq;F	
MyF III	ehl;Lg;Gwf; fiyfs; kw;Wk; tPu tpisahl;Lfs;	3
	njUf;Šj;J> fufhl;lk;> tpy;Yg;ghl;L> fzpahd; Šj;J> xapyhl;lk;> Njhy;ghitf; Šj;J> rpyk;ghl;lk;> tsup> Gypahl;lk;> jkpou;fspd; tpisahl;Lf;fs;.	
myF IV	jkpou;fspd; jpizf; Nfhl;ghLfs;.	3
	Jkpofj;jpd; jhtuq;fSk;> tpyq;FfSk; – njhy;fhg;gpak; kw;Wk; rq;f ,yf;fpaj;jpy; mfk; kw;Wk; Gwf;Nfhl;ghLfs; – jkpou;fs; Nghw;wpa mwf;Nfhl;ghL – rq;ffhy;jpy; jkpofj;jpy; vOj;jwpTk;> fy;tpAk; – rq;ffhy efuq;fSk; Jiw Kfq;fSk; – rq;f fhy;jpy; Vw;Wkjp kw;Wk; ,wf;Fkjp – fly; fle;j ehLfsy; Nrhou;fspd; ntw;wp.	
myF V	,e;jpa Njrpa ,af;fk; kw;Wk; ,e;jpa gz;ghl;bw;F jkpou;fspd; gq;fspg;G	3
	,e;jpa tpLjiyg;Nghupy; jkpou;fspd; gq;F – ,e;jpahtpd; gpwg;gFjpfspy; jkpo;g; gz;ghl;bd; jhf;fk; – Rakupahij ,af;fk; – ,e;jpa kUj;Jtj;jpy; rpj;j kUj;Jtj;jpd; gq;F – fy;ntl;Lfs;> ifnaOj;Jg;gbfs; – jkpo;g; Gj;jfq;fspd; mr;R tuyhW.	
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
	,g;ghlj; jpl;lj;jpd; %yk; khzth;fs;:	
CO1:	jkpo; nkhopapd; Kf;fpaj;Jtk; kw;Wk; ,yf;fpa tiffis tpthpf;f KbAk;.	

CO2:	ghiw Xtpaq;fs; Kjy; etPd fiyfs; tiu mth;fspd; mwpit tpthpf;f KbAk;.
CO3:	jw;fhg;Gf; fiyfspd; tYthd mbj;js mwpit tpthpf;f KbAk;.
CO4:	jkpoh;fspd; jpizf; fUj;Jf;fs; kw;Wk; mjd; kjpg;Gfis tpsf;f KbAk;.
CO5:	,e;jpa fyhr;rhu;j;ppy; jkpoh;fspd; gq;fspg;ig tpthpf;f ,aYk;.
TEXT & REFERENCE BOOKS:	
1.	jkpof tuyhW – kf;fSk; gz;ghLk; – Nf. Nf. gps;is (ntspaPL : jkpo;ehL ghLE}y; kw;Wk; fy;tpay; gzpfs; fofk;.
2.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.
3.	Dr.S.Singaravelu, “Social Life of the Tamils - The Classical Period”, International Institute of Tamil Studies.
4.	Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu, “Historical Heritage of the Tamils”, International Institute of Tamil Studies.
5.	Dr.M.Valarmathi, “ The Contributions of the Tamils to Indian Culture”, International Institute of Tamil Studies.
6.	Dr.K.K.Pillay, “Studies in the History of India with Special Reference to Tamil Nadu”.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

GE 3152 HERITAGE OF TAMIL

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Language and Literature	2	1 either or	2(2)-CO1	1 either or (16)- CO1	-	-
Unit-II: Heritage - Rock Art Paintings to Modern Art – Sculpture	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-	-

Unit-III: Folk and Martial Arts	2	1 either or	1(2)- CO3	1(2)- CO3 1 either or (16)- CO3	-	-
Unit-IV: Thinai Concept of Tamils	2	1 either or	1(2)-CO4	1(2)- CO4 1 either or (16)- CO4	-	-
Unit-V: Contribution of Tamils to Indian National Movement and Indian Culture	2	1 either or	1(2)-CO5	1(2)-CO5 1 either or (16)- CO5	-	-
Total Qns.	10	5 either or	7(2)	3(2) 5 either or (16)	-	-
Total Marks	20	80	14	86	-	-
Weightage	20%	80%	14%	86%	-	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

SEMESTER III

MA22302	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To introduce Propositional Logic and their rules for validity of statements. • To introduce Predicates Calculus for validating arguments and programs. • To give the counting principles for solving combinatorial problems. • To introduce abstract notion of Algebraic structures for studying coding theory and its related areas. • To introduce Boolean algebra as a special algebraic structure for understanding logical circuit problems. 					
UNIT I	PROPOSITIONAL CALCULUS	12			
Propositions and notations- Propositional logic – Propositions and truth tables – Propositional equivalences – Conditional propositions – Converse, Contrapositive and Inverse-Tautologies and Contradictions –Normal Forms - Theory of Inference for the statement calculus (Validity using Truth Tables).					
UNIT II	PREDICATE CALCULUS	12			
Predicates –Statement function - Variables and Quantifiers – Nested quantifiers – Predicate					

CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3

Table of Specification for End Semester Question paper

MA22302 DISCRETE MATHEMATICS

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Propositional Calculus	2	1 either or	1(2)-CO1	1(2)-CO1	1 either or (16)- CO1	-
Unit-II: Predicate Calculus	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16)- CO2	-
Unit-III: Combinatorics	2	1 either or	1(2)- CO3	1(2)- CO3	1 either or (16)- CO3	-
Unit-IV: Algebraic Structures	2	1 either or	1(2)-CO4	1(2)- CO4	1 either or (16)- CO4	-
Unit-V: Lattices and Boolean algebra	2	1 either or	-	2(2)-CO5	1 either or (16)- CO5	-
Total Qns.	10	5 either or	4(2)	6(2)	5 either or (16)	-
Total Marks	20	80	8	12	80	-
Weightage	20%	80%	8%	12%	80%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22301	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C	
		3	0	2	4	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To critically analyze the efficiency of alternative algorithmic solutions for the same problem. 						
<ul style="list-style-type: none"> To illustrate brute force and divide and conquer design techniques. 						
<ul style="list-style-type: none"> To explain dynamic programming and greedy techniques for solving various problems. 						
<ul style="list-style-type: none"> To apply iterative improvement technique to solve optimization problems. 						
<ul style="list-style-type: none"> To examine the limitations of algorithmic power and handling it in different problems. 						
UNIT I	INTRODUCTION					9
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types –Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework - Asymptotic Notations and their properties – Graph algorithms: Representations of graphs - Graph traversal: DFS – BFS – applications.						
UNIT II	BRUTE FORCE AND DIVIDE AND CONQUER					10
Brute Force: –String Matching - Exhaustive Search: - Traveling Salesman Problem – Divide and Conquer Methodology: Multiplication of Large Integers - Closest-Pair Problems. Decrease and Conquer: Topological Sorting – Transform and Conquer: Heap Sort.						
UNIT III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE					9
Dynamic programming: – Warshall’s and Floyd’s algorithms – Multi stage graph – Knapsack Problem and Memory functions. Greedy Technique: – Dijkstra’s algorithm - Kruskal’s algorithm - Huffman Trees and codes.						
UNIT IV	ITERATIVE IMPROVEMENT					8
The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.						
UNIT V	LIMITATIONS OF ALGORITHM POWER					9
Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems. Backtracking: – N Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound: – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Traveling Salesman Problem.						
TOTAL: 45 PERIODS						
PRACTICAL EXERCISES:						
1	Implementation of String Matching using Brute Force approach.					
2	Implementation of Multiplication of Large Integers using Divide and Conquer approach.					
3	Implementation of Topological Sorting using Decrease and Conquer technique.					
4	Implementation of Heap Sort using Transform and Conquer technique.					
5	Implementation of Warshall’s and Floyd ‘s algorithms Dynamic programming method.					
6	Implementation of Dijkstra’s algorithm using Greedy Technique.					
7	Implementation of N-Queen problem using Backtracking method.					
8	Implementation of Traveling Salesman Problem using Branch and Bound method.					

TOTAL: 30 PERIODS	
TOTAL: 75 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Compare the efficiency of recursive and non-recursive algorithms mathematically
CO2:	Compare the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques
CO3:	Illustrate the problems using dynamic programming and greedy algorithmic techniques.
CO4:	Solve the problems using iterative improvement techniques for optimization.
CO5:	Solve the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques.
TEXT BOOKS:	
1.	Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.
2.	Sandeep Sen and Amit Kumar, “Design and Analysis of Algorithms: A Contemporary Perspective”, IIT Delhi, 2018.
REFERENCES:	
1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
2.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
3.	S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
4.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.
5.	O’Reilly, “Design and Analysis of Algorithms”, Pearson India, 2007, ISBN: 9788177585957.

CO’s- PO’s & PSO’s MAPPING

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

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

**Table of Specifications for End Semester Question Paper
AD22301 DESIGN AND ANALYSIS OF ALGORITHMS**

Unit No. and	Total 2	Total 16	Cognitive Level
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Title	Marks Qns.	Marks Qns.	Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Introduction	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: Brute Force and Divide and Conquer	2	1 either or	1(2)-CO2	1(2)-CO2 1 either or (16) - CO2	-	-
Unit-III: Dynamic Programming and Greedy Technique	2	1 either or	1(2)-CO3	1(2)-CO3 1 either or (16) -CO3	-	-
Unit-IV: Iterative Improvement	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4	-
Unit-V: Limitations of Algorithm Power	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16) - CO5-	-
Total Qns.	10	5 either or	5(2)	5(2) 3 either or (16)	2either or (16)	-
Total Marks	20	80	10	58	32	-
Weightage	20%	80%	10%	58%	32%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22302	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> 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			
Data Models- Three Schema Architecture and Data Dependence - Database environment – Database system development lifecycle – 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 – Inferencerules – Minimal cover – Properties of relational decomposition – Normalization (Up to BCNF).					
UNIT IV	TRANSACTION MANAGEMENT	8			
Transaction concepts – Properties – Schedules – Serializability – Concurrency Control – Two-phaselocking techniques.					
UNIT V	OBJECT RELATIONAL AND NO-SQL DATABASES	9			
Mapping EER to ODB schema – UDTs - Object identifier – Reference types – Row types – 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					
PRACTICAL EXERCISES:					
1.	Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL and DML commands.				
2.	Create a set of tables, add foreign key constraints and incorporate referential integrity.				
3.	Query the database tables using different ‘where’ clause conditions and also implement aggregate functions.				
4.	Query the database tables and explore sub queries and simple join operations.				
5.	Write user defined functions and stored procedures in SQL.				
6.	Create document, column and graph-based data using NOSQL database tools.				
7.	Database design using EER-to-ODB mapping / UML class diagrams.				
8.	Querying the Object-relational database using Object Query language.				
9.	Case Study using any of the real-life database applications - Inventory Management for a E-Mart Grocery Shop				
TOTAL: 30 PERIODS					

TOTAL: 75 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Explain the database development life cycle and apply conceptual modeling.
CO2:	Apply SQL queries to create, manipulate and query the database.
CO3:	Apply the conceptual-to-relational mapping and normalization to design relational database.
CO4:	Explain the transaction processing and concurrency control concepts.
CO5:	Apply No SQL development tools on different types of No-SQL databases.
TEXT BOOKS:	
1	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson, 2017.
2	Thomas M. Connolly, Carolyn E. Begg, "Database Systems – A Practical Approach to Design, Implementation and Management", Sixth Edition, Global Edition, Pearson Education, 2015.
REFERENCES:	
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", 6 th Edition, Tata Mc Graw Hill, 2011.
4.	Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems: The Complete Book", 2 nd edition, Pearson.
5.	Raghu Ramakrishnan, "Database Management Systems", 4 th Edition, Tata Mc Graw Hill, 2010.

CO's- PO's & PSO's MAPPING

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

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

**Table of Specifications for End Semester Question Paper
AD22302 DATABASE MANAGEMENT SYSTEMS**

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Conceptual Data Modeling	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: Relational Model and SQL	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16) - CO2	-
Unit-III: Relational Database Design and Normalization	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16) - CO3	-
Unit-IV: Transaction Management	2	1 either or	1(2)-CO4	1(2)-CO4 1 either or (16)-CO4	-	-
Unit-V: Object Relational and NO SQL Database	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16) - CO5	-
Total Qns.	10	5 either or	5(2)	5(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

			3	0	2	4
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To understand about client-server communication and to be familiar with HTML5. 						
<ul style="list-style-type: none"> To design interactive web pages and to use Cascading Style Sheets 						
<ul style="list-style-type: none"> To define web page validation using Java Script objects and use different event handling mechanisms. 						
<ul style="list-style-type: none"> To do modern interactive web applications using JSP and XML. 						
<ul style="list-style-type: none"> To learn the basics of AJAX and web services. 						
UNIT I	WEB SITE BASICS AND HTML					9
Web Essentials: The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message- Markup Languages: XHTML. An Introduction to HTML -Versions-Basic XHTML Syntax and Semantics- Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.						
UNIT II	CSS AND CLIENT-SIDE SCRIPTING					9
Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML-CSS3.0. Client-Side Programming: The JavaScript Language- Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements- Operators-Literals-Functions-Objects-Arrays.						
UNIT III	SERVER-SIDE SCRIPTING					9
Introduction to the Document Object Model DOM - The Document Tree-DOM Event Handling-Server-Side Programming: Java Servlets- Architecture - Overview-Servlet-Generating Dynamic Content-Sessions-Cookies - Data Storage Servlets and Concurrency- Databases and Java Servlets.						
UNIT IV	JSP AND XML					9
JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files- Databases and JSP. XML-Documents and Vocabularies-Versions and Declaration-Namespaces-Event-oriented Parsing: SAX-Transforming XML Documents-Template based Transformations: XSLT-Displaying XML Documents in Browsers.						
UNIT V	AJAX AND WEB SERVICES					9
AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods. Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services-SOAP Related Technologies						
						TOTAL: 45 PERIODS
PRACTICAL EXERCISES:						
1.	Create a web page with the following using HTML. <ul style="list-style-type: none"> To embed an image map in a web page. To fix the hot spots. Show all the related information when the hot spots are clicked 					
2.	Create a web page with all types of Cascading style sheets.					
3.	Create Client-Side Scripts for Validating Web Form Controls using DHTML.					
4.	Installation of Apache Tomcat web server.					
5.	Write programs in Java using Servlets: <ul style="list-style-type: none"> To invoke servlets from HTML forms. Session Tracking. 					

6.	Write programs in Java to create three-tier applications using JSP and Databases <ul style="list-style-type: none"> For conducting on-line examination. For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
7.	Programs using XML.
8.	Programs using DOM and SAX parsers.
9.	Programs using AJAX.
TOTAL: 30 PERIODS	
TOTAL: 75 PERIODS	
COURSE OUTCOMES:	
At the end of this course, the students will be able to:	
CO1:	Build simple web pages using markup languages like HTML and XHTML.
CO2:	Construct dynamic web pages using DHTML and java script that is easy to navigate and use.
CO3:	Develop server-side web pages that have to process request from client side web pages
CO4:	Develop XML and web pages using JSP.
CO5:	Outline web services and how these web services interact.
TEXT BOOKS:	
1.	Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2.	Steven Holzner , "The Complete Reference PHP", Tata McGraw-Hill, 2021.
REFERENCES:	
1.	Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2.	Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3.	Marty Hall and Larry Brown," Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4.	Bates, "Developing Web Applications", Wiley, 2006.
5.	Uttam K Roy, Web Technologies, Oxford University Press, 2021.

CO's-PO's & PSO's MAPPING

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

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

Table of Specifications for End Semester Question Paper

AD22303 WEB TECHNOLOGY

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Web Site Basics and Html	2	1 either or	1(2)-CO1	1(2)-CO1	1 either or (16)-CO1	-
Unit-II: CSS and Client Side Scripting	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16) - CO2	-
Unit-III: Server Side Scripting	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16) -CO3	-
Unit-IV: JSP AND XML	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)-CO4	-
Unit-V: AJAX and Web Services	2	1 either or	1(2)-CO5	1(2)-CO5 1 either or (16) -CO5	-	-
Total Qns.	10	5 either or	5(2)	5(2) 1 either or (16)	4 either or (16)	-
Total Marks	20	80	10	26	64	-
Weightage	20%	80%	10%	26%	64%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22304	DATA EXPLORATION AND VISUALIZATION				L	T	P	C
					3	0	2	4
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To outline an overview of exploratory data analysis. To implement visual aids for exploratory data. 								

	<ul style="list-style-type: none"> To perform data transformation techniques for data exploration and analysis. To apply data sets for data exploration and analysis. To use data exploration and visualization techniques for 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 – Numpy-Pandas-SciPy- Matplotlib.		
UNIT II	VISUAL AIDS FOR EDA	9
Technical Requirements- Line chart- Bar Charts- Scatter plot- Pie chart- Table Chart- Polar chart- Data transformation techniques- Data cleaning- loading the CSV file- Converting Nan values- Applying descriptive Statistics- Data refactoring- Dropping columns- Data Analysis- Number of e mails- time of day- Average emails per day and hour- Most frequently used words.		
UNIT III	DATA TRANSFORMATION TECHNICAL REQUIREMENTS	9
Merging database style data frames- Concatenating along with an axis- using df. merge with an inner join- pd. merge- merging an index- reshaping and pivoting-Transformation techniques- performing data deduplication- replacing values- Handling missing data- Discretization and binning- outlier detection- permutation and random sampling.		
UNIT IV	GROUPING DATSETS	9
Groupby mechanics- selecting a subset column- Max and min, Mean- Data Aggregation- Groupwise operations-Renaming groups aggregation columns Pivot tables and cross tabulations.		
UNIT V	TIME SERIES ANALYSIS	9
Fundamentals of TSA – Univariate time series- Characteristics of time series data – TSA with open Power System Data- Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.		
TOTAL: 45 PERIODS		
PRACTICAL EXERCISES:		
1	Install the data Analysis and Visualization tool: 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 differentinsights 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 Ron sample data sets and visualize.	
5	Perform Time Series Analysis and apply the various visualization techniques.	
6	Perform Data Analysis and representation on a Map using various Map data sets with MouseRollover 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 visualization techniques andpresent an analysis report.	
TOTAL: 30 PERIODS		
TOTAL: 75 PERIODS		

COURSE OUTCOMES:	
At the end of this course, the students will be able to:	
CO1:	Outline the fundamentals of exploratory data analysis.
CO2:	Show visual aids for data exploration and analysis.
CO3:	Develop transformation techniques for data visualization.
CO4:	Apply grouping datasets in data exploration and analysis.
CO5:	Make use of Data exploration and visualization techniques for 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.
REFERENCES:	
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”, 2 nd Edition, CRC press, 2015.
4.	Tamara Munzner, “Visualization Analysis and Design”, Bookshop, Amazon, Jan 23, 2023.
5.	Randy Krum, Effective Communication with Data Visualization and Design, Bookshop, Amazon, Jan 23, 2023.

CO’s- PO’s & PSO’s MAPPING

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

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

Table of Specifications for End Semester Question Paper

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate

						(Ev)
Unit-I: Exploratory Data Analysis	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: Visualizing Using Matplotlib	2	1 either or	1(2)-CO2	1(2)-CO2 1 either or (16) - CO2	-	-
Unit-III: Univariate Analysis	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16) - CO3	-
Unit-IV: Bivariate Analysis	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)- CO4	-
Unit-V: Multivariate and Time Series Analysis	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16) - CO5	-
Total Qns.	10	5 either or	5(2)	5(2) 2 either or (16)	3 either or (16)	-
Total Marks	20	80	10	42	48	-
Weightage	20%	80%	10%	42%	48%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

SD22301	CODING SKILLS AND SOFT SKILLS TRAINING – PHASE I	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To make the students to solve basic programming logics. To help the students develop logics using decision control statements. To make them develop logics using looping statements and arrays. To train the students for effective communication and identify the common errors in 					

formal writings		
<ul style="list-style-type: none"> To guide and motivate the students for setting their goals with positive thinking 		
UNIT I	FUNDAMENTALS IN PROGRAMMING	8
Output of Programs: I/O Functions, Data types, Constants, Operators – Mathematical Problems – Debugging – Puzzles - Company Specific Programming Examples.		
UNIT II	DECISION CONTROL STATEMENTS	8
Logic Building Using Conditional Control Statements – Output of Programs – Mathematical Problems - Puzzles – Company Specific Programming Examples		
UNIT III	LOOPING STATEMENTS AND ARRAYS	14
Logic Building Using Looping Statements – Number Programs – Programs on Patterns – Array Programs – Programs on Sorting and Searching - Matrix Programs – Puzzles - Output of Programs - Company Specific Programming Examples		
UNIT IV	COMMUNICATION IN GENERAL	15
Introduction to communication-Types of communication - Effective Communication-Barriers to communication. Language Study: Vocabulary-Formation of sentences-Sentence and sentence structures-Common errors - Writing paragraphs & essays. Professional writing: Job application & Resume writing		
UNIT V	PERSONALITY DEVELOPMENT	15
Study of personality & ways to improve. Soft Skills: Self-evaluation / self-awareness - Goal setting and positive thinking - Self-esteem and confidence - Public speaking – Extempore - Body language and Observation skills		
TOTAL: 45 PERIODS		
Suggestive Assessment Methods:		
<ol style="list-style-type: none"> 1) Pre Assessment Test – To check the student’s previous knowledge in Programming skills. 2) Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20. 3) Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20. 4) Model Exam for coding skills will be conducted for 100 marks which are then calculated to 20. 5) A test for Communication skills will be conducted for 100 marks which will be then calculated to 40. 6) For assignments, students should attend all the practice tests conducted online on HackerRank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks. 7) The total of 100 marks obtained from the tests will be then calculated to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100. 		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		

CO1:	Solve problems on basic I/O constructs.
CO2:	Develop problem solving skills using decision control statements.
CO3:	Develop logics using looping statements and arrays
CO4:	Avoid / fix the common errors they commit in academic and professional writings and prepare standard resumes and update the same for future career
CO5:	Recognize the value of self-evaluation and grow with self confidence
TEXT BOOKS:	
1.	Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
REFERENCES:	
1.	Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, First Edition, Pearson Education, 2013.
2.	Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
3.	E Balagurusamy, “Programming in ANSI C”, Eighth edition, Mc GrawHill Publications, 2019.
4.	S.Sobana, R.Manivannan, G.Immanuel, “Communication and Soft Skills” VK Publications’, 2016
5.	Zed Shaw, “Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding”, Zed Shaw’s Hardway Series, 2015.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	1	1	1	-	-	-	1	2	2	2	2
CO2	3	2	2	-	1	1	1	-	-	-	1	2	2	2	2
CO3	3	2	2	-	1	1	1	-	-	-	1	2	2	2	2
CO4	-	-	-	-	-	-	-	1	2	3	-	2	-	1	1
CO5	-	-	-	-	-	-	-	1	2	3	-	2	-	1	1
CO	3	2	2	-	1	1	1	1	2	3	1	2	2	2	2

HS22301	VALUE EDUCATION – I	L	T	P	C
		1	0	0	0
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To give the students a deeper understanding about the purpose of life. To animate the students to have a noble vision and a right value system for their life. To help the students to set short term and long-term goals in their life. 					
UNIT I	MY LIFE AND MY PLACE IN THE UNIVERSE	4			
Value of my life – My Uniqueness, strengths and weakness – My self-esteem and confidence –					

My identity in the universe.		
UNIT II	MY LIFE AND THE OTHER	4
Realizing the need to relate with other persons and nature – My refined manners and conduct in relationships – Basic communication and relationship skills – Mature relationship attitudes.		
UNIT III	MY LIFE IS MY RESPONSIBILITY	3
Personal autonomy – developing a value system and moral reasoning skills – setting goals for life.		
UNIT IV	UNDERSTANDING MY EDUCATION AND DEVELOPING MATURITY	4
Importance of my Engineering education – Managing emotions - personal problem-solving skills.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Explain the importance of value-based living.	
CO2:	Set realistic goals and start working towards them.	
CO3:	Apply the interpersonal skills in their personal and professional life.	
CO4:	Emerge as responsible citizens with a clear conviction to be a role model in the society.	
REFERENCES:		
1.	David Brooks. The Social Animal: The Hidden Sources of Love, Character, and Achievement. Random House, 2011.	
2.	Mani Jacob. Resource Book for Value Education. Institute of Value Education, 2002.	
3.	Eddie de Jong. Goal Setting for Success. CreateSpace Independent Publishing, 2014.	
4.	Dr. Abdul kalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.	

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO2	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO3	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO4	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO5	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-
CO	-	-	-	-	-	2	-	1	1	2	-	2	-	1	-

AC22301	CONSTITUTION OF INDIA				L	T	P	C
					2	0	0	0
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> Teach history and philosophy of Indian Constitution. Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective. 								

<ul style="list-style-type: none"> Summarize powers and functions of Indian government. 	
<ul style="list-style-type: none"> Explain emergency rule. 	
<ul style="list-style-type: none"> Explain structure and functions of local administration. 	
UNIT I	INTRODUCTION 6
History of Making of the Indian Constitution - Drafting Committee - Philosophy of the Indian Constitution - Preamble - Salient Features.	
UNIT II	CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES 6
Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Fundamental Duties.	
UNIT III	ORGANISATIONS OF GOVERNANCE 7
Parliament - Composition - Qualifications and Disqualifications - Powers and Functions - Executive President - Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges - Qualifications, Powers and Functions.	
UNIT IV	EMERGENCY PROVISIONS 4
Emergency Provisions - National Emergency, President Rule, Financial Emergency.	
UNIT V	LOCAL ADMINISTRATION 7
District's Administration head - Role and Importance -Municipalities - Introduction- Mayor and role of Elected Representative - CEO of Municipal Corporation -Pachayati raj - Introduction - PRI- Zila Pachayat-Elected officials and their roles.	
TOTAL: 30 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Understand history and philosophy of Indian Constitution.
CO2:	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3:	Understand powers and functions of Indian government.
CO4:	Understand emergency rule.
CO5:	Understand structure and functions of local administration.
TEXT BOOKS:	
1.	Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2.	Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.
REFERENCES:	
1.	Jain M P, Indian Constitution Law, 7th Edn, Lexis Nexis, 2014.
2.	The Constitution of India (Bare Act), Government Publication, 1950.
3.	M.V.Pylee, "Introduction to the Constitution of India", 4 th Edition, Vikas publication, 2005.
4.	Durga Das Basu (DD Basu), "Introduction to the constitution of India", (Student Edition), 19 th Edition, Prentice-Hall EEE, 2008.
5.	Merunandan, "Multiple Choice Questions on Constitution of India", 2 nd Edition, Meraga publication, 2007.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3

CO1	-	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-
CO3	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-
CO4	-	-	-	1	-	-	1	-	1	1	1	1	-	-	-
CO5	-	-	1	-	-	-	1	-	-	1	-	1	-	-	-
CO	-	1	1	1	1	1	1	1	1	1	1	1	-	-	-

GE3252	jkpoUk; njhopy; El;gKk;				L	T	P	C	
					1	0	0	1	
COURSE OBJECTIVES:									
<ul style="list-style-type: none"> • rq;f fhyj;jpd; nerT kw;Wk; gPq;fhd; njhopy; El;gj;ij khzth;fs; Ghpe;Jnfhs;s trjp nra;jy;. • rq;f fhyj; jkpoh;fspd; tbtikg;G njhopy;El;gk; gw;wpa tpopg;Gzh;it Vw;gLj;Jjy;. • gz;ila fhy cw;gj;jp njhopy;El;gj;jpd; midj;J epiyfisAk; NtWgLj;jp mwpa khzth;fSf;F cjTjy;. • tptrhak; kw;Wk; ePh;g;ghrd njhopy;El;gj;jpd; gz;ila mwpitg; Ghpe;Jf; nfhs;s nra;jy;. • jkpo; nkhopapd; b[pl;ly; kakhf;fy; gw;wpg; Ghpe;Jf; nfhs;s nra;jy;. 									
myF I	nerT kw;Wk; ghidj; njhopy;El;gk							3	
rq;f fhyj;jpy; nerTj; njhopy; – ghidj; njhopy;El;gk; – fUg;G rptg;G ghz;lq;fs; – ghz;lq;fspy; fPwy; FwpaPLfs;									
myF II	tbtikg;G kw;Wk; fl;blj; njhopy;El;gk							3	
rq;f fhyj;jpy; tbtikg;G kw;Wk; fl;Lkhdq;fs; & rq;f fhyj;jpy; tPl;Lg; nghUl;fspy; tbtikg;G – rq;f fhyj;jpy; fl;Lkhd nghUl;fSk; eLfy;Yk; – rpyg;gjpfhuj;jpy; Nkil mikg;G gw;wpa tptuq;fs; – khky;yGur; rpw;gq;fSk;> Nfhtpy;fSk; – Nrhou; fhyj;J ngUq;Nfhapy;fs; kw;Wk; gpw topghl;Lj; jyq;fs; – ehaf;fu; fhyf; Nfhtpy;fs; – khjpup fl;likg;Gfs; fw;wp mwpjy;> kJiu kPdhl;rp mk;kd; Myak; kw;Wk; jpUkiy ehaf;fu; k`hy; – nrl;behl;L tPLfs; – gpupl;b\;; fhyj;jpy; nrd;idapy; ,e;Njh – rhNuhnrdpf; fl;blf; fiy.									
myF III	cw;gj;jpj; njhopy; El;gk;							3	
fg;gy; fl;Lk; fiy – cNyhftpay; – ,Uk;Gj; njhopw;rhiy – ,Uk;ig cUf;Fjy;> v/F – tuyhw;Wr; rhd;Wfshf nrk;G kw;Wk; jq;f ehzaq;fs; – ehzaq;fs; mr;rbj;jy; – kzp cUthf;Fk; njhopw;rhiyfs; – fy;kzpf;fz;zhb kzpf;fs; – RLkz; kzpf;fs; – rq;F kzpf;fs; - vYk;Gj;Jz;Lfs; – njhy;ypay; rhd;Wfs; – rpyg;gjpfhuj;jpy; kzpfspd; tiffs;.									
myF IV	Ntshz;ik kw;Wk; ePu;ghrdj; njhopy;El;gk							3	
miz> Vup> Fsq;fs;> kjF – Nrhou;fhyf; FKopj; J}k;gpd; Kf;fpaj;Jtk; – fhy;eil guhkupg;G – fhy;eilfSf;fhd tbtikf;fgl;l fpzWfs; – Ntshz;ik kw;Wk; Ntshz;ikr; rhu;e;j nray;ghLfs; – fly;rhu; mwpT – kPd;tsk; – Kj;J kw;Wk; Kj;Jf;Fspj;jy; – ngUq;fly; Fwpj;j gz;ila mwpT – mwpTrhu; r%fk;.									

myF V	mwptpay; jkpo; kw;Wk; fzdppj;jkpo;	3
mwptpay; jkpopd; tsu;r;rp – fzdppj;jkpo; tsu;r;rp – jkpo; E}y;fis kpd;gjpg;G nra;jy; – jkpo; nkd;nghUl;fs; cUthf;fk; – jkpo; ,izaf; fy;tpf;fofk; – jkpo; kpd; E}yfk; – ,izaj;jpy; jkpo; mfuhjpf; – nrhw;Fitj; jpl;lk;.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
,g;ghlj; jpl;l;j;jpd; %yk; khzth;fs;:		
CO1:	rq;f fhyj;jpd; nerT kw;Wk; gPq;fhd; njhopy; El;gj;jpd; Kf;fpaj;Jtj;ij tpthpf;f KbAk;.	
CO2:	rq;f fhyj; jkpoh;fspd; tbtikg;G njhopy;El;gk; gw;wpa mwpit tpsf;f KbAk;.	
CO3:	gz;ila jkpoh;fspd; cw;gj;jp njhopy;El;gk; gw;wpa tYthd mbj;js mwpit ntspg;gLj;j KbAk;.	
CO4:	jkpoh;fspd; tptrhak; kw;Wk; ePh;g;ghrd njhopy;El;gj;jpd; gz;ila mwpit tpthpf;f KbAk;.	
CO5:	jkpo; nkhopapd; b[pl;ly; kakhf;fy; gw;wpa fUj;ij tpsf;f KbAk;.	
TEXT & REFERENCE BOOKS:		
1.	fzpzpj;jkpo; – Kidtu; ,y. Re;juk;. (tpfld; gpuRuk;)	
2.	fPob – itif ejpf;fuapy; rq;ffhy efu ehfuPfk; (njhy;ypay; Jiw ntspaPL) / Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.	
3.	nghUie – Mw;wq;fiu ehfuPfk;. (njhy;ypay; Jiw ntspaPL) / “Porunai Civilization”, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.	
4.	Dr.K.K.Pillay, Social Life of Tamils, A joint publication of TNTB & ESC and RMRL.	
5.	Dr.S.Singaravelu, “Social Life of the Tamils - The Classical Period”, International Institute of Tamil Studies.	
6.	R.Balakrishnan, “Journey of Civilization Indus to Vaigai”, RMRL.	

Course outcomes	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
CO	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-

Table of Specification for End Semester Question Paper

GE 3252 TAMILS AND TECHNOLOGY

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse(An) Evaluate(Ev)
			No. of Qns. (marks) and CO			
Unit-I: Weaving and Ceramic Technology	2	1 either or	2(2)-CO1	1 either or (16)- CO1	-	-
Unit-II: Design and Construction Technology	2	1 either or	2(2)-CO2	1 either or (16)- CO2	-	-
Unit-III: Manufacturing Technology	2	1 either or	1(2)- CO3	1(2)- CO3 1 either or (16)- CO3	-	-
Unit-IV: Agriculture and Irrigation Technology	2	1 either or	1(2)-CO4	1(2)- CO4 1 either or (16)- CO4	-	-
Unit-V: Scientific Tamil & Tamil Computing	2	1 either or	1(2)-CO5	1(2)-CO5 1 either or (16)- CO5	-	-
Total Qns.	10	5 either or	7(2)	3(2) 5 either or (16)	-	-
Total Marks	20	80	14	86	-	-
Weightage	20%	80%	14%	86%	-	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

SEMESTER IV

MA22401	PROBABILITY AND STATISTICAL TECHNIQUES	L	T	P	C
		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To apply the statistical tools in engineering problems. To introduce the basic concepts of probability and random variables. To introduce the basic concepts of two-dimensional random variables and correlation. To acquaint the knowledge of non-parametric tests which plays an important role in real life problems. To introduce the concept of control charts for statistical quality control. 					
UNIT I	PROBABILITY AND RANDOM VARIABLES	12			
Probability - Axioms of probability – Discrete random variable– Probability mass function– Continuous random variable – Probability density function – Probability distribution – Cumulative distribution function – Mean, Variance- Special distributions: Binomial and Poisson distributions (Derivations not included).					
UNIT II	NORMAL DISTRIBUTION AND COVARIANCE	12			
Normal distribution: Definition and problems, Central limit theorem (excluding proof) - Two-dimensional discrete distribution – Joint probability mass function - Discrete marginal distribution – Discrete conditional distribution - Covariance.					
UNIT III	CORRELATION, REGRESSION AND ESTIMATION THEORY	12			
Correlation (discrete case) – Karl Pearson's coefficient of correlation and Spearman's rank correlation – Linear regression - Regression coefficients – Definitions: Unbiased estimators, Efficiency, Consistency, Sufficiency - Curve fitting by the method of least squares (linear and quadratic forms).					
UNIT IV	NON- PARAMETRIC TESTS	12			
Introduction - Rank sum tests: Mann – Whitney U test- Wilcoxon two sample test - Kruskal - Wallis H test - Tests based on Runs: One sample run test - Test of randomness - The Kolmogorov -Smirnov test for goodness of fit					
UNIT V	STATISTICAL QUALITY CONTROL	12			
The Control Chart – Nature of the Control limits - Control charts for variables or measurements - \bar{X} and R charts for variables – Control charts for attributes - The p -chart for Fraction Defective – Control Charts for Number of Defectives - (c and np charts) – Tolerance limits					
TOTAL: 60 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
CO1:	Apply probability and discrete distributions in engineering field.				
CO2:	Find the probability using central limit theorem, covariance for discrete random variable.				
CO3:	Compute correlation, regression and fitting of curve for discrete data.				
CO4:	Apply non-parametric tests in real life problems.				

CO5:	Apply control charts in data analysis.
TEXT BOOKS:	
1.	Gupta. S.C. and Kapoor. V. K., “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
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.
REFERENCES:	
1.	John E. Freund, "Mathematical Statistics", Prentice Hall, 8th Edition, 2013.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi, 9th Edition, 2017.
3.	Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5th Edition, Elsevier, 2014.
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum’s Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2010.

CO’s- PO’s & PSO’s MAPPING

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

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

Table of Specifications for End Semester Question Paper

MA22401- PROBABILITY AND STATISTICAL TECHNIQUES

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Probability and Random variables	2	1 either or	1(2)-CO1	1(2)-CO1	1either or (16)-CO1	-

Unit-II: Normal Distribution and Covariance	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16)-CO2	-
Unit-III: Correlation, Regression and Estimation Theory	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16)-CO3	-
Unit-IV: Non-Parametric tests	2	1 either or	2(2)-CO4	-	1 either or (16)-CO4	-
Unit-V: Statistical Quality Control	2	1 either or	1(2)-CO5	1(2)-CO3	1 either or (16)-CO5	-
Total Qns.	10	5 either or	6(2)	4(2)	5 either or (16)	-
Total Marks	20	80	12	8	80	-
Weightage	20%	80%	12%	8%	80%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22401	OPERATING SYSTEMS			L	T	P	C
				3	0	2	4
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the basics and functions of operating systems. To understand Processes and Threads. To analyze Scheduling algorithms and process synchronization. To understand the concept of Deadlocks. To analyze various memory management schemes. 							
UNIT I	INTRODUCTION						9
Operating Systems- Computer System organization; Computer System Architecture- Computer System Structure- Operating Systems operations- Process management- Memory Management- Storage Management- Protection and Security- Computing Environments- Open Source Operating Systems.							
UNIT II	OPERATING SYSTEM STRUCTURES						9
Operating System Services- User and Operating System Interface- System Calls- Types of System Calls- System Programs- Operating System Design and Implementation- Operating System Structure- Debugging- OS Generation- System Boot.							
UNIT III	PROCESS MANAGEMENT						9
Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling algorithms (Thread scheduling, Multiple Processor Scheduling, Real time CPU Scheduling): Process Synchronization - The critical-section problem - Deadlock – System Model- Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.							
UNIT IV	MEMORY MANAGEMENT						9
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.							
UNIT V	STORAGE MANAGEMENT						9
Disk Structure - Disk Scheduling and Management - File concept - Access methods - Directory Structure - File Sharing; File System Implementation - File System Structure - Directory implementation - Allocation Methods.							
TOTAL: 45 PERIODS							
PRACTICAL EXERCISES:							
1.	Process Management using System Calls: Fork, Exec, Getpid, Exit, Wait, Close.						
2.	Illustrate the inter process communication strategy.						
3.	Implement mutual exclusion by Semaphores.						
4.	Write a C program to avoid Deadlock using Banker's Algorithm.						
5.	Write a C program to Implement Deadlock Detection Algorithm.						
6.	Write C program to implement Threading.						
7.	Implement the paging Technique using C program.						
8.	Write C programs to implement the following Memory Allocation Methods a. First Fit b. Worst Fit c. Best Fit						
9.	Write C programs to Implement the various File Organization Techniques.						
TOTAL: 30 PERIODS							

TOTAL: 75 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Explain the functionality of operating system
CO2:	Explain file system structure and booting concepts.
CO3:	Compare scheduling algorithms.
CO4:	Compare memory management schemes.
CO5:	Explain storage management and allocation methods.
TEXT BOOKS:	
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2018.
2.	Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.
REFERENCES:	
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.
4.	Deitel, Deitel, and Choffnes, “Operating Systems”, Amazon Web Services (AWS), 2003.
5.	Avi Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Concepts Essentials”, Second Edition, John Wiley & Sons, Inc. ISBN 978-1-118-80492-6, 2023

CO's- PO's & PSO's MAPPING

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

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

Table of Specifications for End Semester Question Paper

AD22401 OPERATING SYSTEMS

Unit No. and Title	Total 2	Total 16	Cognitive Level
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	Marks Qns.	Marks Qns.	Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Introduction	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: Process Management	2	1 either or	1(2)-CO2	1(2)-CO2 1 either or (16) - CO2	-	-
Unit-III: Memory Management	2	1 either or	1(2)-CO3	1(2)-CO3 1 either or (16) -CO3	-	-
Unit-IV: Storage Management	2	1 either or	1(2)-CO4	1(2)-CO4 1 either or (16)-CO4	-	-
Unit-V: Virtual Machines and Mobile OS	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16) -CO5	-
Total Qns.	10	5 either or	5(2)	5(2) 4 either or (16)	1 either or (16)	-
Total Marks	20	80	10	74	16	-
Weightage	20%	80%	10%	74%	16%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22402	AI METHODOLOGIES				L	T	P	C
					3	0	2	4
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> • To learn the basic AI approaches. • To develop problem solving agents. • To perform logical and probabilistic reasoning. 								
UNIT I	INTELLIGENT AGENTS							9

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents – search algorithms – uninformed search strategies- Depth first and Breadth first- Measure of performance and analysis of uninformed search algorithms.		
UNIT II	PROBLEM SOLVING	9
Informed Search Strategies - performance and analysis of Informed search algorithms-Local search and optimization problems – Problem solving agents – search in partially observable environments – online search agents and unknown environments.		
UNIT III	GAME PLAYING AND CSP	9
Game theory – min-max algorithm – 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 REASONING	9
Knowledge-based agents – propositional logic – First-order logic – syntax and semantics – knowledge representation – inferences in first-order logic – forward chaining – backward chaining – resolution.		
UNIT V	PROBABILISTIC REASONING	9
Acting under uncertainty – Probabilistic reasoning – Bayesian Networks- Dempster – Shafer theory- Decision trees- Hidden Markov Model.		
TOTAL: 45 PERIODS		
PRACTICAL EXERCISES:		
1.	Implementation of Breadth First Search using Python.	
2.	Implementation of Depth First Search using Python.	
3.	Implementation of Water Jug Problem	
4.	Implementation of Tower of Hanoi Problem.	
5.	Implementation of Hill Climbing Algorithm.	
6.	Implementation of Alpha-Beta pruning in Game Playing.	
7.	Implementation of Forward Chaining.	
8.	Implementation of Backward Chaining.	
9.	Implementation of Bayesian networks.	
TOTAL: 30 PERIODS		
TOTAL: 75 PERIODS		
COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
CO1:	Explain intelligent agent frameworks.	
CO2:	Apply problem solving techniques.	
CO3:	Apply game playing and CSP techniques.	
CO4:	Build logical reasoning.	
CO5:	Build probabilistic reasoning under uncertainty	
TEXT BOOKS:		
1.	Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.	
REFERENCES:		
1.	Dan W. Patterson, “Introduction to AI and ES”, 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 Education, 2006.	
4.	Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013.	

5.	http://nptel.ac.in/
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CO's- PO's & PSO's MAPPING

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

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

Table of Specifications for End Semester Question Paper

AD22402 AI METHODOLOGIES

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Intelligent Agents	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: Problem Solving	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16) - CO2	-
Unit-III: Game Playing and CSP	2	1 either or	1(2)-CO3	1(2)-CO3	1 either or (16) -CO3	-
Unit-IV: Logical Reasoning	2	1 either or	1(2)-CO4	1(2)-CO4	1 either or (16)- CO4	-
Unit-V: Probabilistic Reasoning	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16) -CO5	-
Total Qns.	10	5 either or	5(2)	5(2) 1 either or (16)	4 either or (16)	-

Total Marks	20	80	10	26	64	-
Weightage	20%	80%	10%	26%	64%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22403	FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand the techniques and processes of data science. 					
<ul style="list-style-type: none"> To apply descriptive data analytics. 					
<ul style="list-style-type: none"> To describe the relationship between data. 					
<ul style="list-style-type: none"> To understand inferential data analytics. 					
<ul style="list-style-type: none"> 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					
UNIT III	DESCRIBING RELATIONSHIPS	9			
Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r ² –multiple regression equations – regression towards the mean					
UNIT IV	INFERENCEAL 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 V	PREDICTIVE ANALYTICS	9			
Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling. Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression – estimating parameters – Time series analysis – moving averages – missing values – serial correlation – autocorrelation.					
TOTAL: 45 PERIODS					
PRACTICALS:					
1.	Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.				
2.	Working with NumPy arrays				
3.	Working with Pandas data frames				
4.	Working with basic plots using Matplotlib.				
5.	Consider the diabetes data set from UCI and Pima Indians Diabetes data set for performing the Univariate analysis (Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis).				
6.	Apply and explore various plotting functions on UCI data sets. a. Normal curves				

	b. Density and contour plots c. Correlation and scatter plots d. Histograms e. Three-dimensional plotting
7.	Perform regression analysis using diabetes data set from UCI.
8.	Building and validating bivariate analysis: (Linear or logistic regression modeling)
TOTAL: 30 PERIODS	
TOTAL: 75 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Define the data science process
CO2:	Understand different types of data description for data science process.
CO3:	Gain knowledge on relationships between data
CO4:	Interpret statistical inferences from data.
CO5:	Build models for predictive analytics.
TEXT BOOKS:	
1.	Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (First two chapters for Unit I).
2.	Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
REFERENCES:	
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.
5.	Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

CO’s- PO’s & PSO’s MAPPING

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

1 - low, 2 - medium, 3 - high, ‘-’ - no correlation

Table of Specifications for End Semester Question Paper
AD22403 FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate (Ev)
Unit-I: Introduction to Data Science	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1		-
Unit-II: Descriptive Analytics	2	1 either or	1(2)-CO2	1(2)-CO2 1 either or (16) - CO2		-
Unit-III: Inferential Statistics	2	1 either or	1(2)-CO3	1(2)-CO3 1 either or (16) - CO3		-
Unit-IV: Analysis of Variance	2	1 either or	1(2)-CO4	1(2)-CO4 1 either or (16)-CO4		-
Unit-V: Predictive Analytics	2	1 either or	1(2)-CO5	1(2)-CO5	1 either or (16) - CO5-	-
Total Qns.	10	5 either or	5(2)	5(2) 4 either or (16)	1 either or (16)	-
Total Marks	20	80	10	74	16	-
Weightage	20%	80%	10%	74%	16%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

AD22404	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To define the fundamentals of computer system, execution of an instruction, memory system and IO communication. To demonstrate the basic organization of computer, different instruction formats and addressing modes. To apply simplification techniques to implement Boolean expression. To design synchronous sequential digital circuits and combinational circuits. 					
UNIT I	DIGITAL FUNDAMENTALS AND COMBINATIONAL LOGIC	9			
Digital system – Logic Gates – Number Base Conventions - Karnaugh Map - Combinational Circuits - Analysis and Design Procedures – Binary Adder – Subtractor – Decoder – Encoder – Multiplexers.					
UNIT II	SYNCHRONOUS SEQUENTIAL LOGIC	9			
Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, State Reduction, state assignment, Registers and Counters (Theory based).					
UNIT III	COMPUTER FUNDAMENTALS	9			
Basic structure of computers – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes – Assembly Language - Encoding of Machine Instruction.					
UNIT IV	PROCESSOR	9			
Instruction Execution – Hardware components – Instruction Fetch and Execution Steps – Control Signals - Hardwired Control, Micro programmed Control – Pipelining					
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.					
TOTAL: 45 PERIODS					
PRACTICALS:					
1.	Design and implementation of Logic gates.				
2.	Design of Adder.				
3.	Design of Subtractor				
4.	Design of Multiplexer.				
5.	Design of Encoder.				
6.	Design of Decoder.				
7.	Design and implementation of counter.				
8.	Design and implementation of shift register.				
TOTAL: 30 PERIODS					
TOTAL: 75 PERIODS					
COURSE OUTCOMES:					
At the end of the course, the students will be able to:					

CO1:	Define the fundamentals of computer system and combinational circuits.
CO2:	Construct synchronous sequential digital circuits.
CO3:	Demonstrate the basic organization of computer, different instruction formats and addressing modes.
CO4:	Summarize hardware and pipeline processor.
CO5:	Explain the characteristics of various memory system and IO communication.
TEXT BOOKS:	
1.	M. Morris Mano, Michael D. Ciletti, “Digital Design”, Fifth Edition, Pearson Education, 2013.
2.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012.
REFERENCES:	
1.	Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, Cengage Learning, 2013.
2.	John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3.	David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Fifth Edition, Morgan Kaufmann/Elsevier, 2013.
4.	William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016.
5.	Govindarajalu, —Computer Architecture and Organization, Design Principles and Applications”, Second edition, McGraw-Hill Education India Pvt. Ltd, 2014.

CO's- PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	2	1	1	1	1	2	3	2	3	3
2	3	3	3	3	2	1	1	1	1	1	2	3	1	2	2
3	3	3	3	3	2	2	1	1	1	1	2	3	2	3	1
4	3	3	3	3	1	1	1	1	1	1	1	2	1	3	1
5	3	3	3	3	1	2	1	1	1	1	1	2	1	2	1
AVG	3	3	3	3	1	2	1	1	1	1	1	2	1	2	1

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

Table of Specifications for End Semester Question Paper

AD22404 DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

Unit No. and Title	Total 2 Marks Qns.	Total 16 Marks Qns.	Cognitive Level			
			Remember (Kn)	Understand (Un)	Apply (Ap)	Analyse (An) Evaluate

						(Ev)
Unit-I: Digital Fundamentals and Combinational Logic	2	1 either or	1(2)-CO1	1(2)-CO1 1 either or (16)-CO1	-	-
Unit-II: Synchronous Sequential Logic	2	1 either or	1(2)-CO2	1(2)-CO2	1 either or (16) CO2	-
Unit-III: Computer Fundamentals	2	1 either or	1(2)-CO3	1(2)-CO3 1 either or (16)-CO3	-	-
Unit-IV: Processor	2	1 either or	1(2)-CO4	1(2)-CO4 1 either or (16)-CO4	-	-
Unit-V: Memory And I/O	2	1 either or	1(2)-CO5	1(2)-CO5 1 either or (16)-CO5	-	-
Total Qns.	10	5 either or	5(2)	5(2) 4 either or (16)	1 either or (16)	-
Total Marks	20	80	10	74	16	-
Weightage	20%	80%	10%	74%	16%	-
Weightage for COs						
	CO1	CO2	CO3	CO4	CO5	
Total Marks	20	20	20	20	20	
Weightage	20%	20%	20%	20%	20%	

SD22401	CODING SKILLS AND SOFT SKILLS TRAINING – PHASE II				L	T	P	C
					0	0	4	2
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> • To help students on developing modular applications using functions. • To train them on building logics using strings and pointers. • To make them develop applications using user defined data types. • To train the students on speaking skills for group discussions 								

<ul style="list-style-type: none"> • To set them correctly on the track of presentation skills and management skills 		
UNIT I	FUNCTIONS	12
Logic Building Using Functions – Programs on Recursion – Puzzles - Output of Programs - Company Specific Programming Examples		
UNIT II	STRINGS AND POINTERS	12
Logic Building Using Strings – Programs on Strings - Logic Building Using Pointers – Puzzles - Output of Programs - Company Specific Examples		
UNIT III	USER DEFINED DATATYPES	6
Working with User Defined Datatypes – Puzzles - Output of Programs - Company Specific Examples		
UNIT IV	COMMUNICATION SKILLS / LANGUAGE SKILLS	15
<p>Receptive Skills and productive skills - Skills together - Integration of skills - Input and output</p> <p>Receptive Skills: Listening and Reading - Lead-in - Pre-existent knowledge - General understanding of the audio or the written text - Discussion in pairs or small groups – feedback - Text-related task in detail - Focus on aspects of language in the text. Productive Skills: Speaking and Writing - lead-in - engaging students with the topic - setting the task - role-play - Monitoring the task - Giving the feedback-positive- task-related follow up - repetition / re-setting of task. Activities: Pronunciation: syllable, stress, intonation - Writing memos, e-mails and formal letters - Oral presentations / seminars - Written and Oral Descriptions Group discussions</p>		
UNIT V	SOFT SKILLS: SEARCH AND FIND FOR CAREER DEVELOPMENTS	15
<p>Self-motivation: Interpersonal relationship - Attitudes and interpersonal integrity – Time management – prioritizing - Leadership quality – In the team: Team building and Team work - Memory technique Problem solving: – emotional intelligence – positive attitude towards life – taking up initiatives – developing mind set –openness to feed back – adaptability – active listening – work ethics. Presentation of skills: creative thinking – critical thinking – logical thinking - decision making. Management ability: empathy – selflessness – humility – cultural respectfulness – versatility – generosity – trustworthiness – planning and executing – target achievement – listening to others’ views – friendliness - active participation – empowering healthy atmosphere – exchange of ideas – mediation – negotiation – qualities – updating the knowledge – pre-work for performance – respect for rules and regulations</p>		
TOTAL: 45 PERIODS		
Suggestive Assessment Methods:		
<ol style="list-style-type: none"> 1) Pre Assessment Test – To check the student’s previous knowledge in Programming skills. 2) Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20. 3) Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20. 4) Model Exam for coding skills will be conducted for 100 marks which are then reduced to 		

20

5) A test for Communication skills will be conducted for 100 marks which will be then calculated to 40.

6) For assignments, students should attend all the practice tests conducted online on HackerRank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks.

7) The total of 100 marks obtained from the tests will be then reduced to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100.

COURSE OUTCOMES:

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

CO1: Develop and implement modular applications using functions

CO2: Develop logics using strings and pointers.

CO3: Develop applications in C using user defined datatypes.

CO4: Practice both receptive skills (listening and reading) and productive skills (writing and speaking) and speak English with standard pronunciation using correct stress and intonation.

CO5: Practice team building and team work procedures and develop memory techniques and manage abilities like empathy, selflessness, cultural respectfulness and trustworthiness preparing themselves for target achievement.

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.

2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", First Edition, Pearson Education, 2013.

2. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.

3. E Balagurusamy, "Programming in ANSI C", Eighth edition, Mc GrawHill Publications, 2019.

4. S.Sobana, R.Manivannan, G.Immanuel, "Communication and Soft Skills" VK Publications', 2016

5. Zed Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding", Zed Shaw's Hardway Series, 2015.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	1	1	1	-	-	-	1	2	2	2	2
CO2	3	2	2	-	1	1	1	-	-	-	1	2	2	2	2
CO3	3	2	2	-	1	1	1	-	-	-	1	2	2	2	2
CO4	-	-	-	-	-	-	-	1	2	3	-	2	-	1	1

CO5	-	-	-	-	-	-	-	1	2	3	-	2	-	1	1
CO	3	2	2	-	1	1	1	1	2	3	1	2	2	2	2

AC22401	INDUSTRIAL SAFETY ENGINEERING											L	T	P	C
												2	0	0	0
COURSE OBJECTIVES:															
<ul style="list-style-type: none"> Explaining the fundamental concept and principles of industrial safety Applying the principles of maintenance engineering. Analyzing the wear and its reduction. Evaluating faults in various tools, equipment and machines. Applying periodic maintenance procedures in preventive maintenance. 															
UNIT I	INDUSTRIAL SAFETY												9		
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.															
UNIT II	MAINTENANCE ENGINEERING												9		
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.															
UNIT III	WEAR AND CORROSION AND THEIR PREVENTION												9		
Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.															
UNIT IV	FAULT TRACING												9		
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.															
UNIT V	PERIODIC AND PREVENTIVE MAINTENANCE												9		
Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive															

maintenance. Repair cycle concept and importance.	
TOTAL: 45 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to:	
CO1:	Explain the fundamental concept and principles of industrial safety
CO2:	Apply the principles of maintenance engineering.
CO3:	Apply periodic maintenance procedures in preventive maintenance.
CO4:	Analyze the wear and its reduction.
CO5:	Evaluate faults in various tools, equipment and machines
TEXT BOOKS:	
1.	L M Deshmukh, Industrial Safety Management, Tata McGraw-Hill Education, 2005.
2.	Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 2003.
REFERENCES:	
1.	Edward Ghali, V. S. Sastri, M. Elboudjaini, Corrosion Prevention and Protection: Practical Solutions, John Wiley & Sons, 2007.
2.	Garg, HP, Maintenance Engineering, S. Chand Publishing.
3.	J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer, 2017.
4.	R. Keith Mobley, Maintenance Fundamentals, Elsevier, 2011.
5.	W. E. Vesely, F. F. Goldberg, Fault Tree Handbook, Create space Independent Pub., 2014

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO2	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO3	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO4	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO5	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-
CO	2	1	2	-	-	2	1	-	-	-	-	1	-	2	-

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