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

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATIONS-2024

B.Tech. – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

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

REGULATIONS – 2024
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER I
[COMMON FOR AI & DS, CSE, CSE (CYBER SECURITY)]

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.	AD24001	Data structures and Algorithms	PC	3	0	0	3	3
5.	PH24003	Physics for Information Science	BS	3	0	0	3	3
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.	AD24011	Data Structures and Algorithm 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.	AD24301	Foundations of Artificial Intelligence	PC	3	0	0	3	3
3.	CS24404	Database Management Systems	PC	3	0	0	3	3
4.	AD24302	Design and Analysis of Algorithms	PC	2	0	2	4	3
5.	AD24303	Digital Principles and Computer Organization	PC	3	0	2	5	4
6.	CS24305	Introduction to Game Programming	PC	2	0	2	4	3
PRACTICALS								
7	AD24311	Artificial Intelligence Laboratory	PC	0	0	3	3	1.5
8	AD24312	Database Management Systems Laboratory	PC	0	0	3	3	1.5
TOTAL				**16**	**1**	**12**	**29**	**23**

SEMESTER–IV

S.No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	MA24401	Probability and Statistical Modelling	BS	3	1	0	4	4
2.	AD24401	Foundations of Data Science and Analytics	PC	3	0	0	3	3
3.	AD24402	Data Communication and Networks	PC	3	0	0	3	3
4.	AD24403	Machine Learning Techniques	PC	3	0	0	3	3
5.	AD24404	Operating Systems	PC	3	0	2	5	4
6.	CS24401	Fundamentals of Swift Programming	PC	2	0	2	4	3
PRACTICAL								
7.	AD24411	Foundations of Data Science and Analytics Laboratory	PC	0	0	3	3	1.5
8.	AD24412	Machine Learning Techniques Laboratory	PC	0	0	3	3	1.5
TOTAL				**17**	**1**	**10**	**28**	**23**

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,improperintergrals.	**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															

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 mechanics.	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**	**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															

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, 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.	**9**
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	K1

	treatment of water.	
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	தமிழகவரலாறு - மக்களும்பண்பாடும், கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).	
2	கணினித்தமிழ் – முனைவர். இலசுந்தரம் (விகடன்பிரசுரம்).	
3	கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு).	
4	பொருநை - ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு).	
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 – தமிழர்மரபு							
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

- விரிவானஇலக்கியம்மற்றும்செம்மொழிதமிழ்கற்க.
- தமிழ்கலாச்சாரத்தின்நுண்கலைபாரம்பரியத்தைமதிப்பாய்வுசெய்ய.
- இந்தியசுதந்திரப்போராட்டத்தில்பங்களிப்பைஉணரவேண்டும்.
- சங்கநகரங்கள்/துறைமுகங்களில்கோயிலின்பங்கைப்புரிந்துகொள்ள, சோழர்களின்வெற்றி.
- இந்தியாவில்தமிழ்கலாச்சாரதாக்கத்தைஆய்வுசெய்ய.

அலகு I - மொழிமற்றும்இலக்கியம் இந்தியமொழிக்குடும்பங்கள் - திராவிடமொழிகள் - தமிழ்ஒருசெம்மொழிதமிழ்செவ்விலக்கியங்கள் - சங்கஇலக்கியத்தின்சமயச்சார்பற்றதன்மைதிருக்குறளில்மேலாண்மைக்கருத்துக்கள்தமிழ்க்காப்பியங்கள், தமிழகத்தில்சமணபௌத்தசமயங்களின்தாக்கம் -பக்திஇலக்கியம், ஆழ்வார்கள்மற்றும்நாயன்மார்கள்சிற்றிலக்கியங்கள்தமிழில்நவீனஇலக்கியத்தின்வளர்ச்சி.	**3**
அலகு II - மரபுபாறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை - சிற்பக்கலை நடுகல்முதல்நவீனசிற்பங்கள்வரை - ஐம்பொன்சிலைகள் - பழங்குடியினர்மற்றும்அவர்கள்தயாரிக்கும்கைவினைப்பொருட்கள், பொம்மைகள் - தேர்செய்யும்கலை - நாட்டுப்புறத்தெய்வங்கள்குமரிமுனையில்திருவள்ளுவர்சிலை .	**3**
அலகு III - நாட்டுப்புறக்கலைகள்மற்றும்வீரவிளையாட்டுகள் தெருக்கூத்துகரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து. ஒயிலாட்டம்தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்.	**3**
அலகு IV - தமிழர்களின்திணைக்கோட்பாடுகள் தொல்காப்பியம்மற்றும்சங்கஇலக்கியத்தில்அகம்மற்றும்புறக்கோட்பாடுகள் - தமிழர்கள்போற்றியஅறக்கோட்பாடுசங்ககாலத்தில்தமிழகத்தில்எழுத்தறிவும், கல்வியும்.	**3**
அலகு V - **இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குத்தமிழர்களின்பங்களிப்பு** இந்தியவிடுதலைப்போரில்தமிழர்களின்பங்குஇந்தியாவின்பிறப்பகுதிகளில்தமிழ்ப்பண்பாட்டின்தாக்கம் - சுயமரியாதைஇயக்கம், கையெழுத்துப்படிகள்.	**3**

	Total Hours	**15**
Textbook(s)		
1	தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).	
2	கணினித்தமிழ் - முனைவர்இலசுந்தரம் (விகடன்பிரசுரம்).	
3	கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு).	
4	பொருநை - ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு).	
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															

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	40	60	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	**9**

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.	
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	K3

	field.	
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															

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															

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															

HS24002COMMUNICATIVE 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															

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 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.	**9**
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.	K1
CO2	Apply the basic concepts of classifications of design of experiments in the field of agriculture	K4
CO3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K2
CO4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K3
CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K2

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**	**-**	**2**	**3**	**-**	**-**	**-**
CO2	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO3	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO4	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO5	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
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															

AD24001 – DATA STRUCTURES AND ALGORITHMS

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 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 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	**9**
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	To understand the basic concepts such as linear and non-Linear data structures and the notations used to analyze the performance of algorithms.	K1
CO2	To understand the behavior of data structures such as stacks, queues, their operations	K3
CO3	To choose an appropriate data structure such as linked list for a specified application.	K3
CO4	To learn how to implement lists, stacks, queues, trees, graphs, search trees in C to solve problems	K4
CO5	To understand and analyze various searching and sorting algorithms and hashing methods	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**
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															

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**	**1**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
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	**3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	
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 stone types described in Silappathikaram.	**3**
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu 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	K1

	instruments of ancient people	
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															

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	40	60	100

Course Objective

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on 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 megadive/rsity 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 6 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, Green Engineering: Sustainable urbanization - Socio-economical and technological change.	**6**
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 and their conservation.	K1
CO2	To identify the causes, effects of environmental pollution and natural disasters and contributeto the preventive measures in the society.	K1
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.	K3
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2

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															

AD24011- DATA STRUCTURES AND ALGORITHMS 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 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	**60**
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															

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 Objective

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

UNIT I 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 Outcome		Level
CO1	Have knowledge of the concepts needed to test the logic of a program.	K2
CO2	Have an understanding in identifying structures on many levels.	K2
CO3	Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.	K2
CO4	Be aware of the counting principles.	K2
CO5	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.	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		-	-	-
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, - No Correlation															

AD24301– FOUNDATIONS OF ARTIFICIAL INTELLIGENCE								
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 Objective

- To understand the fundamental concepts of AI and its real-world applications.
- To develop an understanding of the basic concepts of Artificial Intelligence.
- To analyze the nature of various advanced search strategies in AI.
- To impart knowledge representation, reasoning and planning mechanisms.
- To resolve Complex Decision-Making rules and their applications in AI.

UNITIINTRODUCTIONTOARTIFICIALINTELLIGENCE Introduction: Foundations, Intelligent agents: Environments, structure of agents. Problem solving:searching forsolutions, uninformed and informed search strategies, heuristic functions- Local Search Algorithms and Optimization Problems, Local search in Continuous Spaces, Nondeterministic Actions, unknown environments	**9**
UNITII ADVANCEDSEARCHSTRATEGIES Global optimization algorithms - Genetic Algorithms, Particle Swarm Optimization Algorithm, Ant Colony Optimization, Gravitational Search Algorithm. Constraint satisfaction problems (CSP): Backtracking and local search for CSPs. Adversarial Search: Games, Optimal decisions, alpha-beta pruning, imperfect real-time decisions, stochastic games, partially observables games.	**9**
UNITIIIKNOWLEDGEREPRESENTATION Logical systems– KnowledgeBasedsystems-RepresentingknowledgeusingPropositionalLogic – Inference in Propositional Logic using Laws of Inference, Forward Chaining, Backward Chaining, Resolution.RepresentingknowledgeusingFirstLogicOrderLogicInferenceinFirstOrderLogic usingUnification,Forward Chaining, BackwardChaining, Ontologies and Classes.	**9**
UNITIVPLANNINGANDQUANTIFYINGUNCERTAINTY Classical Planning: Definition, Algorithms for Planning as State-Space Search, Planning Graphs, Classical Planning Approaches. Planning and Acting: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi-agent Planning. Acting under Uncertainty, -Conditional Independence- Bayes Rule –Naïve Bayes Classifier - Bayesian Belief Network- Inference in Bayesian Belief Network- Making Decisions in Complex Environments- Markov Decision Processes.	**9**
UNITVAIAPPLICATIONS Future trends in AI (Quantum AI, Human AI Collaboration, Explainable AI, AI in Edge Computing, Artificial General Intelligence), Other AI applications, Natural language processing (NLP), Computer vision, Machine learning, Robotics AI in business intelligence, AI in healthcare, AI in education, AI in finance, AI in manufacturing	**9**
Total Hours	**45**

Textbook(s)

1	Artificial Intelligence – A Modern Approach, S. Russel and P. Norvig, 3rd Edition, Pearson Education, 2010.
2	Sutton, R. S., & Barto, A. G. (2018). Reinforcement learning: An introduction (2nd ed.). MIT Press.
Reference(s)	
1	Artificial Intelligence and Machine Learning, Vinod Chandra. S.S, Anand Hareendran.S., PHI Publishers, 2014.
2	Artificial Intelligence: Structures and Strategies for complex problem solving, G. Luger, 6th Edition, Pearson Education, 2008.
3	Artificial Intelligence: A new Synthesis, J. Nilsson, Elsevier Publishers, 1998.

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

Course Outcome		Level
CO1	Demonstrate intelligent agent frameworks	K2
CO2	Apply problem solving techniques in search Strategies	K3
CO3	Build game playing and CSP techniques	K3
CO4	Perform logical reasoning in knowledge representation.	K4
CO5	Analyze probabilistic reasoning under uncertainty	K4

ping with Program Outcomes

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

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

CS24404 – DATABASE MANAGEMENT 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 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 E-R 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	Construct SQL Queries using relational algebra	K3
CO2	Develop database using ER model and normalize the database	K3
CO3	Apply queries to handle transaction processing and maintain consistency of the database	K3
CO4	Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database	K4
CO5	Distinguish how advanced databases differ from Relational Databases and find a suitable database for the given requirement	K5

Mapping with Program Outcomes

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

AD24302– DESIGN AND ANALYSIS OF ALGORITHMS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	2	0	2	60	3	50	50	100

Course Objective

- Learn and understand the algorithm analysis techniques and complexity notations
- Become familiar with the different algorithm design techniques for effective problem solving in computing.
- Learn to apply the design techniques in solving various kinds of problems in an efficient way.
- Understand the limitations of Algorithm power.
- Solve variety of problems using different design techniques

UNIT IINTRODUCTION Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms – Empirical analysis of algorithm – Algorithm visualization.	**6**
UNIT II BRUTE FORCE & DIVIDE AND CONQUER Selection sort– Sequential search and String Matching – closest pair and convex hull problem – Divide and Conquer methodology: Merge sort – Quick sort – Binary search – Binary tree traversals and related properties – Multiplication of large integers and Strassen's Matrix Multiplication – closest pair and convex hull problem.	6
UNIT III DECREASE AND CONQUER & TRANSFORM AND CONQUER Insertion sort – Topological Sorting – Fake coin problem – Computing a Median and the Selection Problem – Transform and conquer: Presorting – Balanced search trees – AVL trees – 2-3Trees – Heaps and Heap sort.	6
UNIT IV DYNAMIC PROGRAMMING & GREEDY TECHNIQUE Warshall's and Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions – Greedy Technique: Prim's algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Trees.	**6**
UNIT VBACKTRACKING & BRANCH AND BOUND NQueens problem – Hamiltonian Circuit Problem – Subset Sum Problem – Branch and Bound: Assignment problem – Knapsack Problem – Traveling Salesman Problem – Overview of P, NP and NP-Complete Problems – Randomized algorithms.	**6**
List of Exercises: 1. Find the order of growth of the given problems. Identify the basic operation and count the number of times the basic operation is executed. 2. Analyze the different sorting algorithms and find out the best algorithm with respect to space and time. 3. Using Decrease and conquer technique, compute the kth smallest element in the list of 'n' numbers. Also, find the time complexity. 4. Write the heap sort algorithm to sort 'n' numbers using transform and conquer. 5. Compare top down and bottom-up approaches of solving the Knapsack problem using Dynamic Programming. 6. Construct huffman code for the given data. Also perform encoding and decoding (use Greedy technique). 7. Apply backtracking to solve the given instance of subset sum problem. 8. Solve the travelling salesman problem of the given graph using branch and bound technique.	**30**
Total Hours	**60**

Textbook(s)

1	AnanyLevitin,"IntroductiontotheDesignandAnalysisofAlgorithms",ThirdEdition,PearsonEducation,2012.

2	EllisHorowitz,Shani,SanguthevarRajasekaran,"ComputerAlgorithms"UniversitiesPress,SecondEdition 2008.
3	ThomasH.Cormen,CharlesE.Leiserson,RonaldL.RivestandCliffordStein,"IntroductiontoAlgorithms",ThirdEdition,PHILearningPrivateLimited,2012.
Reference(s)	
1	AlfredV.Aho,JohnE.HopcroftandJeffreyD.Ullman,"DataStructuresandAlgorithms",Pearson Education,Reprint2006.
2	DonaldE.Knuth,"TheArtofComputerProgramming",Volumes1&3PearsonEducation,2009.
3	SaraBaaseAllenVanGelder,"ComputerAlgorithms-IntroductiontoAnalysis"PearsonEducationAsia, 2010
4	https://www.hackerrank.com/domains/algorithms
5	https://www.geeksforgeeks.org/fundamentals-of-algorithms/

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

Course Outcome		Level
CO1	Analyze algorithm efficiency by understanding space and time complexity principles.	K4
CO2	Implement dynamic programming and greedy techniques to design optimal solutions.	K3
CO3	Apply divide and conquer strategies for efficient problem-solving in algorithm development.	K3
CO4	Solve programming problems using state space tree representations for structured solutions.	K3
CO5	Understand the foundations of NP completeness, approximation algorithms, and randomized algorithms to assess computational complexity.	K2

Mapping with Program Outcomes

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

AD24303– DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	2	75	4	50	50	100

Course Objective

- Acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To analyze and design combinational circuits and sequential circuits.

• To understand the basic structure and operation of a digital computer. • To study the design of data path unit, control unit for processor and to familiarize with the hazards. • To understand the concept of various memories and I/O interfacing.	
UNIT I NUMBER SYSTEMS &BOOLEAN ALGEBRA AND COMBINATIONAL LOGIC Introduction to Number systems – Base Conversions – Signed numbers – Fixed and Floatingpoint Numbers – Basic Arithmetic Operations – Alphanumeric Codes – Boolean algebra and Switching Functions. Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.	**9**
UNIT II SYNCHRONOUS SEQUENTIAL LOGIC Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters..	**9**
UNIT III COMPUTER FUNDAMENTALS Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction– Interaction between Assembly and High Level Language.	**9**
UNIT IV PROCESSOR InstructionExecution–BuildingaDataPath–DesigningaControlUnit–HardwiredControl, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.	**9**
UNIT V MEMORY AND I/O Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA	**9**
List of Exercises: 1. Verification of Boolean theorems using logic gates. 2. Design and implementation of combinational circuits using basic logic gates 3. Implementation of 4-bit binary adder/subtractor circuits. 4. Implementation of code converters. 5. Implementation of BCD adder, encoder and decoder circuits. 6. Implementation of functions using Multiplexers. 7. Implementation of any one of the synchronous counters. 8. Implementation of a Universal Shift register. 9. Simulation based study of Computer Architecture	**30**
Total Hours	**75**
Textbook(s)	
1	Donald P Leach, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications. ”, McGraw Hill, (8th Edition, 2014.
2	S. Salivahanan, S. Arivazhagan, “Digital Circuits and Design”, Oxford University Press, India,

	5th Edition, 2018.
3	Morris M. Mano, "Digital Logic and Computer Design, Pearson Education", 2016
Reference(s)	
1	Anand Kumar A., "Fundamentals of Digital Circuits", PHI, 4th Edition, 2016.
2	M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley, 5th Edition, 2005.
3	A. Saha, N. Manna, "Digital Principles and Logic Design: Fundamentals and Modern applications", Jones and Bartlett Publishers, 2010.
4	Thomas L. Floyd, "Digital Fundamentals", Pearson Education, 2011.
5	https://www.geeksforgeeks.org/fundamentals-of-algorithms/

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

Course Outcome		Level
CO1	Design various combinational digital circuits using logic gates.	K4
CO2	Design sequential circuits and analyze the design procedures.	K4
CO3	State the fundamentals of computer systems and analyze the execution of instruction.	K1
CO4	Analyze different types of control design and identify hazards.	K5
CO5	Identify the characteristics of various memory systems and I/O communication Demonstrate the working of logic families with its characteristics.	K2

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	2	1	1	1	1	2	3	2	3	3
CO2	3	3	3	3	2	1	1	1	1	1	2	3	1	2	2
CO3	3	3	3	3	2	2	1	1	1	1	2	3	2	3	1
CO4	3	3	3	3	1	1	1	1	1	1	1	2	1	3	1
CO5	3	3	3	3	1	2	1	1	1	1	1	2	1	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	2	0	2	60	3	50	50	100

Course Objective

- 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 GameObjects 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 Rigidbody 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 Outcome		Level
CO1	Create and manage game objects effectively within a Unity environment.	K2
CO2	Develop basic scripts using C# to control game behavior and interactivity.	K3
CO3	Design and implement interactive user input systems for games and simulations.	K3

CO4	Construct simple 3D scenes and environments using Unity tools and assets.	K4
CO5	Develop and successfully deploy a basic Unity project to target platforms.	K4

Mapping with Program Outcomes

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

AD24311– ARTIFICIAL INTELLIGENCE LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	3	45	1.5	60	40	100

Course Objective

- Implement fundamental AI algorithms.
- Develop and evaluate machine learning models.
- Use AI libraries such as Tensor Flow, PyTorch, and OpenAI Gym.
- Work with natural language processing and computer vision techniques.
- Apply AI concepts to real-world problems.

LISTOFEXPERIMENTS

1. Introduction to AI & Python Basics
2. Study & list tuple, set, dictionary, classes, inheritance in Python
3. Implement graph in Python for profit or loss in banking application
4. Describe the given problem statement using PEAS description.
5. Implement basic searching algorithm for given AI problem
6. Write a program to solve 8 Queens' problem
7. Implement memory bounded A* & A* algorithm for given problem.
8. Implement Alpha Beta Tree search.
9. Implement classical planning algorithm
10. Solve Robot Obstacle/transversal problem means end analysis.
11. Implement classical planning algorithm

Total Hours	**45**

Required Software & Tools

- Python (Anaconda or Jupyter Notebook)
- Scikit-Learn, TensorFlow, PyTorch
- OpenAI Gym, , NLTK OpenCV

Reference(s)

1	Artificial Intelligence: A Modern Approach – Stuart Russell, Peter Norvig
2	Deep Learning – Ian Goodfellow, Yoshua Bengio, Aaron Courville
3	Pattern Recognition and Machine Learning – Christopher M. Bishop

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

	Course Outcome	Level
CO1	Design and implement search strategies	K6
CO2	Implement game playing techniques	K5
CO3	Implement CSP techniques	K5
CO4	Develop systems with logical reasoning	K4
CO5	Develop systems with probabilistic reasoning	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**2**	**-**
CO2	**2**	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**1**	**2**	**1**	**2**	**1**	**-**
CO3	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**1**	**2**	**1**	**1**	**2**	**1**
CO4	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**1**	**2**	**1**
CO5	**2**	**2**	**2**	**4**	**2**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**1**	**2**	**3**

3 – Strong, 2 – Medium, 1 – Low

AD24312– DATABASE MANAGEMENT SYSTEMS LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	3	45	1.5	60	40	100

Course Objective

- 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	**45**

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

	Course Outcome	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).	K6
CO5	Create and manipulate data using NOSQL database	K6

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															

MA24401– PROBABILITY AND STATISTICAL 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 Objective

- This course aims at providing the required skill to apply the statistical tools in engineeringproblems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which playsan important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays veryimportant roles in the field of agriculture and statistical quality control

UNIT I PROBABILITY AND RANDOM VARIABLES Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Exponential and Normal distributions.	**12**
UNIT II TWO DIMENSIONAL RANDOM VARIABLES Joint distributions – Marginal and conditional distributions – Covariance – Joint moment generating functions and its properties-Multinomial distribution –Bivariate normal distribution – Central limit theorem (for independent and identically distributed random variables).	**12**
UNIT III LINEAR STATISTICAL MODELS Simple linear regression and correlation, multiple regression and multiple correlation. Test of hypothesis – concept and formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing(F test, T test, chi – square test)	**12**

UNIT IV TESTING OF HYPOTHESIS Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-squares and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.	**12**
UNIT V ESTIMATION AND TIME SERIES ANALYSIS Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation. Basics of Time Series: Stationary, ARIMA Models: Identification, Estimation and Forecasting.	**12**
Total Hours	**60**

Textbook(s)

1	Probability and Statistics for Engineers (4th Edition), I. R. Miller, J. E. Freund and R. Johnson, 2016.
2	Introduction to Probability Models, S. M. Ross, Academic Press, N.Y, 2009.
3	Fundamentals of Statistics (Vol. I and Vol. II), A. Goon, M. Gupta and B. Dasgupta, 2013.
4	The Analysis of Time Series: An Introduction, Chris Chatfield, 2003.

Reference(s)

1	A first course in Probability, S. M. Ross, Prentice Hall, 2013.
2	Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill and D.C. Boes, 2017.
3	Introduction to Linear Regression Analysis, D. C. Montgomery and E. Peck, 2006.
4	Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, 2014

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

	Course Outcome	Level
CO1	Apply standard discrete and continuous probability distributions in solving real life problems.	K4
CO2	Apply the concepts of two dimensional random variables, central limit theorem and multivariate distributions in the real life problems.	K4
CO3	Apply the methods of Simple, Multiple - Regression, Correlation, Design of experiments and hypothesis testing to infer the relation among the given data.	K4
CO4	Apply the appropriate non parametric hypothesis testing procedures based on inferences.	K4
CO5	Analyze the various models of time series analysis for forecasting and methods of estimation in statistical analysis.	K5

Mapping with Program Outcomes

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

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

3 – Strong, 2 – Medium, 1 – Low

AD24401-FOUNDATIONS OF DATA SCIENCE AND ANALYTICS

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

- Define key concepts and terminologies in data science
- Describe the methods used in descriptive data analysis
- Use machine learning techniques to build and test models for both regression and classification tasks.
- Explore data handling strategies and model evaluation techniques to ensure data quality and assess model performance.
- Assess various data analytics approaches, including feature selection, error measurement, and predictive modeling, to derive insights from data and improve model performance.

UNIT – I INTRODUCTION Introduction to Data Science - Overview of Data - Sources of Data - Types of Data - data distribution - Small Data and Big Data - Data collection methods - Surveys - Interviews - Log and Diary data - User studies in Lab and Field - Web Scraping - Public datasets - Data cleaning - Tools for Data Science	9
UNIT II DESCRIPTIVE DATA ANALYSIS Dataset Construction - Sampling of data - Stem and Leaf Plots - Frequency table - Time Series data - Central Tendency Measures of the location of data - Dispersion measures - Correlation analysis - Data reduction techniques – basics of Principal Component analysis (PCA) - Independent component analysis – Hypothesis testing – Statistical Tests	9
UNIT III MODEL CONSTRUCTION Overview of Machine learning concepts – Rules for data splitting - Model construction using regression and Classification models - Linear regression and multiple regression models - KNN classification models - Comparison models - Training Data construction - Regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean	9
UNIT IV DATA HANDLING AND MODEL EVALUATION Data aggregation – Data Transformation: merging datasets, reshaping data – Data enrichment: missing values - Normalization - Cross-validation techniques - Accuracy metrics for evaluation of models – Contingency table, ROC curve, Precision-recall curves - A/B testing	9
UNIT V DATA ANALYTICS Introduction- Information-based learning- Handling alternative feature selection - Impurity metrics - Continuous descriptive features and targets- Similarity-based learning- Feature space Predicting continuous targets-Error based learning- Measuring Error-Error surfaces.	9
Total Hours	**45**

Textbook(s)

1	Chirag Shah, “A Hands-on Introduction to Data Science”, Cambridge University Press, UK, 2020.
2	Grus, Joel, “Data science from scratch: first principles with python”, O'Reilly Media, 2019.
3	Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

Reference(s)

1	Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
2	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3	Peter Bruce, Andrew Bruce, Peter Gedeck," Practical Statistics for Data Scientists", O'Reilly; 2nd edition, 2020.

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

Course Outcome		Level
CO1	Apply the skills of data inspecting and cleansing.	K5
CO2	Determine the relationship between data dependencies using statistics	K2
CO3	Can handle data using primary tools used for data science in Python	K2
CO4	Represent the useful information using mathematical skills	K1
CO5	Can apply the knowledge for data describing and visualization using tools.	K5

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

AD24402 – DATA COMMUNICATION AND NETWORKS								
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 protocol layering and physical level communication
- To understand the basic concepts of Digital communication techniques
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.
- To understand and analyze the performance of network applications

UNIT- I INTRODUCTION AND MEDIUM Networks – Network Types – TCP/IP Protocol suite – OSI Model – Transmission media – Line Configuration – Topology – Transmission Modes – Analog Communication Systems	**9**
UNIT- II DATA COMMUNICATION Analog Signals – Time and Frequency Domain – Digital Signals – Digital to Digital Conversions – Analog to Digital Conversions – Digital to Analog Conversions – Analog to Analog Conversions	**9**
UNIT- III DATA-LINK LAYER & MEDIA ACCESS Introduction – DLC Services – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs: IEEE 802.11, Bluetooth – Connecting Devices: Hubs, Switches- Routers	**9**

UNIT- IV NETWORK LAYER Network Layer Services – Packet switching – IPV4 Addresses: Classful addressing- classless addressing – Network Layer Protocol: Internet Protocol (IP) – Routing Algorithms: Distance vector routing- Link State routing- Unicast routing algorithm: OSPF– Multicasting Basics – IPV6 Addressing – IPV6 Protocol	**9**
UNIT- V TRANSPORT LAYER AND APPLICATION LAYER Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP). WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP	**9**
Total Hours	**45**

Textbook(s)	
1	Behrouz A.Forouzan,"Data Communications and Networking", FifthEditionTMH, 2013.
2	Wayne Tomasi,"Advanced lectronic Communication Systems",6th Edition, PearsonEducation,2009.
Reference(s)	
1	Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2	WilliamStallings,"DataandComputerCommunications",TenthEdition,Pearson Education, 2013.
3	NaderF.Mir,"ComputerandCommunicationNetworks",SecondEdition,Prentice Hall,2014.

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

Course Outcome		Level
CO1	Understand the basic layers and its functions in computer networks.	K1
CO2	Understand the basics of how data flows from one node to another.	K1
CO3	Analyze and design routing algorithms.	K5
CO4	Design protocols for various functions in the network.	K6
CO5	Understand the working of various application layer protocols	K1

Mapping with Program Outcomes

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

AD24403 – MACHINE LEARNING TECHNIQUES								
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 machine learning theory
- To implement linear and non-linear learning models
- To implement distance-based clustering techniques
- To build tree and rule-based models

UNITIINTRODUCTION TO MACHINE LEARNING Machinelearningapplications–Basicdefinitions-typesoflearning:unsupervisedlearning– Reinforcement Learning – Supervised Learning – Learning a class from examples– hypothesis space and inductive bias-VapnikChervonenkis(VC)Dimension–ProbablyApproximatelyCorrect(PAC)Learning–Noise–Learning multiple classes – Model selection and Generalization-Evaluation and Cross-validation.	**9**
UNIT II LINEAR REGRESSION Introductiontodecisiontrees-Learningdecisiontrees-IssuesPruningOverfitting,k Nearestneighbor-Featureselection:Metrics,FeatureReduction:Dimensionalityreduction,Subsetselection,Principalcomponent analysis, Factor analysis, Multidimensional scaling, Linear discriminate analysis.	**9**
UNIT III BAYESIANLEARNING Bayestheorem-MaximumLikelihood-Bayesoptimalclassifier-GibbsAlgorithm-Naive BayesClassifier-BayesianBeliefnetworks-Clustering:MixtureDensities–KMeansClustering–ExpectationMaximization – Hierarchical clustering.	**9**
UNIT IV LINEARDISCRIMINATION LinearModel–GeometryoftheLinearDiscriminate–PairwiseSeparation–GradientDescent – LogisticDiscrimination – Discrimination by Regression – Multilayer Perceptions: Introduction – Perceptron – Training a Perceptron – Learning Boolean Functions – Multilayer Perceptrons – Backpropagation Algorithm.	**9**
UNIT V KERNELMACHINES SVM-OptimalSeparatingHyperplane–kerneltrick–HiddenMarkovModels–Evaluation- Model selection – Introduction to Ensembles- Bagging – Boosting.	**9**
Total Hours	**45**

Textbook(s)

1	Ethem Alpaydin,"IntroductiontoMachineLearning",ThirdEdition,PHI,2015.
2	TomM.Mitchell,"MachineLearning",McGrawHill,2013.

Reference(s)

1	KevinP.Murphy,"ProbabilisticMachineLearning:AnIntroduction(AdaptiveComputationandMachine Learning series)",1st Edition, MIT Press,2022.
2	EthemAlpaydin,"IntroductiontoMachineLearning",4thEdition,MITPress,2020.
3	Navin Kumar Manaswi,"DeepLearningwith ApplicationsusingPython",1stEdition,Apress,2018.

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

Course Outcome		Level
CO1	**Understand** the fundamental concepts of machine learning, including types of learning	K2
CO2	**Apply** supervised learning algorithms.	K3
CO3	**Implement** unsupervised learning techniques.	K4
CO4	**Evaluate** and compare the performance of machine learning models using appropriate metrics	K5
CO5	**Analyze** ethical and practical issues in machine learning.	K5

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

AD24404– OPERATINGSYSTEMS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	L	T	P
IV	3	0	2	60	4	50	50	100

Course Objective

- To study the basic concepts and functions of operating systems.
- To learn about Processes, Threads, Scheduling algorithms
- To understand the process of synchronization and deadlock issues
- To learn and understand the Memory management systems.
- To learn I/O Management and File Systems.

UNITI OPERATINGSYSTEMS OVERVIEW Introduction–ComputerSystemOrganization–ComputerSystemArchitecture–Operations–ResourceManagement– Security and Protection – Virtualization – Computing Environments. Operating Systems Structures: Services – User and OS Interface – System Calls – Linkers and Loaders – Operating system Structure – Building and Booting OS.	**9**
UNIT II PROCESSMANAGEMENT ProcessConcepts–ProcessScheduling–Operations–InterprocessCommunication-SharedMemoryandMessage Passing Systems Threads: Overview- multithreading models-issues. CPU Scheduling: – FCFS – SJF – Priority– RR – Multilevel Queue Scheduling – Multilevel Feedback Queue.	**9**
UNIT III PROCESSSYNCHRONIZATIONANDDEADLOCKS Process Synchronization–Critical Section Problem–Peterson's Solution–Hardware Synchronization–	**9**

Semaphores-Monitors–Classic Problems of Synchronization, Deadlocks: Characterization-Prevention–Avoidance – Detection – Recovery.	
UNIT IV MEMORYMANAGEMENT MainMemory:Background–ContiguousMemoryAllocation–Paging–Structureofapagetable–Segmentation–Virtual Memory – Demand Paging – Page Replacement-FIFO-LRU-Optimal –Allocation of Frames – Thrashing –Mass Storage Management-Disk scheduling.	**9**
UNIT V FILEMANAGEMENT FileSystem–Concepts–AccessMethods-DirectoryStructure–Protection–DiscretionaryAccesscontroland MandatoryAccessControl–FileSystemstructure–DirectoryImplementation–AllocationMethods–Free-Space Management-Virtual File System. Case studies:Linux	**9**

List of Exercises:

1. Installation of Operating system : Windows/ Linux
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exec, Getpid, Exit, 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 Semaphores
7. Write a C program to avoid Deadlock using Banker's Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm
9. Write C program to implement Threading
10. Implement the paging Technique using C program

1. Write C programs to implement the following Memory Allocation Methods
   a. First Fit b. Worst Fit c. Best Fit
2. Write C programs to implement the various Page Replacement Algorithms
3. Write C programs to Implement the various File Organization Techniques
4. Implement the following File Allocation Strategies using C programs
   a. Sequential b. Indexed c. Linked
5. Write C programs for the implementation of various disk scheduling algorithms

Total Hours	**75**

Textbook(s)

1	AbrahamSilberschatz,PeterBaerGalvinandGregGagne,"OperatingSystemConcepts",10th Edition,John WileyandSonsInc.,2018.
2	Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.

Reference(s)

1	WilliamStallings,"OperatingSystems–InternalsandDesignPrinciples",9thEdition,Pearson,2018.
2	Achyut GodboleandAtulKahate,"OperatingSystem",3rd Edition,TataMcGrawHill,2017.
3	PavelY.,AlexI.,MarkE.,DavidA.,"WindowsInternalPartI–SystemArchitecture,Processes, Memory Management and More", 7th Edition, Microsoft Press, 2017.

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	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	3	-	1	-	1	2	2	2	3	-	1
CO2	2	2	2	1	2	-	-	-	2	-	2	2	2	3	2
CO3	2	2	2	1	2	-	-	-	1	-	2	2	2	3	2
CO4	2	2	-	-	2	-	-	-	2	-	2	2	3	2	1
CO5	2	-	1	-	2	-	-	1	1	-	2	2	3	-	2

3 – Strong, 2 – Medium, 1 – Low

CS24401-FUNDAMENTALS OF SWIFT PROGRAMMING							
Semester	Hours/Week			Total Hours	Credit	Maximum Marks	
	L	T	P		C	CIAT	ESE	Total
IV	2	0	2	45	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

UNIT1-INTRODUCTIONTOUIKIT 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**
UNITII-UIKITANDAUTO LAYOUT SystemViews - View Controllers - Arrays - Dictionaries - Loops- ForLoops- While Loops- Displaying Data Controls In Action - Buttons - Switches – Sliders - Actions and Outlets -Auto Layout and Stack Views	6
UNITIII-NAVIGATIONANDWORKFLOWS Optionals-FunctionsandOptionals-TypeCastingandInspection-Guard-Guardwith Optionals-ConstantandVariableScope-Enumerations-SeguesandNavigationControllers - Navigation Bar - Tab Bar Controllers - View Controller Life Cycle- View Did Load - View Event Management.	6

UNITIV-TABLESANDPERSISTENCE Protocols - Creating a Protocol - Delegation - App Anatomy and Life Cycle Lesson - Model-ViewController - Scroll Views - Scroll Views in Interface Builder - Table Views - AnatomyofaTable View - Table View DataSource - IntermediateTableViewsLesson - Saving Data - System View Controllers Lesson - Complex Input Screens	6
UNITV–XCODE Xcode-XcodeFilesTypes-XcodePreference-Building,Running,andDebugginganApp - Interface Builder Basics - Storyboards - Interface Builder Layout - Outlets And Actions.	6
Total Hours	**30**
PRACTICAL EXERCISES: Total Hours	**30**
1.DiceApp	
2.LoginApp	
3.QuizApp	
4.TouristApp	
5.MobileAppfor College	
Reference	
1	Develop in Swift, 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	Explain the concepts of Strings, functions, and Structures in Swift programming.	K2
CO2	Apply the principles of classes and collections to develop structured Swift programs.	K3
CO3	Utilize arrays and loops effectively to construct efficient Swift programs	K4
CO4	Develop Swift applications using functions, demonstrating problem-solving techniques.	K5
CO5	Evaluate the role of UIKit and Auto Layout in designing responsive and user-friendly applications.	K6

Mapping with Program Outcomes

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

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

AD24411 - FOUNDATIONS OF DATA SCIENCE AND ANALYTICS LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	3	45	1.5	60	40	100

Course Objective

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

LIST OF EXPERIMENTS

1.Download, install and explore the features of NumPy, SciPy, Jupyter,Statsmodels and Pandas packages.
2.Create an empty and a full NumPy array.
3.Program to remove rows in Numpy array that contains non-numeric Values
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 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.Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
7.Write a Pandas program to get the first 3 rows of a given DataFrame.
8.Program to find the variance and standard deviation of set of elements.
9.Write a Python program to draw line charts of the financial data of Alphabet Inc. between October 3, 2016 to October 7, 2016.
10.Program to plot a Correlation and scatter plots.
11.Program for Linear Regression and Logistic Regression
12.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
13.Perform Mini Project on Fake News Detection
14.Build an application to detect colors in the given picture using Basic Data Science.

Total Hours	**45**

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

Course Outcome		Level
CO1	Recall the fundamental concepts and processes of data science, establishing foundational knowledge.	K1
CO2	Explain and summarize data effectively to support decision-making in the data science workflow.	K2
CO3	Apply techniques to analyze relationships between data attributes, identifying meaningful correlations.	K3
CO4	Utilize Python libraries for data wrangling, demonstrating proficiency in processing and transforming data	K4
CO5	Evaluate and Interpret data visualizations using Python, extracting insights from graphical representations	K5

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

AD24412– MACHINE LEARNING TECHNIQUES LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	3	45	1.5	60	40	100

Course Objective

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To build the graph based learning models for standard data sets.
- To compare the performance of different ML algorithms and select the suitable one based on the application.

LISTOFEXPERIMENTS

1.Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a.CSV file.
2.Implement and demonstrate for a given set of training data examples stored in a.CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3.Write a program to demonstrate the working of the decision tree-based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4.Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
5.Write a program to implement the naive Bayesian classifier for a sample training data set stored as a.CSV file.
6.Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7.Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using a standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8.Apply EM algorithm to cluster a set of data stored in a . CSV file. Use the same data set for clustering using the k-means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API to the program.
9.Write a program to implement the k-nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10.Implement the non-parametric Locally Weighted Regression algorithm to fit data points.

Total Hours	**45**

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

Course Outcome		Level
CO1	Understand the machine learning algorithms through Python programming.	K2
CO2	Apply structured thinking to unstructured problems.	K5
CO3	Design and evaluate the unsupervised models through Python inbuilt functions.	K6
CO4	Design and apply various reinforcement algorithms to solve real-time complex problems.	K6
CO5	Develop an appreciation for what is involved in learning from data.	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	1	-	-	1	2	2	-
CO2	2	2	3	3	3	-	-	-	2	1	2	1	2	1	-
CO3	2	2	2	2	2	-	-	-	2	1	2	1	1	2	1
CO4	2	2	2	2	2	-	-	-	1	1	-	-	1	2	1
CO5	2	2	2	4	2	-	-	-	2	-	2	2	1	2	3
3 – Strong, 2 – Medium, 1 – Low															