DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING
(AUTONOMOUS)
COIMBATORE - 641 105 | www.dsce.ac.in

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

REGULATIONS-2024

B.E. – COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

CHOICE BASED CREDIT SYSTEM (CBCS)

NH -47, Palakkad Main Road, Post, Navakkarai,
Coimbatore-641 105
Tamil Nadu, India

REGULATIONS – 2024
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(CYBER SECURITY)
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER I

S. No.	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1	HS24001	Communicative English – I	HSM	3	0	0	3	3
2	MA24001	Engineering Mathematics – I	BS	3	1	0	4	4
3	PH24001	Engineering Physics	BS	3	0	0	3	3
4	CY24001	Engineering Chemistry	BS	3	0	0	3	3
5	CS24001	Problem Solving and Python Programming	ES	3	1	0	4	4
6	TA24001	Heritage of Tamils	HSM	1	0	0	1	1
7	MN24001	Overview of Engineering and Technology	MN	3	0	0	3	0
PRACTICALS								
8	BS24001	Engineering Physics & Chemistry Laboratory	BS	0	0	4	4	2
9	CS24002	Problem Solving and Python Programming Laboratory	ES	0	0	4	4	2
10	HS24002	Communicative Laboratory	HSM	0	0	2	2	1
TOTAL				**19**	**2**	**10**	**31**	**23**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	HS24003	Communicative English II	HSM	3	0	0	3	3
2.	MA24002	Statistics and Numerical Methods	BS	3	1	0	4	4
3.	ES24001	Engineering Graphics	ES	2	0	4	6	4
4.	PH24003	Physics for Information Science	BS	3	0	0	3	3
5.	ES24003	Basics of Civil and Mechanical	ES	3	0	0	3	3

		Engineering						
6.	TA24002	Tamils and Technology	HSM	1	0	0	1	1
7.	MN24002	Environmental Science and Sustainability	MN	3	0	0	3	0
PRACTICALS								
8.	ES24002	Engineering Practices Laboratory	ES	0	0	4	4	2
9.	CS24003	Programming in C Laboratory	ES	0	0	4	4	2
TOTAL				**18**	**1**	**12**	**31**	**22**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	MA24301	Discrete Mathematics	BS	3	1	0	4	4
2.	CY24301	Introduction to Programming in Java	PC	3	0	0	3	3
3.	CY24302	Foundation of Cyber Security	PC	3	0	0	3	3
4.	AI24001	Data Structures& Algorithms	PC	3	0	0	3	3
5.	CS24303	Operating Systems	PC	3	0	0	3	3
6.	CS24305	Introduction to Game Programming	PC	2	0	2	4	3
PRACTICALS								
7.	CY24311	Java Programming Laboratory	PC	0	0	4	4	2
8.	AI24002	Data Structures &Algorithms Laboratory	PC	0	0	4	4	2
	CS24313	Operating Systems Laboratory	PC	0	0	4	4	2
TOTAL				**17**	**1**	**14**	**32**	**25**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	CY24401	Generative AI: Math Foundations to Multimodal Modelling	BS	3	1	0	4	4
2.	CY24402	Fundamentals of Computer Networks and Communication	PC	3	0	0	3	3
3.	CY24403	Cyber Laws and Ethics	PC	3	0	0	3	3

4.	CS24404	Database Management Systems	PC	3	0	0	3	3
5.	CS24405	Foundations of DataScience	PC	3	0	0	3	3
6.	CS24406	Fundamentals of Swift Programming	PC	2	0	2	4	3
PRACTICALS								
7.	CS24411	Database Management Systems Laboratory	PC	0	0	4	4	2
8.	CS24412	DataScience Laboratory	PC	0	0	4	4	2
				17	**1**	**10**	**28**	**23**
TOTAL				**17**	**1**	**14**	**32**	**25**

HS24001-COMMUNICATIVE ENGLISH I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- To enable learners to understand the basics of communication.
- To empower learners to use narrative techniques to convey ideas and experiences in academic and work environment.
- To support learners in enhancing their linguistic competence and engaging in effortless dialogue.
- To assist learners in mastering language for the successful academic and professional communication.
- To strengthen language proficiency for effective comprehension of core curricula.

UNIT I - Basics of Communication **Listening -** Telephone conversation, Listening to Podcast, NEWS, Interviews **Speaking -** Verbal and Non-Verbal Conversation, Role play **Reading -** Types of Reading- Skimming, Scanning, Intensive and Extensive finding key information in a given text **Writing -** Passage Comprehension , Formal Letter Writing Professional Email Writing **Grammar -** Parts of Speech - Noun, Verb, Pronoun & Adverb, Tense -Present Tense, Types of Sentences **Vocabulary -** Prefix & Suffix	**9**
UNIT II - Narrative Skill Development **Listening -** Watching travel documentary **Speaking -** Narrating a story , Narrating a personal incident **Reading -** Reading Travelogues, Blogs **Writing** Paragraph Writing, Rearrangement of jumbled sentences **Grammar -** Tense Past Tense, Subject Verb Agreement, Auxiliary and Modal Verbs **Vocabulary -** Synonyms and Antonyms	**9**
UNIT III Enriching Speaking Skills **Listening -** Dialogues & conversations **Speaking -** Group Conversation, Speaking on given topics and context **Reading -** Reading Newspaper Articles, Reading user manuals **Writing -** Instructions, Writing definitions **Grammar -** Adjective, Tense Future Tense, Types of Questions WH Questions **Vocabulary -** Abbreviations & Acronyms	**9**
UNIT IV - Language Enhancement **Listening -** Listening to TED Talks **Speaking -** Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial **Writing -** Short Report writing **Grammar** Preposition, Question Tags, Yes or No questions, Articles **Vocabulary** One word Substitution	**9**

UNIT V - Technical Usage of Language **Listening -** Listening to native dialects & live commentaries **Speaking -** Group Discussion, Debates, Proposing Vote of Thanks **Reading -** Opinion articles, Journal Reports **Writing -** Essay Writing **Grammar -** Cause and Effect expressions**,** Negations **Vocabulary -** Gerund & infinitives, Compound Noun	**9**
Total Hours	**45**

Textbook(s)	
1	English for Engineers & Technologists Orient Blackswan Private Ltd., Anna University, 2020.
2	Veena Selvam, Sujatha Priyadarshini, Deepa Mary Francis, K. N. Shoba, Lourdes Joevani, English for Science & Technology, Cambridge University Press, 2021.
Reference(s)	
1	English for Academic Correspondence and Socializing by Adrian Wall work, Springer, 2011.
2	Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.
3	Meenakshi Raman, Technical Communication, Oxford University Press, New Delhi, 2017
4	Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Communicate effectively using grammatical words according to the context.	K1
CO2	Analyze the given context and frame content accordingly using narrative skills.	K2
CO3	Effectively use language techniques in extended discussions.	K2
CO4	Frame short and long sentences using grammatical techniques according to given context.	K1
CO5	Respond with clarity and accuracy in a range of professional situations, using appropriate linguistic accuracy.	K3

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**-**
CO2	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**-**
CO3	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO4	**2**	**3**	**2**	**3**	**-**	**3**	**3**	**3**	**2**	**3**	**-**	**3**	**-**	**-**	**-**
CO5	**2**	**3**	**3**	**3**	**-**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

MA24001 – ENGINEERING MATHEMATICS – I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	1	0	60	4	40	60	100

Course Objectives

- Understand the concept of matrices and reduction quadratic form to canonical form.
- Solve the problems using fundamentals principles of calculus.
- Apply the concept of calculus in several variables.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.

UNIT I - MATRICES Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.	**12**
UNIT II – DIFFERENTIAL CALCULUS 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	**12**
UNIT III - FUNCTIONS OF SEVERAL VARIABLES Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – 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.	**12**
UNIT IV – INTEGRAL CALCULUS Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts(reduction),Trigonometric substitutions, Integration of rational functions by partial fraction,improper intergrals.	**12**
UNIT V - MULTIPLE INTEGRALS Double integrals – Change of order of integration – Double integrals in polar coordinates – Area as a double integral - Triple integrals.	**12**
Total Hours	**60**

Textbook(s)

1	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3	James Stewart, "Calculus:Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.

Reference(s)

1	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016.
2	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd), New Delhi, 7th Edition, 2009.
3	Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.

4	Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6	Srimantha Pal and Bhunia. S.C, "Engineering Mathematics" Oxford University Press, 2015.
7	Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Understand the matrix algebra methods for solving practical problems.	K2
CO2	Apply differential calculus tools in solving various application problems.	K4
CO3	Use differential calculus ideas on several variable functions.	K3
CO4	Apply different methods of integration in solving problems.	K4
CO5	Apply multiple integral ideas to find the area.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO2	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO3	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO4	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO5	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

CHOICE BASED CREDIT SYSTEM (CBCS)

PH24001 – ENGINEERING PHYSICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- To introduce the concepts of Laser and its applications.
- To achieve an understanding of mechanics.
- To introduce the concepts of thermal physics.
- To gain knowledge about the basics of quantum mechanics.
- To understand the applications of quantum mechanics.

UNIT I – LASER Theory of laser - characteristics - spontaneous and stimulated emission - Laser action- Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - population inversion - Types of laser – Nd -YAG laser, CO_2 laser - Basic applications of lasers in industries – laser heat treatment in annealing, welding, drilling, cutting and soldering – Application of laser in fibre optic communication system.	**9**

UNIT II - MECHANICS Linear motion and rotational motion – Multi particle dynamics – Center of mass (CM) – kinetic energy of system of particles– Physical significance of moment of inertia – M.I of a diatomic molecule – Torsional pendulum.	**9**
UNIT III - THERMAL PHYSICS Modes of heat transfer - thermal conduction, convection and radiation - heat conduction in solids - thermal conductivity - Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - Application: Solar water heater.	**9**
UNIT IV - BASIC QUANTUM MECHANICS Photons and light waves - wave particle duality - De Broglie's wavelength - Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - particle in an infinite potential well - particle in a 3D box - correspondence principle (qualitative).	**9**
UNIT V - APPLIED QUANTUM MECHANICS Barrier penetration and quantum tunneling (qualitative)- Scanning Tunneling microscope – Resonant diode – Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model.	**9**
Total Hours	**45**

Textbook(s)	
1	M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun Murthy, "A Textbook of Engineering Physics", 11th Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2019.
2	D. K. Bhattacharya, T. Poonam, "Engineering Physics". Oxford University Press, 2015.
3	R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 2013.
4	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017
Reference(s)	
1	R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2	D. Halliday, R. Resnick, J. Walker, "Principles of Physics", Wiley Publishers (Indian Edition), 2015.
3	Dattu R Joshi, "Engineering Physics", 1st Edition, Tata McGraw Hill Publications, New Delhi, 2010.
4	B. K. Pandey, S. Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
5	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw Hill (Indian Edition), 2017.

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Gain knowledge about lasers and its applications.	K2
CO2	Understand the importance of mechanics.	K1
CO3	Acquire knowledge on the concepts of thermal physics.	K2
CO4	Understand the concepts of quantum mechanics.	K1
CO5	Comprehend and express their knowledge about applications of quantum	K3

	mechanics.	

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	2	1	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	2	1	-	-	-	-	-	1	-	-	-
CO4	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
CO5	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

CHOICE BASED CREDIT SYSTEM (CBCS)

CY24001 – ENGINEERING CHEMISTRY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- The objective of this course is to better understanding of basic concepts of chemistry and its applications on engineering domine.
- It imparts knowledge on properties of water and its treatment methods, different types of fuels and its applications.
- It also imparts knowledge about different storage devices.
- This course also highlights the preparation, properties and applications of nanomaterials.
- It also gives basic idea about different types of engineering materials.

UNIT I - WATER TECHNOLOGY **Water Technology:** Introduction – Sources − Impurities − Hardness of water −Estimation of harness of water − Boiler feed water − Boiler troubles (Scale and Sludge, Boiler corrosion, Caustic embrittlement, Priming and Foaming)− Treatment of boiler feed water − Internal treatment (Phosphate, Sodium aluminate, Colloidal, Calgon conditioning) − External treatment (Demineralisation process, Zeolite process) − Desalination process − Reverse Osmosis − Municipal water treatment– Case study.	**9**
UNIT II - FUELS **Fuels:** Introduction − Classification of fuels − Solid fuels − Coal and Coke − Metallurgical coke − Manufacture of metallurgical coke (Otto Hoffmann's by-product oven) − Liquid fuels − Petroleum and Diesel − Synthetic petrol (Bergius process) − Knocking in petrol − Octane number − Knocking in diesel − Cetane number − Power alcohol – Gaseous fuels – Natural gaseous fuel – Synthetic gaseous fuel (CNG, LPG) – Flue gas analysis – ORSAT method.	**9**
UNIT III - ELECTROCHEMICAL STORAGE DEVICES **Batteries:** Introduction – Types of batteries – Primary battery (Dry cell) – Secondary battery (Lead acid battery) – Modern battery (Lithium ion battery) – Fuel cells – H_2-O_2 fuel cell– Solar Cells –Electric vehicles: Working principles –Super capacitors: Types and examples.	**9**
UNIT IV - NANO CHEMISTRY **Nano Materials:**Introduction – Types of nano materials – Nanoparticle, Nanocluster,	**9**

Nanorod, Nanowire and Nanotube – Preparation of nanomaterials (Sol-gel, Solvothermal, Chemical vapour deposition (CVD), Electro chemical deposition (ECD), Laser ablation and Electro spinning methods) – Applications of nanomaterials.	
UNIT V - ENGINEERING MATERIALS **Engineering Polymers:** Introduction – Types of polymers (Natural and Synthetic polymers) – Polymerization – Types of polymerization (Addition polymerization and Condensation polymerization) –Degree of polymerization – Thermosetting and Thermoplastic polymers– Application of polymers.	**9**
Total Hours	**45**

Textbook(s)	
1.	P. C. Jain and Monica Jain, "A Text Book of Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2020.
2.	Shashi Chawla "A Text Book of Engineering Chemistry" 3rd Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2011.
3.	S. S. Dara and S. S. Umare "A Text Book of Engineering Chemistry", 12th Edition, S. Chand & Company Publishing, 2018.
4.	B. Sivasankar, "Engineering Chemistry", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.
Reference(s)	
1.	Shikha Agarwal, "Engineering Chemistry - Fundamentals and Applications", 2nd Edition, Cambridge University Press, New Delhi, 2019.
2.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, James Murday, "Text Book of Nanoscience and Nanotechnology", Universities Press – IIM Series in Metallurgy and Materials Science, 2018.
3.	V. R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science" New Age International Publishers, 2009.

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Knowledge about different types of water and propose suitable methods for treatment of water.	K1
CO2	Customize various types of fuels for engineering processes and applications.	K3
CO3	Dramatize different storage devices and apply the concepts in engineering energy sectors.	K3
CO4	Identify and apply the basic concepts of nanotechnology and design the synthesis of nano materials for the applications of engineering and technology.	K1
CO5	Summarize the types of engineering materials and their suitable applications in recent technologies.	K2

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**2**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**

CO2	**2**	**-**	**-**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

CS24001 PROBLEM SOLVING AND PYTHON PROGRAMMING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	1	0	60	4	40	60	100

Course Objectives

- 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, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO PROBLEM SOLVING Fundamentals of Computing, Identification of computational problems, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	**12**
UNIT II BASICS OF PYTHON PROGRAMMING Introduction: Features, Installation, Modes of operations (interpreter and interactive mode); variables and data types: int, float, boolean, string, and list; expressions, statements, operators and comments; modules and functions.	**12**
UNIT III CONTROL STATEMENTS & FUNCTIONS Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion.	**12**
UNIT IV SEQUENTIAL DATA TYPES Strings: String slices, String functions and methods, immutability; Lists: list operations, list slices, list methods, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.	**12**
UNIT V FILES HANDLING AND EXCEPTIONS Files Handling: File types and operations (open, close, read and write), file positions; command line arguments; Exceptions : Introduction to errors and exceptions, handling exceptions, modules, packages.	**12**

	Total Hours	**60**
Textbook(s)		
1	Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.	
2	Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.	
Reference(s)		
1	Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.	
2	G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 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”, 2nd Edition, No Starch Press, 2019.	
5	Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.	

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Develop algorithmic solutions to simple computational problems.	K3
CO2	Develop and execute simple Python programs.	K3
CO3	Write simple Python programs using conditionals and loops for solving problems.	K2
CO4	Represent compound data using Python lists, tuples, dictionaries etc.	K2
CO5	Read and write data from/to files in Python programs.	K3

Mapping with Program Outcomes

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**3**	**-**
CO2	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**-**	**-**
CO3	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	**-**
CO4	**2**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**-**	**-**
CO5	**1**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

TA24001 – HERITAGE OF TAMILS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	1	0	0	15	1	40	60	100

Course Objectives

- To learn the extensive literature of classical tamil.
- To review the fine arts heritage of tamil culture.
- To realize the contribution in Indian freedom struggle.
- To understand the role of Temple in Sangam cities/ports, Chola conquest.
- To examine Tamil cultural influence in India.

UNIT I - LANGUAGE AND LITERATURE Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil.	**3**
UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari.	**3**
UNIT III - FOLK AND MARTIAL ARTS Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	**3**
UNIT IV - THINAI CONCEPT OF TAMILS Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age.	**3**
UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement Inscriptions & Manuscripts.	**3**
Total Hours	**15**

Textbook(s)

1	தமிழக வரலாறு - மக்களும் பண்பாடும், கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் – முனைவர். இல சுந்தரம் (விகடன் பிரசுரம்).
3	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).

Reference(s)

1	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL (in print).
2	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International

	Institute of Tamil Studies
3	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
5	Keeladi - 'Sangam City Civilization on the banks of River Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author).
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
8	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL).

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, Thinai concept, Indian Freedom Struggle & Aham, Puram and Aram Concept.	K1
CO2	Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars, heritage of sculpture, painting ancient people.	K1
CO3	Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.	K2
CO4	Understand the Ancient Cities and Ports of Sangam Age of Tamils	K2
CO5	Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement.	K1

Mapping with Program Outcomes

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO2	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO3	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO4	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO5	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

TA24001 – தமிழர் மரபு								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ES	Total
I	1	0	0	15	1	40	60	100

Course Objectives

- விரிவான இலக்கியம் மற்றும் செம்மொழி தமிழ் கற்க.
- தமிழ் கலாச்சாரத்தின் நுண்கலை பாரம்பரியத்தை மதிப்பாய்வு செய்ய.
- இந்திய சுதந்திரப் போராட்டத்தில் பங்களிப்பை உணர வேண்டும்.
- சங்க நகரங்கள்/துறைமுகங்களில் கோயிலின் பங்கைப் புரிந்து கொள்ள, சோழர்களின் வெற்றி.
- இந்தியாவில் தமிழ் கலாச்சார தாக்கத்தை ஆய்வு செய்ய.

அலகு I - மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் சிற்றிலக்கியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி.	**3**
அலகு II - மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - நாட்டுப்புறத் தெய்வங்கள் குமரிமுனையில் திருவள்ளுவர் சிலை .	**3**
அலகு III - நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து. ஒயிலாட்டம் தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	**3**
அலகு IV - தமிழர்களின் திணைக் கோட்பாடுகள் தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும்.	**3**
அலகு V - இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம், கையெழுத்துப்படிகள்.	**3**
Total Hours	**15**

Textbook(s)

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

2	கணினித் தமிழ் - முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்).
3	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
Reference(s)	
1	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
2	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
3	Historical Heritage of the Tamils (Dr. S.V. Subramanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author).
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL).

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, Thinai concept, Indian Freedom Struggle & Aham, Puram and Aram Concept.	K1
CO2	Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars, heritage of sculpture, painting of ancient people.	K1
CO3	Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.	K2
CO4	Understand the Ancient Cities and Ports of Sangam Age of Tamils	K2
CO5	Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement.	K1

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO2	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO3	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO4	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-

CO5	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

CHOICE BASED CREDIT SYSTEM (CBCS)

MN24001 – OVERVIEW OF ENGINEERING AND TECHNOLOGY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	0	100	0	100

Course Objectives

- To outline the basics of the Civil Engineering.
- To learn the fundamentals of Mechanical Engineering.
- To impart knowledge on fundamental concepts and recent trends in the field of Electrical and Control Systems.
- To provide the overview of the Computer Science and Engineering and AI&DS.
- To provide the overview of Food Technology and Bio Medical Engineering.

UNIT I – INTRODUCTION TO ENGINEERING & TECHNOLOGY Science, Engineering and Technology(E&T), Approaches for a Scientific process vs an Engineering process; Engineering Product Life Cycle, processes in Engineering Design Methodology with few examples; various branches in Engineering and Technology (Traditional and Recent), Impact of E&T on human life, (pros & cons); Activities performed by an Engineer, Interdisciplinary nature of real world problems; Revised Bloom's Taxonomy Levels (BTL)	**9**
UNIT II – OVERVIEW OF CIVIL, MECHANICAL AND AGRICULTURAL ENGINEERING Introduction - Who is a civil Engineer? -Roles and Responsibilities- Scope and Opportunities- Structures -Geo Technical Engineering - Estimation and Costing- Construction - Project Management - Structural Engineering - Irrigation and Water Supply. Introduction - Who is a Mechanical Engineer? - Roles and Responsibilities - Scope and Opportunities – Manufacturing- Design - Automobile-Power Generation - Industrial Engineering- computer aided design and manufacturing - computer integrated manufacturing. Introduction - Who is an Agricultural Engineer? - Difference between Agricultural & Horticultural Engineering - Types of Agricultural Engineering - Processing or Post Harvest Engineering - Farm Power and Machinery Engineering - Soil and Water Conservation Engineering - Environmental Control Engineering - Forestry - Wood Product Engineering - Food Engineering - Scope and Opportunities.	**9**
UNIT III – OVERVIEW OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING Introduction- Different between Electrical Engineer and Electronics Engineer - Roles and Responsibilities - Scope and Opportunities - Power Generation and Consumption - Reason development - Current area of research - Energy audit - Energy utilization -PLC- Embedded control systems and computer based control system- wired and wireless communication- satellite communication- IoT communication network.	**9**
UNIT IV - OVERVIEWOF COMPUTER SCIENCE AND ENGINEERING, CYBER SECURITY & AI &DS Introduction- Different between Computer Science and Engineering and AI&DS - Job Description-Roles and Responsibilities - Scope and Opportunities.Computer hardware and software - programming languages, operating system - application of software-database management system (DBMS) - Computer networks - Internet and computer security- Web technology - Mobile application - Artificial intelligent (AI) - Machine learning(ML) - Internet of things(IoT) - Black chain - Cyber security -Cloud computing.	**9**

UNIT V –OVERVIEW OF FOOD TECHNOLOGY AND BIO MEDICAL ENGINEERING Introduction - Scope and Importance of Food Technology - Historical development and trends in the field - Sources of food - Chemical composition of food - Microorganisms in food - Food borne illness and safety measures - Unit operations in food Processing - Principles and methods of Food Processing - Case studies on successful food products or processes. Introduction-Role of Biomedical Engineer - Scope of Biomedical Engineer- Key Areas: Bio materials, Biomechanics, Biomedical Instrumentation, Medical Devices, Clinical Engineering, Cell and Tissue Engineering-Career Opportunities:Research and Development- Applications and Future Directions.	**9**
Total Hours	**45**

Textbook(s)	
1	"Overview of Engineering and Technology", Lecture Notes from DSCE, 2024.
2	"Introduction to Engineering Technology and Engineering" by Val D Hawks, A Brent Strong, 1st Edition, Pearson Publisher, 2000.
Reference(s)	
1	N. R. Banapurmath,V. S. Yalliwal, "Basics of Mechanical Engineering",Vikas Publishing House, 2021.
2	G. Shanmugam, M. S. Palanichamy, "Basic Civil and Mechanical Engineering", McGraw Hill Education; 1st Edition, 2018.
3	D. P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", 4th Edition, McGraw Hill Education, 2019.
4	Albert Malvino, David J. Bates," Electronic Principles (SIE)", 7th Education, McGraw Hill 2017.
5	Reema Thareja, "Fundamentals of Computer", Oxford University Press, 2016.

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Identify the major areas and relate their current trends in Civil Engineering.	K1
CO2	Explain the principles behind various mechanical systems and components.	K2
CO3	Identify different Electricals and Control Systems applied in the Engineering field.	K3
CO4	Relate the various Electronics and Communication Systems involved in real life.	K4
CO5	Understand the components of computer hardware, software, and operating systems and their applications in real life.	K2

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**-**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**-**	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 - Low															

CHOICE BASED CREDIT SYSTEM (CBCS)

BS24001 – ENGINEERING PHYSICS AND CHEMISTRY LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

ENGINEERING PHYSICS LABORATORY

Course Objectives

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills.
- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To determine error in experimental measurements and techniques used to minimize such errors.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS (Any 7 Experiments)	
1. Determination of rigidity modulus of a metallic wire using torsional pendulum.	
2. Determination of Young's modulus – Non-uniform bending method.	
3. Determination of Young's modulus – Uniform bending method.	
4. Determination of Young's modulus – Cantilever method.	
5. Determination of wavelength of the laser using grating.	
6. a) Determination of Acceptance angle and Numerical aperture of an optical fiber. b) Determination of width of the groove using laser.	
7. Determination of thickness of a thin film by air-wedge arrangement.	
8. Determination of velocity of sound and compressibility of liquid using Ultrasonic Interferometer.	
9. Determination of velocity of ultrasonic waves using acoustic grating.	
10. Determination of the band gap of a given semiconducting material.	
11. Determination of Planck's constant and work function using Photoelectric effect.	
12. Determination of frequency of the vibrator using Melde's string arrangement.	
Total Hours	**30**

Reference(s)

1	M. N. Srinivasan, S. Balasubramanian, R. Ranganathan, "Practical Physics", S. Chand & Sons Educational Publications, New Delhi, 2011.
2	P. R Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.	K1
CO2	Use graphical models to analyze laboratory data.	K2
CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K2
CO4	Access, process and analyze scientific information.	K3
CO5	Solve problems individually and collaboratively	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

ENGINEERING CHEMISTRY LABORATORY	
Course Objectives • To make the students to acquire practical skills in basic understanding of water quality parameters such as, hardness, alkalinity, acidity, DO, chloride and copper content. • To induce the students to familiarize with electro analytical techniques such as, conductometry, potentiometry and pH metry. • To demonstrate the synthesis of nano particles. • To develop skills on analysis of coal.	
LIST OF EXPERIMENTS: (Any 7 Experiments)	
1. Estimation of acidity of a water sample using the primary standard.	
2. Determination of types and amount of alkalinity in water sample.	
3. Determination of total, temporary & permanent hardness of water by EDTA method.	
4. Determination of DO content of water sample by Winkler's method.	
5. Determination of chloride content of water sample by Argentometric method.	
6. Estimation of copper content of the given solution by Iodometry.	
7. Estimation of TDS of a water sample by gravimetry.	
8. Determination of strength of strong acid using conductivity meter.	
9. Determination of strength of acids in a mixture of acids using conductivity meter.	
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)	
11. Determination of strength of given hydrochloric acid using pH meter.	
12. Estimation of iron content of the given solution using potentiometer.	
13. Estimation of sodium/potassium present in water using flame photometer.	
14. Preparation of nano particles (TiO_2/ZnO/CuO) by Sol-Gel method.	
15. Proximate analysis of Coal	
Total Hours	**30**
Reference(s)	
1	J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, B. Sivasankar, "Vogel's Text Book of Quantitative Chemical Analysis", (2009).
2	G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis, 5th Edition, 2009.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Analyze the quality of water samples with respect to their hardness, alkalinity, acidity and DO.	K4
CO2	Determine the amount of metal ions through volumetric and spectroscopic techniques.	K4
CO3	Analyze and determine the composition of coals.	K3
CO4	Learn simple method of synthesis of nano particles.	K1
CO5	Quantitatively analyze the impurities in solution by electro analytical techniques.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	**3**	**1**	**2**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**1**	**2**	**-**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

CS24002 – PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

Course Objectives

- 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. a. Write a program for checking the given number is even or odd.
   b. Write a program for displaying reversal of a number.
2. a. Write a program for finding biggest number among 3 numbers.
   b. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
3. a. Implement python script to check the given year is leap year or not.
   b. Implement Python Script to generate first N natural numbers.
4. a. Implement Python Script to generate first N natural numbers.
   b. Implement Python Script to check given number is palindrome or not.
5. a. Implement Python script to print factorial of a number.
   b. Implement Python Script to print sum of N natural numbers.
6. a. Implement Python Script to check given number is Armstrong or not.

	b. Implement Python Script to generate prime numbers series up to n	
7.	Finding the minimum and maximum elements in the lists	
8.	Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.	
9.	Implement a python script for factorial of number by using recursion	
10.	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).	
11.	Implementing programs using Functions. (Factorial, largest number in a list, area of shape)	
12.	Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)	
	Total Hours	**60**

Reference(s)	
1	Paul Deitel, Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", 3rd Edition, MIT Press, 2021.

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Develop algorithmic solutions to simple computational problems.	K2
CO2	Develop and execute simple Python programs.	K2
CO3	Write simple Python programs using conditionals and loops for solving problems.	K3
CO4	Decompose a Python program into functions.	K3
CO5	Represent compound data using Python lists, tuples, dictionaries etc.	K3

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**3**	**-**
CO2	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**-**	**-**
CO3	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	**-**
CO4	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**-**	**-**
CO5	**1**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**	**-**
3 – Strong, 2 – Medium, 1 - Low															

HS24002-COMMUNICATIVE LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	2	30	1	60	40	100

Course Objectives

- To enable learners to understand the basics of communication.
- To empower learners to use narrative techniques to convey ideas and experiences in academic and work environment.
- To support learners in enhancing their linguistic competence and engaging in effortless dialogue.
- To assist learners in mastering language for the successful academic and professional communication.
- To strengthen language proficiency for effective comprehension of core curricula.

Basics of Communication **Listening -** Telephone conversation, Listening to Podcast, NEWS, Interviews **Speaking -** Verbal and Non-Verbal Conversation, Role play **Reading -** Types of Reading- Skimming, Scanning, Intensive and Extensive - finding key information in a given text	**6**
Narrative Skill Development **Listening -** Watching travel documentary **Speaking -** Narrating a story -Narrating a personal incident **Reading -** Reading Travelogues, Blogs	**6**
Enriching Speaking Skills **Listening -**Dialogues & Conversations **Speaking -**Group Conversation, Speaking on given topics and context **Reading -** Reading Newspaper Articles, Reading user manuals	**6**
Language Enhancement **Listening -** Listening to TED Talks, **Speaking -** Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial.	**6**
Technical Usage of Language **Listening -** Listening to native dialects & live commentaries **Speaking -** Group Discussion, Debates, Proposing Vote of Thanks **Reading -** Opinion articles, Journal Reports	**6**
Total Hours	**30**

Reference(s)

1	English for Academic Correspondence and Socializing by Adrian Wall work, Springer, 2011.
2	Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Communicate effectively using grammatical words according to the context.	K3
CO2	Analyze the given context and frame content accordingly using narrative skills.	K4
CO3	Effectively use language techniques in extended discussions.	K3
CO4	Frame short and long sentences using grammatical techniques according to given context.	K3
CO5	Respond with clarity and accuracy in a range of professional situations, using appropriate linguistic accuracy.	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO3	**2**	**2**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
3 - Strong, 2 - Medium, 1 – Low															

SEMSTER-II

HS24003 – COMMUNICATIVE ENGLISH – II								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	45	3	40	60	100

Course Objective

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

UNIT I - INTRODUCTION TO TECHNICAL ENGLISH Listening - Listening to talks mostly of a scientific/technical nature and completing information-gap exercises Speaking - Asking for and giving directions Reading - reading short technical texts from journals- news papers Writing - purpose statements – extended definitions – writing instructions – checklists- recommendations Language Development - subject verb agreement - compound words	**9**
UNIT II - READING AND STUDY SKILLS Listening - Listening to longer technical talks and completing exercises based on them- Speaking – Describing a process Reading – Reading longer technical texts- identifying the various transitions in a text- paragraphing Writing - Interpreting charts, graphs Vocabulary Development-vocabulary used in formal letters/emails and reports Language Development - Impersonal passive voice, numerical adjectives.	**9**
UNIT III - TECHNICAL WRITING AND GRAMMAR Listening - Listening to classroom lectures/ talks on engineering/technology Speaking - Introduction to technical presentations Reading – longer texts both general and technical, practice in speed reading; Writing - Describing a process, use of sequence words Vocabulary Development - sequence words- Misspelled words. Language Development - embedded sentences.	**9**
UNIT IV - PROFESSIONAL WRITING Listening - Listening to documentaries and making notes. Speaking – mechanics of presentations Reading – reading for detailed comprehension Writing - email etiquette - job application – cover letter – Resume preparation (digital and paper based) – analytical essays and issue based essays Vocabulary Development - finding suitable synonyms-paraphrasing Language Development - clauses- if conditionals.	**9**
UNIT V - BUSINESS COMMUNICATION Listening - TED/Ink talks Speaking – participating in a group discussion	**9**

Reading – reading and understanding technical articles Writing – Writing reports - accident and survey report – Memos – Notices - Circulars - Minutes of a meeting - Vocabulary Development- verbal analogies- reported speech.	
Total Hours	**45**

Textbook(s)	
1	Swan Michael- Practical English Usage- Oxford University Press.
2	.Thomson.A.J and Martinet. A. V - A practical English Grammar- Oxford India.
Reference(s)	
1	Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2	Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad, 2015.
3	Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4	Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
5	Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
6	Troyka & Hesse – Handbook for writers- Pearson Publication, 11th edition, 2017.

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Use proper technical vocabulary and grammar in appropriate contexts.	K1
CO2	Enhance speaking skills to participate confidently in formal / informal conversations and to do effective Presentations/Discussions.	K2
CO3	Critically read and analyze technical texts and articles of a general kind.	K1
CO4	Acquire a working knowledge of writing strategies, formats and templates of professional writing.	K2
CO5	Analyze different way of communication and get familiarized with proper presentation.	K1

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**1**	**1**	**1**	**2**	**2**	**0**	**0**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO2	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO3	**1**	**1**	**0**	**1**	**2**	**1**	**1**	**0**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO4	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO5	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

MA24002 – STATISTICS AND NUMERICAL METHODS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	1	0	60	4	40	60	100

Course Objective

- This course aims at providing 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.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I - NON- PARAMETRIC TESTS Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test - Tests based on Runs - Test of randomness - The Kolmogorov Tests.	**9+3**
UNIT II - DESIGN OF EXPERIMENTS One way and two way classifications - Completely randomized design – Randomized block design – Latin square design**.**	**9+3**
UNIT III - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.	**9+3**
UNIT IV - INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single integrations using Trapezoidal and Simpson's 1/3 rules.	**9+3**
UNIT V - NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.	**9+3**
Total Hours	**60**

Textbook(s)

1	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

2	Johnson, R.A., Miller, I and Freund J., “Miller and Freund’s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
Reference(s)	
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, 7th Edition, 2007.
4	Gupta S.C. and Kapoor V. K., “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum’s Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., “Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Apply the concept of testing of hypothesis for small and large samples in real life problems.	K3
CO2	Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K2
CO3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K3
CO4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K1
CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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**	**-**	**-**	**-**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

ES24001 – ENGINEERING GRAPHICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	2	0	4	60	4	40	60	100

Course Objectives

- Drawing engineering curves and free hand sketch of simple objects.
- Drawing orthographic projection of points, lines and plane surface.
- Drawing orthographic projection of solids.
- Drawing development of solids and section of solids.
- Drawing isometric and perspective projections of simple solids.

UNIT I - PLANE CURVES AND FREE HAND SKETCHING Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves.	**12**
UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACE Orthographic projection – principles - Principal planes - First angle projection - projection of points. Projection of straight lines (only first angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.	**12**
UNIT III - PROJECTION OF SOLIDS Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method and auxiliary plane method.	**12**
UNIT IV - PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids, cylinders and cones.	**12**
UNIT V - ISOMETRIC AND PERSPECTIVE PROJECTIONS Principles of isometric projection - isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - combination of two solid objects in simple vertical positions - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method. Computer assisted isometric and perspective projections.	**12**
Total Hours	**60**

Textbook(s)

1	N. D. Bhatt, V. M. Panchal, "Engineering Drawing", 53rd Edition, Charotar Publishing House, 2019.
2	K. V. Natrajan, "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

3	N. S. Parthasarathy, Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.
Reference(s)	
1	Basant Agarwal, C. M. Agarwal, “Engineering Drawing”, McGraw Hill, 2ndEdition, 2019.
2	K. R. Gopalakrishna, “Engineering Drawing” (Vol. I & II combined), 27th Edition, Subhas Publications, Bangalore, 2017.
3	J. Luzzader, Warren, M. Duff, John, “Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4	N. S. Parthasarathy, Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
5	M. B. Shah, B. C. Rana, “Engineering Drawing”, 2ndEdition, Pearson Education India, 2009.
6	K. Venugopal, V. Prabhu Raja, “Engineering Graphics", New Age International (P) Ltd, 2008.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Familiarize with the fundamentals and standards of engineering drawing. Construct the conic curves, in volutes and cycloid and perform free hand sketching of basic geometrical constructions and multiple views of objects.	K3
CO2	Draw the orthographic projections of points, lines and plane surfaces.	K4
CO3	Draw the projection of simple solids.	K3
CO4	Draw the projection of sectioned solids and draw the development of surfaces of simple solids.	K3
CO5	Visualize and projections of Isometric and perspective projections of simple solids.	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO2	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO3	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO4	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO5	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
3 – Strong, 2 – Medium, 1 – Low															

PH24003 – PHYSICS FOR INFORMATION SCIENCE								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	45	3	40	60	100

COURSE OBJECTIVES:

- To understand the electrical properties of materials
- To impart knowledge on semiconductor physics and its applications.
- To introduce the concepts of magnetic properties of materials.
- To establish a sound grasp of knowledge on optical materials.
- To enable the students understand about nano devices and quantum computing.

UNIT I - ELECTRICAL PROPERTIES OF MATERIALS Classical free electron theory - Expression for electrical conductivity and Thermal conductivity - Wiedemann - Franz law – Success and failures of CFE - Quantum free electron theory **:** Particle in a three dimensional box - degenerate states - Fermi- Dirac statistics -Effect of temperature on fermi function - Density of energy states - Energy bands in solids.	**9**
UNIT II - SEMI CONDUCTOR PHYSICS Intrinsic Semiconductors - Energy band diagram - direct and indirect band gap semiconductors - Carrier concentration in an intrinsic semiconductor - extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - variation of Fermi level with temperature and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices.	**9**
UNIT III – MAGNETIC PROPERTIES OF MATERIALS Magnetic dipole moment - magnetic permeability and susceptibility – Magnetic material classification: diamagnetism – para magnetism – ferromagnetism – anti ferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory of ferro magnetism – Hard and soft magnetic materials – Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).	**9**
UNIT IV - OPTICAL PROPERTIES OF MATERIALS Classification of optical materials – carrier generation and recombination processes – Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) – photo current in a P-N diode – solar cell – LED – Organic LED – Optical data storage techniques.	**9**
UNIT V - NANO DEVICES AND QUANTUM COMPUTING Introduction – Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots – Band gap of nano materials –synthesis of nano materials – top down and bottom up process – pulsed laser method and chemical vapour deposition method – Carbon nanotubes: Properties and applications. Quantum cellular automata – Quantum system for information processing – classical bits and quantum bits(qualitative).	**9**
Total Hours	**45**

Textbook(s)

1	Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2	Umesh K Mishra and Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.

Reference(s)

1	Halliday, D., Resnick, R. and Walker. J, "Principles of Physics", Wiley, 2015.
2	Arthur Beiser, "Concepts of Modern Physics", Tata McGraw Hill, 2009.
3	Pillai, S.O., "Solid State Physics", New age International Publishers, 7th Edition, 2015

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Express their knowledge in understanding the electrical properties of materials.	K1
CO2	Acquire knowledge on semi conductor physics and its applications.	K1
CO3	Understand the concepts of magnetic storage devices.	K1
CO4	Gain knowledge about to electronic devices.	K2
CO5	Able to gain a strong foundational knowledge in nano technology and quantum computing.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**-**	**-**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**1**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

ES24003 – BASIC CIVIL AND MECHANICAL ENGINEERING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	45	3	40	60	100

COURSE OBJECTIVES:

- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.

UNIT I **PART A: OVERVIEW OF CIVIL ENGINEERING** **9**

Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering — National building code — terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

PART B: OVERVIEW OF MECHANICAL ENGINEERING

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering — Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.	
UNIT II- SURVEYING AND CIVIL ENGINEERING MATERIALS **Surveying**: Objects — Classification — Principles — Measurements of Distances and angles — Leveling – Determination of areas– Contours. Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber - Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building component (brief discussion only)	**9**
UNIT III - BUILDING COMPONENTS AND INFRASTRUCTURE Building plans – Setting out of a Building - Foundations: Types of foundations- Bearing capacity and settlement — Brick masonry — Stone Masonry — Beams — Columns — Lintels — Roofing — Flooring — Plastering. Types of Bridges and Dams — Water Supply Network - Rain Water Harvesting — Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.	**9**
UNIT IV- INTERNAL COMBUSTION ENGINES AND POWER PLANTS Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants- Internal combustion engines as automobile power plant — Working principle of Petrol and Diesel Engines — Four stroke and two stroke cycles — Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices	**9**
UNIT V - REFRIGERATION AND AIR CONDITIONING SYSTEM Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Properties of air - water mixture, concepts of psychometric and its process	**9**
Total Hours	**45**

Textbook(s)	
1	G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018
Reference(s)	
1	Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
2	Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3	Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
4	Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Understanding profession of Civil and Mechanical engineering.	K1
CO2	Summarize the planning of building, infrastructure and working of Machineries.	K2

CO3	Apply the knowledge gained in respective discipline	K1
CO4	Illustrate the ideas of Civil and Mechanical Engineering applications.	K2
CO5	Appraise the material, Structures, machines and energy	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**1**	**2**	**-**	**1**	**-**	**-**	**-**
CO2	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**2**	**-**	**2**	**-**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**2**	**-**	**2**	**-**	**-**	**-**
CO4	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**2**	**-**	**2**	**-**	**-**	**-**
CO5	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**2**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

TA24002 – TAMILS AND TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	1	0	0	15	1	40	60	100

COURSE OBJECTIVES:

- Explore the historical development of technology in the Tamil region
- Examine how traditional Tamil practices and knowledge systems have influenced technological advancements
- Promote inclusivity and diversity in the technology sector, encouraging the participation of Tamils in various technological fields
- Provide a global perspective on Tamil contributions to technology and the role of Tamils in the global technology landscape
- Explore the role of the Tamil language in technology, including the development of software, language processing

UNIT I - WEAVING AND CERAMIC TECHNOLOGY Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	**3**
UNIT II -DESIGN AND CONSTRUCTION TECHNOLOGY Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3**
UNIT III – MANUFACTURING TECHNOLOGY Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem	**3**

stone types described in Silappathikaram.	
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	**3**
UNIT V - SCIENTIFIC TAMIL & TAMIL COMPUTING Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	**3**
Total Hours	**15**

Textbook(s)	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (inprint).
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
Reference(s)	
1	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
2	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
3	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

On the successful completion of the course, students will be able to

Course Outcome		**Level**
CO1	Understand the extensive literature of Tamil and its classical nature.	K1
CO2	Understand the heritage of sculpture, painting and musical instruments of ancient people	K1
CO3	Review on folk and martial arts of Tamil people	K3
CO4	Realization of Thinai concepts, trade and victory of chozha dynasty	K2
CO5	Understand the contribution of Tamils in Indian freedom struggle, self-esteem movement and siddha medicine	K2

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO2	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO3	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO4	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO5	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

TA24002 – தமிழரும் தொழில்நுட்பமும்

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	1	0	0	15	1	40	60	100

Course Objective

- தமிழ் பிராந்தியத்தில் தொழில்நுட்பத்தின் வரலாற்று வளர்ச்சியை ஆராய்ச்சி செய்யுங்கள்.
- பாரம்பரிய தமிழ் நடைமுறைகளும் அறிவு அமைப்புகளும் தொழில்நுட்ப முன்னேற்றங்களை எவ்வாறு பாதித்துள்ளன என்பதை ஆராயுங்கள்
- பல்வேறு தொழில்நுட்பத் துறைகளில் தமிழர்களின் பங்கேற்பை ஊக்குவித்தல், தொழில்நுட்பத் துறையில் உள்ளடக்கம் மற்றும் பன்முகத் தன்மையை ஊக்குவித்தல்.
- தொழில்நுட்பத்திற்கான தமிழ் பங்களிப்புகள் மற்றும் உலகளாவிய தொழில்நுட்ப நிலப்பரப்பில் தமிழர்களின் பங்கு பற்றிய உலகளாவிய கண்ணோட்டத்தை வழங்கவும்.
- மென்பொருளின் வளர்ச்சி, மொழி செயலாக்கம், தமிழில் டிஜிட்டல் உள்ளடக்கம் உள்ளிட்ட தொழில்நுட்பத்தில் தமிழ் மொழியின் பங்கை ஆராயுங்கள்.

அலகு I - நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	**3**
அலகு II - வடிவமைப்பு மற்றும் சுட்டிடத் தொழில்நுட்பம் சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு. சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.	**3**
அலகு III - உற்பத்தித் தொழில் நுட்பம் கப்பல் கட்டும் கலை உலோகவியல் - இரும்புத் தொழிற்சாலை இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் நாணயங்கள் அச்சடித்தல் மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் சங்கு மணிகள் எலும்புத்துண்டுகள் தொல்லியல் சான்றுகள் சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.	**3**
அலகு IV - வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் அணை, ஏரி குளங்கள், மதகு சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு - மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார்	**3**

சமூகம்.	
அலகு V - அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	**3**
Total Hours	**15**

Textbook(s)	
1	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் - முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).
Reference(s)	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
3	National The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: Interl Institute of Tamil Studies)

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	தமிழின் விரிவான இலக்கியங்களையும் அதன் செம்மொழித் தன்மையையும் புரிந்து கொள்ளுங்கள்.	K1
CO2	பழங்கால மக்களின் சிற்ப ஓவியம் மற்றும் இசைக்கருவிகளின் பாரம்பரியத்தைப் புரிந்து கொள்ளுங்கள்	K1
CO3	தமிழ் மக்களின் நாட்டுப்புற மற்றும் தற்காப்பு கலைகள் பற்றிய ஆய்வு.	K2
CO4	திணை கருத்துக்கள், வர்த்தகம் மற்றும் சோழ வம்சத்தின் வெற்றி.	K3
CO5	இந்திய சுதந்திரப் போராட்டத்திலும், சுயமரியாதை இயக்கத்திலும், சித்த மருத்துவத்திலும் தமிழர்களின் பங்களிப்பைப் புரிந்து கொள்ளுங்கள்	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO2	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO3	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO4	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO5	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

MN24002 – ENVIRONMENTAL SCIENCE AND SUSTAINABILITY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	30	0	100	00	100

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasizeon the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewableresources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I - ENVIRONMENT AND BIODIVERSITY Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow – ecological succession. Biodiversity - Types of biodiversity: genetic, species and ecosystem biodiversity – Values of biodiversity, India as a mega diversity nation – hot-spots of biodiversity – Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and Endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation.	**6**
UNIT II - ENVIRONMENTAL POLLUTION Causes, Effects and Preventive measures of Air pollution, Water pollution, Soil pollution and Noise pollution. Solid, Hazardous and E-Waste management. Environmental protection, Environmental protection acts.	**6**
UNIT III - RENEWABLE SOURCES OF ENERGY Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	**6**
UNIT IV- SUSTAINABILITY AND MANAGEMENT Development, GDP, Sustainability - concept, needs and challenges - economic, social and aspects of sustainability - from unsustainability to sustainability - millennium development goals, and protocols - Sustainable Development Goals - targets, indicators and intervention areas Climate change - Global, Regional and Local environmental issues and possible solutions - case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry - A case study.	**6**
UNIT V - SUSTAINABILITY PRACTICES Zero waste and R concept, Circular economy, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles - carbon cycle, emission and sequestration,	**6**

Green Engineering: Sustainable urbanization - Socio-economical and technological change.	
Total Hours	**30**

Textbook(s)	
1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition,New Age International Publishers, 2018.
2	Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, New Delhi, 2016.
Reference(s)	
1	R. K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media. 38. Edition, 2010.
2	Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001
3	Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt. Ltd, New Delhi, 2007.
4	Rajagopalan, R, "Environmental Studies - From Crisis to Cure", Oxford University Press, 3rd Edition, 2015.
5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

On the successful completion of the course, students will be able to

Course Outcome		**Level**
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity andtheir conservation.	K1
CO2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	K2
CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	K2
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K1

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO3	**3**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO4	**3**	**2**	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	**3**	**2**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

ES24003 – ENGINEERING PRACTICES LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	0	0	4	60	2	60	40	100

Course Objectives

- Prepare pipe line plan; laying and connecting various pipe fittings used in common household plumbing work. Making joints in wood materials used in common household wood work.
- Prepare various welding joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling a simple mechanical common household equipment's; Making at ray out of metal sheet using sheet metal work.
- Wiring various electrical joints in common household electrical wire work.
- 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 equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

CIVIL ENGINEERING PRACTICES:

PLUMBING WORK:

- 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 in household appliances.

WOOD WORK:

- Sawing
- Planning
- Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

WOOD WORK STUDY:

- Studying joints indoor panels and wooden furniture.
- Studying common industrial trusses using models.

ELECTRICAL ENGINEERING PRACTICES :

- Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
- Staircase wiring
- Fluorescent Lamp wiring with introduction to CFL and LED types.
- Energy meter wiring and related calculations/ calibration
- Study of Iron Box wiring and assembly
- Study of Fan Regulator (Resistor type and Electronic type using

Diac/Triac/quadrac) • Study of emergency lamp wiring/Water heater	
MECHANICAL ENGINEERING PRACTICES :	
WELDING WORK: • Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. • Practicing gas welding • Making of models	
BASIC MACHINING WORK: • (simple) Turning. • (simple) Drilling. • (simple) Tapping.	
SHEET METAL WORK: • Making of as square tray.	
FOUNDRY WORK: • Demonstrating basic foundry operations.	
ELECTRONIC ENGINEERING PRACTICES:	
SOLDERING WORK: • Soldering simple electronic circuits and checking continuity	
ELECTRONIC ASSEMBLY AND TESTING WORK: • Assembling and testing electronic components on a small PCB.	
ELECTRONIC EQUIPMENT STUDY: • Study an elements of smart phone. • Study of TV parts and working. • Assembly and dismantle of computer/ laptop	
Total Hours	**60**
Reference(s)	
1.	Shoop, Charles Franklin, "Mechanical Engineering Practice: A Laboratory reference text", McGraw-Hill Publisher, 1956.
2.	S Gowri, T Jayapoovan, "Engineering Practices Lab Manual", Vikas Publishing House, 2011.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Draw pipe line plan; layout and connect various pipe fittings used in common household plumbing work; make joints in wood materials used in common household wood work.	K1
CO2	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assembles simplemechanical common household equipments; Make a tray out of metal sheet using sheet metal work.	K2
CO3	Wire various electrical joints in common household electrical wire work.	K2
CO4	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO2	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO3	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO4	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

CS24003 PROGRAMMING IN C LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

Course Objectives

- To familiarize with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:		
1	I/O statements, operators, expressions	
2	Decision-making constructs: if-else, goto, switch-case, break-continue	
3	Loops: for, while, do-while	
4	Arrays: 1D and 2D, Multi-dimensional arrays, traversal	
5	Strings: operations	
6	Functions: call, return, passing parameters by (value, reference), passing arrays to function.	
7	Recursion	
8	Pointers: Pointers to functions, Arrays,Strings, Pointers to Pointers, Array of Pointers	
9	Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.	
10	Files: reading and writing, File pointers, file operations, random access, processor directives.	
	Total Hours	**60**

Reference(s)

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, PearsonEducation, 2

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Demonstrate knowledge on C programming constructs.	K2
CO2	Develop programs in C using basic constructs.	K2
CO3	Develop programs in C using arrays.	K3
CO4	Develop applications in C using strings, pointers, functions.	K3

CO5	Develop applications in C using structures.	K3
CO6	Develop applications in C using file processing	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**	**-**
CO2	**2**	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**3**	**-**
CO3	**2**	**2**	**2**	**1**	**1**	**2**	**-**	**-**	**2**	**-**	**2**	**-**	**2**	**2**	**-**
CO4	**2**	**2**	**2**	**2**	**1**	**2**	**-**	**-**	**3**	**-**	**3**	**-**	**3**	**2**	**-**
CO5	**2**	**2**	**3**	**2**	**3**	**2**	**-**	**-**	**3**	**-**	**3**	**-**	**3**	**3**	**-**
CO6	**2**	**2**	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**	**-**
3 – Strong, 2 – Medium, 1 - Low															

SEMESTER III

MA24301 - DISCRETE MATHEMATICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	1	0	60	4	40	60	100

Course Objectives

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses
- To understand the basic concepts of combinatory and graph theory.
- To learn algebraic structures and respective theorems.
- To understand the concepts and significance of lattices and Boolean algebra

UNIT I - LOGIC AND PROOFS Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.	**12**
UNIT II - COMBINATORICS Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.	**12**
UNIT III - GRAPHS Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.	**12**
UNIT IV - ALGEBRAIC STRUCTURES Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and COSETS – Lagrange's theorem – Definitions and examples of Rings and Fields.	**12**
UNIT V - LATTICES AND BOOLEAN ALGEBRA Partial ordering – POSETS – Lattices as POSETS – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Sub Boolean Algebra – Boolean Homomorphism.	**12**
Total Hours	**60**

Textbook(s)	
1	Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2	Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011
Reference(s)	
1	Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
2	Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3	Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Understand the fundamental concepts of propositional logic, quantifiers, and proof strategies	K2
CO2	Apply combinatorics in solving real-time problems.	K3
CO3	Apply graph theory concepts to model and solve real-time computational problems.	K3
CO4	Compare and contrast the structural properties of algebraic structures.	K2
CO5	Apply lattices and boolean algebra in logical reasoning and computational design.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	-	-	2	2	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	3	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-	3	-	-	-	-
CO4	3	2	3	3	3	-	-	-	-	-	3	-	-	-	-
CO5	3	3	3	3	3	-	-	-	-	-	3	-	-	-	-
3 – Strong, 2 – Medium, 1 - Low															

CY24301 - INTRODUCTION TO PROGRAMMING IN JAVA								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objectives

- To understand the basics of OOP and Java programming.
- To know the principles of classes, abstraction, and inheritance.
- To create packages, define exceptions, and use the interface.
- To use I/O streams and collections in applications.
- To design and build simple programs using Streams, Lambda, and JDBC.

UNIT I - ELEMENTS OF JAVA PROGRAMMING OOPS Concepts: Features of OOP – Benefits of OOP – Application of OOP – Java Virtual Machine – Reflection Byte Codes – Byte Code Interpretation – Data Types – Variables – Arrays – Expressions – Operators – Control Structures – Objects and Classes	**9**
UNIT II - CLASSES AND METHODS Abstract classes – Static Classes – Inner Classes – Packages – Wrapper Classes – Abstract Class – Interfaces – This Operator – Super Keyword – Access Control – Methods – Constructors & Destructors – Method Overloading – Method Overriding – Command Line Arguments	**9**
UNIT III - STRING AND ARRAYS String Handling – String Constructors – String Length – Special String Operations – Character Extraction – String Comparison, – Searching Strings – Modifying Strings – using valueOf() – Comparison of StringBuffer and String – Arrays – Definition & Syntax – Declaration and Initialization – Accessing Array Elements – Array Operations – Arrays Class Methods – Basics of Two-Dimensional Arrays	**9**
UNIT IV - DATA STRUCTURES IN JAVA Data Structures Introduction – Stack – Queue – Dequeue– Linked List – Singly Linked List – Doubly Linked List – Circular Linked List – Searching & Sorting Algorithms	**9**

UNIT V - EXCEPTION HANDLING AND PACKAGES Exception Handling – Checked Exceptions – Unchecked Exceptions – Try Block and Catch Clause – Multiple Catch Clauses – Nested Try Statements – Throw – Throws and Finally– Packages – Defining Package – CLASSPATH – Access Protection – Importing Packages – IO Package	**9**
Total Hours	**45**

Textbook(s)	
1	Herbert Schildt, "Java The Complete Reference", 9th Edition, McGraw Hill Education, 2014.
2	Rajib Mall, Fundamentals of Software Engineering, 4th edition, PHI, 2014.
3	Paul Deitel, Harvey Deitel, Java How to Program, Early Objects 11th Edition, Pearson,2018.
Reference(s)	
1	Y. Daniel Liang, Introduction to Java Programming, 7/e, Pearson, 2013.
2	Nageswararao R., Core Java: An Integrated Approach, Dreamtech Press, 2008
3	Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
4	Balagurusamy E., Programming JAVA a Primer, 5/e, McGraw Hill, 2014.
	WEBSITES: www.javatutorialspot.com , www.intellipaat.com

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Memorize the basics of object-oriented programming concepts and Java	K1
CO2	Interpret classes and methods in Java programming for real-time solutions	K2
CO3	Solve real-time problems using strings and arrays in Java	K3
CO4	Understand various advanced data structures implementation in Java	K2
CO5	Recognize the exception handling concepts in Java programming	K1

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	3	1	3	-	-	-	3	2	2	2	3	1	2
CO2	2	1	3	2	1	-	-	-	2	1	1	3	3	3	2
CO3	3	3	1	2	2	-	-	-	3	2	1	2	3	1	3

CO4	3	1	2	2	2	-	-	-	1	2	1	3	3	1	1
CO5	1	1	2	3	2	-	-	-	3	2	1	2	3	3	3
3 – Strong, 2 – Medium, 1 - Low															

CY24302 – FOUNDATIONS OF CYBER SECURITY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objectives

- To learn about cybercrime, cyber-attacks, and tools for mitigating them.
- To know about network vulnerabilities and defense mechanisms.
- To learn how to detect various cyber-attacks.
- To learn how to prevent various cyber-attacks.
- To know about cyber laws, cyber forensics, and its process.

UNIT I - CYBER SECURITY & CYBER ATTACKS Security Concepts: Confidentiality, Integrity, and Availability, Cyber Security, Need for Cyber Security, Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Cyber Security Tools (Kali Linux, Wireshark) – Countermeasures.	**9**
UNIT II - NETWORK VULNERABILITIES & DEFENCE Network Vulnerabilities: Overview of vulnerability scanning, Open Port / Service Identification, Banner /Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Network Vulnerability Scanning (Netcat, Socat), Network Sniffers and Injection tools. Defence: Firewalls and Packet Filters, VPN, Snort.	**9**
UNIT III - INTRUSION DETECTION Host-Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.	**9**

UNIT IV - INTRUSION PREVENTION Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.	**9**
UNIT V - CYBER LAWS AND INVESTIGATION Internet crime and Act: A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000. Cyber Forensics, Types, Investigation Process Stages.	**9**
Total Hours	**45**

Textbook(s)	
1	Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
2	Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)
3	https://owasp.org/www-project-top-ten/
Reference(s)	
1	David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)
2	Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)
3	Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide",Wiley Publishers, 2007 (Unit 3)
4	Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, 2014 (Lab)

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Tell the basics of cybersecurity, cybercrime, and cyberattacks	K1
CO2	Identify various types of attacks and learn the tools to launch the attacks	K1
CO3	Understand network vulnerabilities and their defense mechanisms	K2
CO4	Extend the knowledge on techniques to detect intrusions	K2
CO5	Understand intrusion prevention techniques to prevent intrusion	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	1	1	1	2	1	2	3
CO2	2	1	-	1	1	-	-	-	2	1	1	2	-	2	2
CO3	2	2	1	2	2	1	1	-	1	2	1	3	1	2	1
CO4	3	2	2	1	2	-	-	-	1	1	2	2	1	3	1
CO5	2	2	1	2	2	-	-	-	1	1	1	2	2	2	1
3 – Strong, 2 – Medium, 1 - Low															

AI24001 – DATA STRUCTURES AND ALGORITHMS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

COURSE OBJECTIVES:

- To understand algorithms and analysis.
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I – ALGORITHM AND ANALYSIS Algorithms- recursion – analyzing recursive algorithms-Performance analysis- Time complexity, space complexity – asymptotic notations- abstract Data Types (ADTs)	**9**
UNIT II - LINEAR DATA STRUCTURES Polynomial representation using Arrays, Sparse matrix, Stacks, Queues-Circular Queues, Priority Queues, Double Ended Queues, Evaluation of Expressions- Linear Search and Binary Search	**9**
UNIT III – LINKED LIST Self Referential Structures, Dynamic Memory Allocation, Singly Linked List-Operations on Linked List. Doubly Linked List, Circular Linked List- Memory allocation and de-allocation-First-fit, Best-fit and Worst-fit allocation schemes.	**9**
UNIT IV – TREES AND GRAPHS Trees, Binary Trees-Tree Operations, Binary Tree Representation, Tree Traversals, Binary Search Trees- Binary Search Tree Operations Graphs, Representation of Graphs, Depth First Search and Breadth First Search on Graphs, Applications of Graphs	**9**
UNIT V – SORTING AND HASHING	**9**

Sorting Techniques – Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Heap Sort Hashing- Hashing Techniques, Collision Resolution, Overflow handling, Hashing functions – Mid square, Division, Folding, Digit Analysis	
Total Hours	**45**

Textbook(s)	
1	Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Python" (An Indian Adaptation), Wiley, 2021.
2	Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.
Reference(s)	
1	Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning, 2010.
3	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014
4	Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education India, 2002.

On the successful completion of the course, students will be able to

Course Outcome		**Level**
CO1	Understand the basic concepts such as linear and non-Linear data structures and the notations used to analyze the performance of algorithms.	K1
CO2	Understand the behavior of data structures such as stacks, queues, their operations	K3
CO3	Choose an appropriate data structure such as linked list for a specified application.	K3
CO4	Implement advanced data types in searching and sorting algorithms.	K3
CO5	Analyze various searching and sorting algorithms and hashing methods	K4

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	-	-	-	-	-	-	-	-	-	2	2	1
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	2	1
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	2	1
CO4	3	2	2	1	-	-	-	-	-	-	-	-	2	2	1
CO5	3	2	2	1	-	-	-	-	-	-	-	-	2	2	1

3 – Strong, 2 – Medium, 1 – Low

CS24303 – OPERATING SYSTEMS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	40	60	100

Course Objectives

- 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, I/O management and file system.

UNIT I – INTRODUCTION Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.	**9**
UNIT II - PROCESS MANAGEMENT Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	**9**
UNIT III - MEMORY MANAGEMENT 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.	**9**
UNIT IV - STORAGE MANAGEMENT Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.	**9**

UNIT V - VIRTUAL MACHINES AND MOBILE OS Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.	**9**
Total Hours	**45**

Textbook(s)

1	Braham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
2	Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

Reference(s)

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", 7 th Edition, Prentice Hall, 2018.
3	Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Illustrate various scheduling algorithms and process synchronization	K2
CO2	Understand deadlock prevention and avoidance algorithms	K2
CO3	Compare and contrast various memory management schemes.	K2
CO4	Memorize the functionality of file systems, I/O systems, and Virtualization	K1
CO5	Compare iOS and Android Operating Systems.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	-	-	-	-	3	2	3	1	1	2	2
CO2	2	2	3	1	1	-	-	-	2	1	1	2	2	1	2
CO3	1	3	2	2	1	-	-	-	2	2	1	1	1	2	2
CO4	1	3	3	3	-	-	-	-	1	2	1	2	1	3	2
CO5	3	1	2	1	1	-	-	-	3	2	3	2	2	2	1

3 – Strong, 2 – Medium, 1 - Low

CS24305 - INTRODUCTION TO GAME PROGRAMMING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	2	60	3	50	50	100

Course Objectives

- To introduce students to the fundamentals of the Unity 3D development environment.
- To teach the basics of C# scripting for controlling game logic and interactions in Unity.
- To develop the ability to design user input systems for interactive game applications.
- To guide students in constructing and organizing 3D scenes and virtual environments.
- To equip students with the skills to build, test, and deploy Unity projects on various platforms.

UNIT I – INTRODUCTION TO UNITY AND GAME DEVELOPMENT BASICS Overview of C# programming language - Introduction to the Unity Editor and C# scripting environment - Setting up Unity for C# development - Unity Editor Overview (Scenes, GameObjects, Inspector, Hierarchy)-Basic Game Objects manipulation (Position, Rotation, Scale)- Components & Prefabs- Materials, Textures, and Basic Lighting- Simple Scripting with C# (Variables, Functions, Events)- Building your first basic game.	6
UNIT II - OBJECT-ORIENTED PROGRAMMING (OOP) FUNDAMENTALS Understanding the principles of Object-Oriented Programming (OOP) - Classes, objects, and inheritance in C# - Encapsulation, abstraction, and polymorphism - Implementing OOP concepts in Unity scripts - Design patterns and best practices in Unity C# programming	6
UNIT III - SCRIPTING GAME MECHANICS AND INTERACTIONS Importing 3D models (FBX, OBJ)- Working with the Asset Store- Animator & Animation Controller. Implementing player controls and character movement in Unity - Collision detection and physics interactions - Handling user input for game interactions - Scripting game mechanics such as scoring, health, and inventory systems - Debugging and optimizing scripts for better performance	6

UNIT IV - SCRIPTING UI ELEMENTS AND MENUS Introduction to Unity's UI system - Scripting UI elements such as buttons, text fields, and sliders - Creating interactive menus and user interfaces - Handling UI events and user input - Designing and implementing user-friendly UI for games- Testing and Debugging- Final Project: Build and deploy a complete 3D game	6
UNIT V - INTRODUCTION TO AR/VR Basics of AR/VR, History - VR Devices- AR Devices- Applications of AR- Applications of VR- Use cases Applications- Case Studies and Industry Trends.	6
Total Hours	**30**

PRACTICAL EXERCISES:	**Total Hours**	**30**

1. Introduction to Unity and Project Setup Install Unity and set up a new unity project. Familiarize with Unity interface and basic components. Create and import simple assets.
2. Basic Player Movement Create a player character with basic left/right and jump movements. Implement movement using Rigid body and Colliders.
3. Camera Follow Implement a camera that follows the player.
4. Collectibles and Scoring Create collectible items. Implement scoring system and UI to display the score.
5. Enemy Behaviour Create a basic enemy with simple script. Implement player-enemy interaction (e.g., losing health on contact).
6. UI System Create a basic Menu system. UI Interaction & navigation between the panels.
7. Level Design and Scene Management Design a basic level layout. Implement scene transitions and level loading.
8. Player Animation Implement Animations for the player. Create an animator and change the animation based on user inputs.
9. Audio Integration Add background music and sound effects. Implement audio triggers for specific actions/events.
10. Deployment & Testing Build settings for Different platform. Final project deployment & testing & debugging.

Textbook(S):

1	Joseph Hocking, “Unity in Action: Multiplatform Game Development in C# with Unity”, Manning Publications
2	Harrison Ferrone, “Learning C# by Developing Games with Unity”, Packt Publishing

Reference(s)	
1	**https://learn.unity.com/**
2	https://community.unity.com/

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Understand game objects to use it effectively within a Unity environment.	K2
CO2	Understand basic scripts using C# to control game behavior and interactivity.	K2
CO3	Design interactive user input systems for games and simulations.	K3
CO4	Apply simple 3D scenes and environments using Unity tools and assets.	K3
CO5	Develop a basic Unity project to various real-time domains.	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	2	-	-	-	3	-	-	-	-	-
CO4	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	2	-	-	-	-	-	2	-	-	-	-	-
3 – Strong, 2 – Medium, 1 - Low															

CY24311 – JAVA PROGRAMMING LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	4	30	2	60	40	100

Course Objectives

- To develop basic Java-based solutions to computational problems.
- To be able to use OOPs features with Java.
- To develop Java programs for string manipulations
- To develop Java programs for file handling and exception handling
- To perform searching and sorting using Java.
- To implementation of ADTs using Java

1. Write a Java program that checks whether a given string is a palindrome or not	
2. Write a Java Program to find the frequency of a given character in a string	
3. Write a Java Program to multiply two matrices	
4. Write a Java Program to to implement inheritance	
5. Write a java program to implement polymorphism	
6. Write a Java program to demonstrate the use of garbage collector	
7. Write a file handling program in Java with reader/writer	
8. Write a Java program that read from a file and write to file by handling all file related exceptions	
9. Write a Java program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util	
10. Write a Java program that shows the usage of try, catch, throws and finally	
11. Write a Java program to implement linear searching and binary searching algorithms	
12. Write a Java program to implement Insertion Sort, Selection Sort, and Bubble Sort algorithms	
13. Write a Java program to perform stack operations	
14. Write a Java program to perform queue and dequeue operations	
15. Write a Java program to perform singly linked list and doubly linked list operations	
Total Hours	**30**

Reference(s)	
1	Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2	Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011 John L. Hennessey and David A.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Write a Java program to perform singly linked list and doubly linked list operations	K3
CO2	Perform implementation of OOPS features and string manipulations using Java	K3
CO3	Implement exception handling and file handling mechanisms using Java	K3
CO4	Implement searching and sorting algorithms using Java	K3
CO5	Apply Java programming in implementation of ADTs	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	-	-	-	-	1	2	2	2	1	2	3
CO2	2	1	3	1	-	-	-	-	2	3	3	2	1	3	1
CO3	2	2	1	2	1	-	-	-	1	2	1	3	2	3	2
CO4	2	2	1	3	-	-	-	-	3	1	1	1	2	1	2
CO5	1	3	3	1	3	-	-	-	1	1	1	1	2	1	2
3 – Strong, 2 – Medium, 1 - Low															

AI24002- DATA STRUCTURES AND ALGORITHMS LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	4	30	2	60	40	100

Course Objective

- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures
- To implement ADTs in Python

LIST OF EXPERIMENTS:

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. Implementation of array- insertion, deletion, sorting and searching.
2. Implementation of Polynomials using arrays
3. Implementation of Stack ADT
4. Implementation of Queue ADT
5. Applications of Stack ADT- Expression conversion
6. Implementaion of linked lists
7. Tree representation and traversal algorithms
8. Implementation of Binary Search Trees
9. Implementation of Heaps
10. Graph representation and Traversal algorithms
11. Implementation of single source shortest path algorithm
12. Implementation of minimum spanning tree algorithms
13. Implementation of sorting and searching algorithms
14. Implementation of Hash tables

Total Hours	**30**

Reference(s)	
1	Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011.
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to Algorithms", Third Edition, PHI Learning, 2010

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Write a time/space efficient program to implement arrays/stack/queue.	K1
CO2	Write a time/space efficient program to convert an arithmetic expression from one notation to another.	K2
CO3	Design and implement an efficient data structure to represent given data using linked list, trees and graphs	K4
CO4	Write a time/space efficient program to sort a list of records and search from a list of records based on a given key in the record.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	-	-	-	2	2	1
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	2	1
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	2	1
CO4	3	2	2	1	-	-	-	-	-	-	-	-	2	2	1

3 – Strong, 2 – Medium, 1 – Low

CS24313 – OPERATING SYSTEMS LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	4	30	2	60	40	100

Course Objective

- To install windows operating systems.
- To apply various CPU scheduling algorithms.
- To develop Deadlock Avoidance and Deadlock Detection Algorithms
- To demonstrate Page Replacement Algorithms
- To design File Organization and File Allocation Strategies.

1. Installation of windows operating system	
2. Illustrate UNIX commands and Shell Programming	
3. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close	
4. Write C programs to implement the various CPU Scheduling Algorithms	
5. Illustrate the inter process communication strategy	
6. Implement mutual exclusion by Semaphore	
7. Write C programs to avoid Deadlock using Banker's Algorithm	
8. Write C program to implement Threading	
9. Implement the paging Technique using C program	
10. Write C programs to implement the following Memory Allocation Methods a. First Fit b. Worst Fit c. Best Fit	
11. Write C programs to implement the various Page Replacement Algorithms	
12. Write C programs to Implement the various File Organization Techniques	
13. Implement the following File Allocation Strategies using C programs a. Sequential b. Indexed c. Linked	
14. Write C programs for the implementation of various disk scheduling algorithms	
Total Hours	**45**

Reference(s)

1	Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Experiment with various scheduling algorithms and process synchronization	K3
CO2	Utilize the deadlock prevention and avoidance algorithms	K3
CO3	Compare and contrast various memory management schemes.	K4
CO4	Identify the functionality of file systems, I/O systems, and Virtualization	K3
CO5	Compare iOS and Android Operating Systems.	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	2	1	-	-	-	-	2	1	2	2	2	3
CO2	3	3	1	1	-	-	-	-	1	1	1	1	2	2
CO3	2	1	3	1	-	-	-	-	1	1	2	3	3	3
CO4	3	1	3	3	-	-	-	-	1	2	3	2	1	2
CO5	3	2	1	1	2	-	-	-	3	3	3	3	1	3
3 – Strong, 2 – Medium, 1 – Low, - No Correlation														

CY24401 GENERATIVE AI: MATH FOUNDATIONS TO MULTIMODAL MODELLING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	1	0	60	4	40	60	100

Course Objectives

- To understand Core Mathematical Concepts
- Analyze and Implement Generative Models
- Apply Multimodal Learning Techniques
- Critically Evaluate Model Performance and Ethics
- Develop End-to-End Generative AI Applications

UNIT I MATHEMATICAL FOUNDATIONS FOR MACHINE LEARNING Linear Algebra – Vectors, matrices, eigen values, eigenvectors, matrix operations, Calculus - Derivatives, gradients, chain rule, optimization, Probability and Statistics - Probability distributions, sampling, Bayes' theorem, Information Theory - Entropy, cross-entropy, KL divergence	**12**
UNIT II MACHINE LEARNING FUNDAMENTALS Supervised Learning - Classification, Regression, model evaluation, Unsupervised Learning, Deep Learning Basics - Building Blocks of Neural Networks, Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs) & Long Short-Term Memory (LSTM) Networks, Word Embeddings and Text Processing.	**12**
UNIT III INTRODUCTION TO GENERATIVE AI Generative AI – Definition, history and key concepts, Generative Adversarial Networks (GANs) – Introduction, Variations and applications. Variational Autoencoders (VAEs) – Introduction and applications, Diffusion Models – Introduction and applications.	**12**
UNIT IV MULTI-MODAL MODELING Definition, motivation, and applications, Challenges and opportunities in multimodal generation, Fusion Mechanisms for Generative Models, Multimodal Generative Models, Applications and Case Studies	**12**
UNIT V GENERATIVE MODELS AND ADVANCED TOPICS Autoregressive models, Flow-based models, Generative models for text, Generative models for music and audio, Ethical considerations in generative AI, Trends and future directions in generative AI	**12**
Total Hours	**60**

Textbook(s)	
1	Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
Reference(s)	
1	Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep learning. MIT press.
2	Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.
3	Trevor Hastie, Robert Tibshirani, and Jerome Friedman. (2017). The Elements of Statistical Learning. Springer.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Memorize the concepts needed to test the logic of a program.	K1
CO2	Understand the machine learning fundamentals.	K1
CO3	Understand the basics and scope of GenAI in real-time.	K2
CO4	Interpret the awareness of the counting principles.	K2
CO5	Demonstrate concepts and properties of algebraic structures.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	2	-	-	-	3	-	-	-	-	-
CO4	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	2	-	-	-	-	-	2	-	-	-	-	-

3 – Strong, 2 – Medium, 1 – Low, - - no correlation

CY24402 FUNDAMENTALS OF COMPUTER NETWORKS AND COMMUNICATION

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

- To understand the concept of communication systems & layering in networks.
- To know about the protocols of each layer of TCP/IP protocol suite.
- To know IP addressing and subnetting in computer networks.
- To learn networking and routing mechanisms in details.
- To learn the functions of error control and flow control mechanisms

UNIT I COMMUNICATION SYSTEMS AND PROTOCOL LAYERING Introduction – Concepts of Communication Systems – Analog vs Digital Communication – Data Communication Modes: Synchronous vs Asynchronous, Simplex, Duplex, Full Duplex – Networks – Network Types – Protocol Layering – OSI Model – TCP/IP Protocol suite – Application of Computer Networking	**8**
UNIT II APPLICATION LAYER &TRANSPORT LAYER Application Layer Services & Protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – Transport Layer Services & Protocols: UDP, TCP – Connection Management: Flow Control, Congestion Control - Congestion Avoidance (DECbit, RED)	**9**
UNIT III NETWORK LAYER Switching: Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP	**8**
UNIT IV ROUTING Network layer design issues. Routing algorithms - The Optimality Principle, Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Multicast routing, Quality of Service (QoS) - requirements, Techniques for achieving good QoS.	**8**
UNIT V DATA LINK AND PHYSICAL LAYERS Data Link Layer: Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission Media- Switching – Circuit Switching	**12**
Total Hours	**45**

Textbook(s)	
1	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
2	Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022
Reference(s)	
1	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Show the basic layers and its functions in computer networks.	K1
CO2	Understand the working of various application & transport layer protocols.	K2
CO3	Describe protocols for various functions in the network.	K3
CO4	Compare and contrast routing algorithms.	K2
CO5	Understand the basics of how data flows from one node to another	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	3	-	-	-	3	2	2	2	3	1	2
CO2	2	1	3	2	1	-	-	-	2	1	1	3	3	3	2
CO3	3	3	1	2	2	-	-	-	3	2	1	2	3	1	3
CO4	3	1	2	2	2	-	-	-	1	2	1	3	3	1	1
CO5	1	1	2	3	2	-	-	-	3	2	1	2	3	3	3
3 – Strong, 2 – Medium, 1 – Low, - - no correlation															

CY24403 CYBER LAWS AND ETHICS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

- To understand the basics of cyber threats & security.
- To learn various fundamentals of law & act
- To study about legal cyber & security policies.
- To understand the nature and applications of cyber law in real life
- To understand scope of technology in cyber ethics.

UNIT I INTRODUCTION Introduction, Forgery, Hacking, Software Piracy, Computer Network Intrusion - Category of Cybercrime - Cybercrime Mobile & Wireless devices - Tools and Methods used in Cybercrime - Phishing & Identity Theft.	**9**
UNIT II INTRODUCTION TO CYBER LAW AND ETHICS Evolution of the Internet and the need for Cyber Laws-Key definitions: Cyberspace, Cyber Law, Information Security-Ethical issues in cyberspace: Privacy, Intellectual Freedom, Net Neutrality-Types of ethics: Professional ethics, Cyber ethics, Legal Ethics-Importance of cyber ethics in the digital age, Cyber Security Tools – Kali Linux, Wire shark	**9**
UNIT III LEGAL FRAMEWORK IN INDIA AND GLOBAL CONTEXT Information Technology Act, 2000: Objectives, Key Sections, Amendments-Role of CERT-IN-Legal recognition of electronic records and digital signatures-International Cyber Law frameworks: Budapest Convention, GDPR-Comparison of cyber law frameworks across jurisdictions (India, US, EU)	**9**
UNIT IV ELECTRONIC BUSINESS AND LEGAL ISSUES Evolution and development in E-commerce, paper vs paperless contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	**9**
UNIT V CYBER ETHICS & TECHNOLOGY The Importance of Cyber Law, Significance of Cyber Ethics, Need for Cyber Regulations and Ethics. Ethics in Information Society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and Core Blockchain Principles, Introduction to Blockchain Ethics.	**9**
Total Hours	**45**

Textbook(s)	
1	Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, Dominant Publisher
2	Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3	Information Security policy & Implementation Issues, NIIT, PHI
4	Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur.
5	Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi.
Reference(s)	
1	Cyber Law, Jonthan Rosenoer, Springer, New York, (1997). .

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Define the basic information on different cybercrime.	K1
CO2	Understand cyber laws and ethics for various crime activities	K2
CO3	Identify the security policies and standard frameworks for cyber issues.	K3
CO4	Recognize the role of cyber ethics and laws in electronic business	K1
CO5	Understand the technologies like AI and blockchain in cyber ethics	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	-	-	-	-	3	2	3	1	1	2	2
CO2	2	2	3	1	1	-	-	-	2	1	1	2	2	1	2
CO3	1	3	2	2	1	-	-	-	2	2	1	1	1	2	2
CO4	1	3	3	3	-	-	-	-	1	2	1	2	1	3	2
CO5	3	1	2	1	1	-	-	-	3	2	3	2	2	2	1
3 – Strong, 2 – Medium, 1 - Low															

CS24404 – DATABASE MANAGEMENT SYSTEMS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objective

- To illustrate the fundamentals of data models, relational algebra and SQL
- To summarize with the design of various combinational digital circuits using logic gates
- To design a database system using ER diagrams and to learn normalization techniques
- To outline the internal storage structures using different file and indexing techniques which will help in physical DB design
- To build knowledge about the Distributed databases, NOSQL and database security

UNIT I – INTRODUCTION Introduction to Data Base Management Systems-Purpose of Database System – Views of data – Data Models – Database System Architecture –Introduction to ER Diagrams – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL	**9**
UNIT II - DATABASE DESIGN Entity-Relationship model – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form	9
UNIT III – TRANSACTIONS Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm	9
UNIT IV – STORAGE MANAGEMENT TECHNIQUES RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview –	9
UNIT V – DATABASE SECURITY Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges	9
Total Hours	**45**

Textbook(s)	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020
2	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017
Reference(s)	
1	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Recognize SQL Queries using relational algebra	K1
CO2	Understand database using ER model and normalize the database	K2
CO3	Construct queries to handle transaction processing to maintain consistency of the database	K3
CO4	Compare and contrast various indexing strategies to tune the performance of the database	K3
CO5	Interpret how advanced databases differ from Relational Databases	K2

Mapping with Program Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	2	3	2	1	-	-	-	2	1	1	2	1	3
CO 2	3	1	1	1	1	-	-	-	2	3	3	3	1	2
CO 3	3	2	3	2	1	-	-	-	2	1	1	2	3	3
CO 4	1	2	3	2	-	-	-	-	3	2	3	1	2	3
CO 5	1	1	3	3	2	-	-	-	1	3	3	2	2	2
3 – Strong, 2 – Medium, 1 – Low, - No Correlation														

CS24405 – FOUNDATIONS OF DATA SCIENCE								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objective

- To understand the data science fundamentals and process
- To learn to describe the data for the data science process
- To learn to describe the relationship between data
- To utilize the Python libraries for Data Wrangling
- To present and interpret data using visualization libraries in Python

UNIT I – INTRODUCTION Data Science: Benefits and uses – facets of data –Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Statistics -Basic Statistical descriptions of Data	**9**
UNIT II - DESCRIBING DATA Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores	**9**
UNIT III - DESCRIBING RELATIONSHIPS 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 r2 –multiple regression equations –regression towards the mean	**9**
UNIT IV - PYTHON LIBRARIES FOR DATA WRANGLING Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables	**9**
UNIT V - DATA VISUALIZATION Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn	**9**
Total Hours	**45**

Textbook(s)	
1	David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)
3	Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)
Reference(s)	
1	Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Define the data science process	K2
CO2	Understand different types of data description for data science process	K2
CO3	Demonstrate correlation methods on computing relationships between data	K2
CO4	Use the python libraries for data wrangling	K3
CO5	Apply visualization libraries in python to explore data	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
CO2	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
CO3	2	2	1	2	2	1	1	-	1	2	1	3	2	2	3
CO4	3	2	2	1	2	-	-	-	1	1	2	2	3	3	2
CO5	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3 – Strong, 2 – Medium, 1 – Low, - No Correlation															

CS24406 - FUNDAMENTALS OF SWIFT PROGRAMMING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	2	0	2	60	3	50	50	100

Course Objective

- To understand the concept of String, function and Structure.
- To understand the concept of class and collections.
- To develop swift programs using arrays and loops.
- To develop swift applications using functions.
- To understand the concept of UIKit and Auto Layout

UNIT I INTRODUCTION TO UIKIT Introduction to UIKit - Strings - Concatenation and Interpolation - String Equality and Comparison - Functions - Parameters - Return Values - Text Fields - Structures - Instances - Instance Methods - Classes and Inheritance Collections	**6**
UNIT II UIKIT AND AUTO LAYOUT System Views - View Controllers - Arrays - Dictionaries - Loops - For Loops - While Loops - Displaying Data Controls In Action - Buttons - Switches – Sliders - Actions and Outlets - Auto Layout and Stack Views	6
UNIT III NAVIGATION AND WORKFLOWS Optionals - Functions and Optionals - Type Casting and Inspection - Guard - Guard with Optionals - Constant and Variable Scope - Enumerations - Segues and Navigation Controllers - Navigation Bar - Tab Bar Controllers - View Controller Life Cycle- View Did Load - View Event Management.	6
UNIT IV TABLES AND PERSISTENCE Protocols - Creating a Protocol - Delegation - App Anatomy and Life Cycle Lesson - Model-ViewController - Scroll Views - Scroll Views in Interface Builder - Table Views - Anatomy of a Table View - Table View Data Source - Intermediate Table Views Lesson - Saving Data - System View Controllers Lesson - Complex Input Screens	6
UNIT V XCODE Xcode - Xcode Files Types - Xcode Preference - Building, Running, and Debugging an App - Interface Builder Basics - Storyboards - Interface Builder Layout - Outlets And Actions.	6
Total Hours	**30**
PRACTICAL EXERCISES: Total Hours	**30**

1. Dice App
2. Login App
3. Quiz App
4. Tourist App
5. Mobile App for College

Reference	
1	Develop in Swi, Fundamentals, Apple Educa8on, h:ps://books.apple.com/in/book/develop-in-swi,-fundamentals/id1581182804

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Understand basics of UIKit programming structures	K2
CO2	Demonstrate knowledge on swift class and collections.	K2
CO3	Write fundamental swift programs using arrays and loops.	K2
CO4	Use functions in swift programs for real-time problem solving.	K2
CO5	Model different applications using swift UIKit and Auto Layout.	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	2	-	-	-	3	-	-	-	-	-
CO4	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	2	-	-	-	-	-	2	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low, - No Correlation															

CS24411 – DATABASE MANAGEMENT SYSTEMS LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	4	30	2	60	40	100

Course Objectives

- To learn and implement important commands in SQL
- To learn the usage of nested and joint queries
- To understand functions, procedures and procedural extensions of databases
- To understand design and implementation of typical database applications
- To be familiar with the use of a front end tool for GUI based application development

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. Query the database tables and explore natural, equi and outer joins
6. Write user defined functions and stored procedures in SQL
7. Execute complex transactions and realize DCL and TCL commands
8. Write SQL Triggers for insert, delete, and update operations in a database table
9. Create View and index for database tables with a large number of records
10. Create an XML database and validate it using XML schema
11. Create Document, column and graph based data using NOSQL database tools
12. Develop a simple GUI based database application and incorporate all the above-mentioned features

13. Case Study using any of the real life database applications from the following list a) Inventory Management for a EMart Grocery Shop b) Society Financial Management c) Cop Friendly App – Eseva d) Property Management – eMall e) Star Small and Medium Banking and Finance ● Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application ● Apply Normalization rules in designing the tables in scope ● Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features. ● Build PL SQL / Stored Procedures for Complex Functionalities

Total Hours	**30**

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Create databases with different types of key constraints	K3
CO2	Construct simple and complex SQL queries using DML and DCL commands	K3
CO3	Use advanced features such as stored procedures and triggers and incorporate in GUI based application development	K3
CO4	Create an XML database and validate with meta-data (XML schema).	K3
CO5	Create and manipulate data using NOSQL database	K3

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3	2
CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1	2
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3	3
CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1	3
CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1	2
3 – Strong, 2 – Medium, 1 - Low															

CS24412 – DATA SCIENCE LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	4	30	2	60	40	100

Course Objectives

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science
- To learn descriptive analytics on the benchmark data sets
- To apply correlation and regression analytics on standard data sets
- To present and interpret data using visualization packages in Python

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. Reading data from text files, Excel, and the web, and exploring various commands for doing descriptive analytics on the Iris data set

5. Use the diabetes data set from UCI and the Pima Indians Diabetes data set for performing the following:
    a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness, and Kurtosis.
    b. Bivariate analysis: Linear and logistic regression modeling
    c. Multiple Regression analysis
    d. Also, compare the results of the above analysis for the two data sets

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. Visualizing Geographic Data with Basemap

Total Hours	**30**

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Define the data science process	K1
CO2	Understand different types of data description for data science process	K2
CO3	Use the Python Libraries for Data Wrangling	K3
CO4	Apply visualization Libraries in Python to interpret and explore data	K3
CO5	Understand the basics of R programming in data science	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	1	3	3	3	1	3	2
CO2	3	2	2	3	1	-	-	-	3	1	3	2	1	3	3
CO3	3	2	1	3	1	-	-	-	2	1	1	1	3	2	3
CO4	2	3	1	3	-	-	-	-	2	3	2	3	3	3	1
CO5	1	2	3	1	1	-	-	-	2	1	3	1	1	3	3
3 – Strong, 2 – Medium, 1 - Low															

CY24401 GENERATIVE AI: MATH FOUNDATIONS TO MULTIMODAL MODELLING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	1	0	60	4	40	60	100

Course Objectives

- To understand Core Mathematical Concepts
- Analyze and Implement Generative Models
- Apply Multimodal Learning Techniques
- Critically Evaluate Model Performance and Ethics
- Develop End-to-End Generative AI Applications

UNIT I MATHEMATICAL FOUNDATIONS FOR MACHINE LEARNING Linear Algebra – Vectors, matrices, eigen values, eigenvectors, matrix operations, Calculus - Derivatives, gradients, chain rule, optimization, Probability and Statistics - Probability distributions, sampling, Bayes' theorem, Information Theory - Entropy, cross-entropy, KL divergence	**12**
UNIT II MACHINE LEARNING FUNDAMENTALS Supervised Learning - Classification, Regression, model evaluation, Unsupervised Learning, Deep Learning Basics - Building Blocks of Neural Networks, Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs) & Long Short-Term Memory (LSTM) Networks, Word Embeddings and Text Processing.	**12**
UNIT III INTRODUCTION TO GENERATIVE AI Generative AI – Definition, history and key concepts, Generative Adversarial Networks (GANs) – Introduction, Variations and applications. Variational Autoencoders (VAEs) – Introduction and applications, Diffusion Models – Introduction and applications.	**12**
UNIT IV MULTI-MODAL MODELING Definition, motivation, and applications, Challenges and opportunities in multimodal generation, Fusion Mechanisms for Generative Models, Multimodal Generative Models, Applications and Case Studies	**12**
UNIT V GENERATIVE MODELS AND ADVANCED TOPICS Autoregressive models, Flow-based models, Generative models for text, Generative models for music and audio, Ethical considerations in generative AI, Trends and future directions in generative AI	**12**
Total Hours	**60**

Textbook(s)	
1	Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
Reference(s)	
1	Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep learning. MIT press.
2	Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.
3	Trevor Hastie, Robert Tibshirani, and Jerome Friedman. (2017). The Elements of Statistical Learning. Springer.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Memorize the concepts needed to test the logic of a program.	K1
CO2	Understand the machine learning fundamentals.	K1
CO3	Understand the basics and scope of GenAI in real-time.	K2
CO4	Interpret the awareness of the counting principles.	K2
CO5	Demonstrate concepts and properties of algebraic structures.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	2	-	-	-	3	-	-	-	-	-
CO4	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	2	-	-	-	-	-	2	-	-	-	-	-

3 – Strong, 2 – Medium, 1 – Low, - - no correlation

CY24402 FUNDAMENTALS OF COMPUTER NETWORKS AND COMMUNICATION

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

- To understand the concept of communication systems & layering in networks.
- To know about the protocols of each layer of TCP/IP protocol suite.
- To know IP addressing and subnetting in computer networks.
- To learn networking and routing mechanisms in details.
- To learn the functions of error control and flow control mechanisms

UNIT I COMMUNICATION SYSTEMS AND PROTOCOL LAYERING Introduction – Concepts of Communication Systems – Analog vs Digital Communication – Data Communication Modes: Synchronous vs Asynchronous, Simplex, Duplex, Full Duplex – Networks – Network Types – Protocol Layering – OSI Model – TCP/IP Protocol suite – Application of Computer Networking	**8**
UNIT II APPLICATION LAYER &TRANSPORT LAYER Application Layer Services & Protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – Transport Layer Services & Protocols: UDP, TCP – Connection Management: Flow Control, Congestion Control - Congestion Avoidance (DECbit, RED)	**9**
UNIT III NETWORK LAYER Switching: Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP	**8**
UNIT IV ROUTING Network layer design issues. Routing algorithms - The Optimality Principle, Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Multicast routing, Quality of Service (QoS) - requirements, Techniques for achieving good QoS.	**8**
UNIT V DATA LINK AND PHYSICAL LAYERS Data Link Layer: Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission Media- Switching – Circuit Switching	**12**
Total Hours	**45**

Textbook(s)	
1	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
2	Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022
Reference(s)	
1	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Show the basic layers and its functions in computer networks.	K1
CO2	Understand the working of various application & transport layer protocols.	K2
CO3	Describe protocols for various functions in the network.	K3
CO4	Compare and contrast routing algorithms.	K2
CO5	Understand the basics of how data flows from one node to another	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	3	-	-	-	3	2	2	2	3	1	2
CO2	2	1	3	2	1	-	-	-	2	1	1	3	3	3	2
CO3	3	3	1	2	2	-	-	-	3	2	1	2	3	1	3
CO4	3	1	2	2	2	-	-	-	1	2	1	3	3	1	1
CO5	1	1	2	3	2	-	-	-	3	2	1	2	3	3	3
3 – Strong, 2 – Medium, 1 – Low, - - no correlation															

CY24403 CYBER LAWS AND ETHICS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objectives

- To understand the basics of cyber threats & security.
- To learn various fundamentals of law & act
- To study about legal cyber & security policies.
- To understand the nature and applications of cyber law in real life
- To understand scope of technology in cyber ethics.

UNIT I INTRODUCTION Introduction, Forgery, Hacking, Software Piracy, Computer Network Intrusion - Category of Cybercrime - Cybercrime Mobile & Wireless devices - Tools and Methods used in Cybercrime - Phishing & Identity Theft.	**9**
UNIT II INTRODUCTION TO CYBER LAW AND ETHICS Evolution of the Internet and the need for Cyber Laws-Key definitions: Cyberspace, Cyber Law, Information Security-Ethical issues in cyberspace: Privacy, Intellectual Freedom, Net Neutrality-Types of ethics: Professional ethics, Cyber ethics, Legal Ethics-Importance of cyber ethics in the digital age, Cyber Security Tools – Kali Linux, Wire shark	**9**
UNIT III LEGAL FRAMEWORK IN INDIA AND GLOBAL CONTEXT Information Technology Act, 2000: Objectives, Key Sections, Amendments-Role of CERT-IN-Legal recognition of electronic records and digital signatures-International Cyber Law frameworks: Budapest Convention, GDPR-Comparison of cyber law frameworks across jurisdictions (India, US, EU)	**9**
UNIT IV ELECTRONIC BUSINESS AND LEGAL ISSUES Evolution and development in E-commerce, paper vs paperless contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	**9**
UNIT V CYBER ETHICS & TECHNOLOGY The Importance of Cyber Law, Significance of Cyber Ethics, Need for Cyber Regulations and Ethics. Ethics in Information Society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and Core Blockchain Principles, Introduction to Blockchain Ethics.	**9**
Total Hours	**45**

Textbook(s)	
1	Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, Dominant Publisher
2	Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3	Information Security policy & Implementation Issues, NIIT, PHI
4	Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur.
5	Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi.
Reference(s)	
1	Cyber Law, Jonthan Rosenoer, Springer, New York, (1997). .

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Define the basic information on different cybercrime.	K1
CO2	Understand cyber laws and ethics for various crime activities	K2
CO3	Identify the security policies and standard frameworks for cyber issues.	K3
CO4	Recognize the role of cyber ethics and laws in electronic business	K1
CO5	Understand the technologies like AI and blockchain in cyber ethics	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	-	-	-	-	3	2	3	1	1	2	2
CO2	2	2	3	1	1	-	-	-	2	1	1	2	2	1	2
CO3	1	3	2	2	1	-	-	-	2	2	1	1	1	2	2
CO4	1	3	3	3	-	-	-	-	1	2	1	2	1	3	2
CO5	3	1	2	1	1	-	-	-	3	2	3	2	2	2	1
3 – Strong, 2 – Medium, 1 - Low															

CS24404 – DATABASE MANAGEMENT SYSTEMS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objective

- To illustrate the fundamentals of data models, relational algebra and SQL
- To summarize with the design of various combinational digital circuits using logic gates
- To design a database system using ER diagrams and to learn normalization techniques
- To outline the internal storage structures using different file and indexing techniques which will help in physical DB design
- To build knowledge about the Distributed databases, NOSQL and database security

UNIT I – INTRODUCTION Introduction to Data Base Management Systems-Purpose of Database System – Views of data – Data Models – Database System Architecture –Introduction to ER Diagrams – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL	**9**
UNIT II - DATABASE DESIGN Entity-Relationship model – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form	9
UNIT III – TRANSACTIONS Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm	9
UNIT IV – STORAGE MANAGEMENT TECHNIQUES RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview –	9
UNIT V – DATABASE SECURITY Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges	9
Total Hours	**45**

Textbook(s)	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020
2	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017
Reference(s)	
1	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Recognize SQL Queries using relational algebra	K1
CO2	Understand database using ER model and normalize the database	K2
CO3	Construct queries to handle transaction processing to maintain consistency of the database	K3
CO4	Compare and contrast various indexing strategies to tune the performance of the database	K3
CO5	Interpret how advanced databases differ from Relational Databases	K2

Mapping with Program Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	2	3	2	1	-	-	-	2	1	1	2	1	3
CO 2	3	1	1	1	1	-	-	-	2	3	3	3	1	2
CO 3	3	2	3	2	1	-	-	-	2	1	1	2	3	3
CO 4	1	2	3	2	-	-	-	-	3	2	3	1	2	3
CO 5	1	1	3	3	2	-	-	-	1	3	3	2	2	2
3 – Strong, 2 – Medium, 1 – Low, - No Correlation														

CS24405 – FOUNDATIONS OF DATA SCIENCE								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	40	60	100

Course Objective

- To understand the data science fundamentals and process
- To learn to describe the data for the data science process
- To learn to describe the relationship between data
- To utilize the Python libraries for Data Wrangling
- To present and interpret data using visualization libraries in Python

UNIT I – INTRODUCTION Data Science: Benefits and uses – facets of data –Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Statistics -Basic Statistical descriptions of Data	**9**
UNIT II - DESCRIBING DATA Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores	**9**
UNIT III - DESCRIBING RELATIONSHIPS 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 r2 –multiple regression equations –regression towards the mean	**9**
UNIT IV - PYTHON LIBRARIES FOR DATA WRANGLING Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables	**9**
UNIT V - DATA VISUALIZATION Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn	**9**
Total Hours	**45**

Textbook(s)	
1	David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)
3	Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)
Reference(s)	
1	Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Define the data science process	K2
CO2	Understand different types of data description for data science process	K2
CO3	Demonstrate correlation methods on computing relationships between data	K2
CO4	Use the python libraries for data wrangling	K3
CO5	Apply visualization libraries in python to explore data	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
CO2	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
CO3	2	2	1	2	2	1	1	-	1	2	1	3	2	2	3
CO4	3	2	2	1	2	-	-	-	1	1	2	2	3	3	2
CO5	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3 – Strong, 2 – Medium, 1 – Low, - No Correlation															

CS24406 - FUNDAMENTALS OF SWIFT PROGRAMMING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	2	0	2	60	3	50	50	100

Course Objective

- To understand the concept of String, function and Structure.
- To understand the concept of class and collections.
- To develop swift programs using arrays and loops.
- To develop swift applications using functions.
- To understand the concept of UIKit and Auto Layout

UNIT I INTRODUCTION TO UIKIT Introduction to UIKit - Strings - Concatenation and Interpolation - String Equality and Comparison - Functions - Parameters - Return Values - Text Fields - Structures - Instances - Instance Methods - Classes and Inheritance Collections	**6**
UNIT II UIKIT AND AUTO LAYOUT System Views - View Controllers - Arrays - Dictionaries - Loops - For Loops - While Loops - Displaying Data Controls In Action - Buttons - Switches – Sliders - Actions and Outlets - Auto Layout and Stack Views	6
UNIT III NAVIGATION AND WORKFLOWS Optionals - Functions and Optionals - Type Casting and Inspection - Guard - Guard with Optionals - Constant and Variable Scope - Enumerations - Segues and Navigation Controllers - Navigation Bar - Tab Bar Controllers - View Controller Life Cycle- View Did Load - View Event Management.	6
UNIT IV TABLES AND PERSISTENCE Protocols - Creating a Protocol - Delegation - App Anatomy and Life Cycle Lesson - Model-ViewController - Scroll Views - Scroll Views in Interface Builder - Table Views - Anatomy of a Table View - Table View Data Source - Intermediate Table Views Lesson - Saving Data - System View Controllers Lesson - Complex Input Screens	6
UNIT V XCODE Xcode - Xcode Files Types - Xcode Preference - Building, Running, and Debugging an App - Interface Builder Basics - Storyboards - Interface Builder Layout - Outlets And Actions.	6
Total Hours	**30**
PRACTICAL EXERCISES: Total Hours	**30**
6. Dice App	
7. Login App	
8. Quiz App	
9. Tourist App	
10. Mobile App for College	

Reference	
1	Develop in Swi, Fundamentals, Apple Educa8on, h:ps://books.apple.com/in/book/develop-in-swi,-fundamentals/id1581182804

On the successful completion of the course, students will be able to

Course Outcome		Level
CO1	Understand basics of UIKit programming structures	K2
CO2	Demonstrate knowledge on swift class and collections.	K2
CO3	Write fundamental swift programs using arrays and loops.	K2
CO4	Use functions in swift programs for real-time problem solving.	K2
CO5	Model different applications using swift UIKit and Auto Layout.	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	2	-	-	-	3	-	-	-	-	-
CO4	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	2	-	-	-	-	-	2	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low, - No Correlation															

CS24411 – DATABASE MANAGEMENT SYSTEMS LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	4	30	2	60	40	100

Course Objectives

- To learn and implement important commands in SQL
- To learn the usage of nested and joint queries
- To understand functions, procedures and procedural extensions of databases
- To understand design and implementation of typical database applications
- To be familiar with the use of a front end tool for GUI based application development

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. Query the database tables and explore natural, equi and outer joins
6. Write user defined functions and stored procedures in SQL
7. Execute complex transactions and realize DCL and TCL commands
8. Write SQL Triggers for insert, delete, and update operations in a database table
9. Create View and index for database tables with a large number of records
10. Create an XML database and validate it using XML schema
11. Create Document, column and graph based data using NOSQL database tools
12. Develop a simple GUI based database application and incorporate all the above-mentioned features

13. Case Study using any of the real life database applications from the following list f) Inventory Management for a EMart Grocery Shop g) Society Financial Management h) Cop Friendly App – Eseva i) Property Management – eMall j) Star Small and Medium Banking and Finance ● Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application ● Apply Normalization rules in designing the tables in scope ● Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features. ● Build PL SQL / Stored Procedures for Complex Functionalities

Total Hours	**30**

On the successful completion of the course, students will be able to

Course Outcomes		**Level**
CO1	Create databases with different types of key constraints	K3
CO2	Construct simple and complex SQL queries using DML and DCL commands	K3
CO3	Use advanced features such as stored procedures and triggers and incorporate in GUI based application development	K3
CO4	Create an XML database and validate with meta-data (XML schema).	K3
CO5	Create and manipulate data using NOSQL database	K3

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3	2
CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1	2
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3	3
CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1	3
CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1	2
3 – Strong, 2 – Medium, 1 - Low															

CS24412 – DATA SCIENCE LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	4	30	2	60	40	100

Course Objectives

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science
- To learn descriptive analytics on the benchmark data sets
- To apply correlation and regression analytics on standard data sets
- To present and interpret data using visualization packages in Python

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. Reading data from text files, Excel, and the web, and exploring various commands for doing descriptive analytics on the Iris data set

6. Use the diabetes data set from UCI and the Pima Indians Diabetes data set for performing the following:
    a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness, and Kurtosis.
    b. Bivariate analysis: Linear and logistic regression modeling
    c. Multiple Regression analysis
    d. Also, compare the results of the above analysis for the two data sets

7. 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. Visualizing Geographic Data with Basemap

Total Hours	**30**

On the successful completion of the course, students will be able to

Course Outcomes		Level
CO1	Define the data science process	K1
CO2	Understand different types of data description for data science process	K2
CO3	Use the Python Libraries for Data Wrangling	K3
CO4	Apply visualization Libraries in Python to interpret and explore data	K3
CO5	Understand the basics of R programming in data science	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	1	3	3	3	1	3	2
CO2	3	2	2	3	1	-	-	-	3	1	3	2	1	3	3
CO3	3	2	1	3	1	-	-	-	2	1	1	1	3	2	3
CO4	2	3	1	3	-	-	-	-	2	3	2	3	3	3	1
CO5	1	2	3	1	1	-	-	-	2	1	3	1	1	3	3
3 – Strong, 2 – Medium, 1 - Low															