VELAMMAL COLLEGE OF ENGINEERING AND TECHNOLOGY, MADURAI-625 009

(Autonomous)

REGULATIONS 2025

CHOICE BASED CREDIT SYSTEM

B.E. – COMPUTER SCIENCE AND ENGINEERING

CURRICULUM FOR SEMESTERS I to IV

SEMESTER– I

S.No.	Course Code	Course Title	Category	L	T	P	C
1.	IP25C01	Induction Programme *(Common to all B.E./B.Tech. Programmes)*	MC	0	0	0	0
THEORY COURSES							
2.	EN25C01	Technical English *(Common to all B.E./B.Tech. Programmes)*	HSMC	3	0	0	3
3.	MA25C02	Applied Mathematics for Engineers *(Common to B.E. Civil, CSE, EEE and B.Tech. IT Programmes)*	BSC	3	1	0	4
4.	PH25C01	Engineering Physics *(Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	BSC	3	0	0	3
5.	CH25C01	Engineering Chemistry *(Common to all B.E./B.Tech. Programmes)*	BSC	3	0	0	3
6.	CS25C01	Problem Solving using C Programming *(Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	ESC	3	0	0	3
7.	TA25C01	Heritage of Tamils /தமிழர் மரபு *(Common to all B.E./B.Tech. Programmes)*	HSMC	1	0	0	1
PRACTICAL COURSES							
8.	CS25C02	Programming in C Laboratory *(Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	ESC	0	0	4	2
9.	PC25C01	Physics and Chemistry Laboratory *(Common to all B.E./B.Tech. Programmes)*	BSC	0	0	4	2
10.	EM25C01	Engineering Practices Laboratory *(Common to B.E. Civil, , CSE, EEE, CSE(CS), EE(VLSI), Mech and B.Tech. IT Programmes)*	ESC	0	0	4	2
TOTAL				**16**	**1**	**12**	**23**

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B.E. – COMPUTER SCIENCE AND ENGINEERING

CURRICULUM FOR SEMESTERS I to IV

SEMESTER– II

S.No.	Course Code	Course Title	Category	L	T	P	C
THEORY COURSES							
1.	MA25C03	Probability and Statistics *(Common to B.E. CSE, and CSE(CS),B.Tech. IT and AI&DS Programmes)*	BSC	3	1	0	4
2.	PH25C02	Physics for Information Science *(Common to B.E. CSE, CSE(CS), and B.Tech. IT, AI&DS Programmes)*	BSC	3	0	0	3
3.	IT25C01	Object Oriented Programming using C++ *(Common to B.Tech. IT and B.E. CSE,CSE(CS) Programmes)*	PCC	3	0	0	3
4.	CH25C02	Environmental Science *(Common to all B.E./B.Tech. Programmes)*	BSC	2	0	0	2
5.	EC25C01	Fundamentals of Digital Electronics *(Common to B.E. CSE, and B.Tech. IT Programmes)*	ESC	3	0	0	3
6.	ME25C01	Engineering Graphics and Design *(Common to B.E. CSE, EEE, CSE(CS), EE(VLSI) ,MECH and B.Tech. IT, AI&DS Programmes)*	ESC	2	0	2	3
7.	TA25C02	Tamils and Technology / தமிழரும் தொழில்நுட்பமும் *(Common to all B.E./B.Tech. Programmes)*	HSMC	1	0	0	1
THEORY WITH PRACTICAL COURSE							
8	EN25C02	English proficiency and soft skills *(Common to B.E. Civil, CSE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	HSMC	2	0	2	3
PRACTICAL COURSE							
9	IT25C02	Object Oriented Programming using C++ Laboratory *(Common to B.Tech. IT and B.E. CSE,CSE(CS) Programmes)*	PCC	0	0	4	2
Total				**19**	**1**	**8**	**24**

REGULATIONS 2025
CHOICE BASED CREDIT SYSTEM
B.E. – COMPUTER SCIENCE AND ENGINEERING
CURRICULUM FOR SEMESTERS I to IV

SEMESTER– III

S.No.	Course Code	Course Title	Category	L	T	P	C
THEORY COURSES							
1.	MA25C04	Discrete Mathematics *(Common to B.E. CSE,CSE(CS) and B.Tech. IT,AI&DS Programmes)*	BSC	3	1	0	4
2.	CS25C06	*Data Structures (Common to B.E. CSE,CSE(CS) and B.Tech. IT Programmes)*	PCC	3	0	0	3
3.	CS25C07	Java Programming *(Common to B.E. CSE, and B.Tech. IT Programmes)*	PCC	3	0	0	3
4.	IT25C03	Computer Organization and Architecture *(Common to B.Tech. IT and B.E. CSE,CSE(CS) Programmes)*	PCC	3	0	0	3
5.	IT25C04	Operating Systems *(Common to B.Tech. IT and B.E. CSE,CSE(CS) Programmes)*	PCC	3	0	0	3
PRACTICAL COURSES							
6.	CS25C08	Data Structures Laboratory *(Common to B.E. CSE,CSE(CS) and B.Tech. IT Programmes)*	PCC	0	0	3	1.5
7.	CS25C09	Java Programming Laboratory *(Common to B.E. CSE and B.Tech. IT Programmes)*	PCC	0	0	3	1.5
8.	IT25C05	Operating Systems Laboratory *(Common to B.Tech. IT and B.E. CSE,CSE(CS) Programmes)*	PCC	0	0	3	1.5
Total				**15**	**1**	**9**	**20.5**

BoS Chairman

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CHOICE BASED CREDIT SYSTEM
B.E. – COMPUTER SCIENCE AND ENGINEERING
CURRICULUM FOR SEMESTERS I to IV

SEMESTER– IV

S.No.	Course Code	Course Title	Category	L	T	P	C
THEORY COURSES							
1.	MA25C07	Numerical Analysis and Linear Algebra *(Common to B.E. CSE, and B.Tech. IT Programmes)*	BSC	3	1	0	4
2.	CS25C10	Design and Analysis of Algorithms *(Common to B.E. CSE, CSE(CS) and B.Tech. IT Programmes)*	PCC	3	0	0	3
3.	CS25C11	Database Management Systems *(Common to B.E. CSE, CSE(CS) and B.Tech. IT Programmes)*	PCC	3	0	0	3
4.	CB25C01	Data Communication and Networks *(Common to B.E. CSE(CS) , CSE Programmes)*	PCC	3	0	0	3
5.	CS25401	Object Oriented Software Engineering	PCC	3	0	0	3
THEORY WITH PRACTICAL COURSE							
7.	CS25402	Foundation of Data Science	PCC	3	0	2	4
PRACTICAL COURSES							
8	CS25C12	Database Management Systems Laboratory *(Common to B.E. CSE, CSE(CS) and B.Tech. IT Programmes)*	PCC	0	0	3	1.5
9	CB25C02	Networks Laboratory *(Common to B.E. CSE(CS), CSE Programmes)*	PCC	0	0	3	1.5
Total				**18**	**1**	**8**	**23**

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CHOICE BASED CREDIT SYSTEM
B.E. – COMPUTER SCIENCE AND ENGINEERING
CURRICULUM FOR SEMESTERS I to IV

COURSES OFFERED TO OTHER DEPARTMENTS

S.No.	Course Code	Course Title	Category	L	T	P	C
1	CS25C03	Python with Foundation of Data Science	ESC	3	0	0	2
2	CS25C04	Python with Foundation of Data Science Laboratory	ESC	0	0	4	2
3	CS25C05	Problem Solving and Python Programming *(Common to B.E. ECE, Mech Programmes)*	ESC	3	0	2	4
4	CS25C13	Data Structures and Algorithms	ESC	3	0	2	4
5	CS25C14	Problem Solving using Python Programming Laboratory	ESC	0	0	4	2
6	CS25C15	Data Structures and Algorithms Using C++	ESC	3	0	2	4

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B.E. – COMPUTER SCIENCE AND ENGINEERING

SYLLABUS FOR SEMESTERS I TO IV

SEMESTER-I

IP25C01	INDUCTION PROGRAMME *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		0	0	0	0

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfil his/her responsibility as an engineer, as a citizen and as a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and

allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and **therefore there shall be no tests / assessments** during this programme.

REFERENCE:

Guide to Induction program from AICTE

EN25C01	TECHNICAL ENGLISH *(Common to all B.E./B.TECH. Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Recognize and interpret listening cues for enhancing comprehending skills in spoken interactions
- Develop confidence in expressing ideas clearly in speaking situations.
- Understand and apply vocabulary effectively while summarizing written content.
- Build the ability to plan and structure coherent written compositions
- Encourage articulation to support personal viewpoints in diverse formats.

UNIT I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	9

Listening – Pronunciation, Stress, Syllable, Listening for general information and specific details - Listening and filling a form; **Speaking** - Self Introduction, asking for information to fill details in a form; **Reading** - Comprehension Passages – Skimming,Scanning and intensive & extensive reading; **Writing** - Writing emails / letters (formal & informal - requisition, Complaint); **Grammar** - Parts of Speech (Nouns, Pronouns, Verbs, Adverbs, Adjectives, Prepositions, Conjunctions, Interjections), Kinds of Sentences; **Vocabulary** - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II	NARRATION AND SUMMATION	9

Listening - Listening short talks/ podcast/ stories / event narration, documentaries and say true or false **Speaking** - Narrating personal experiences/events, summarizing of documentaries/podcasts; **Reading** - Reading biographies, travelogues & technical blogs; **Writing** -- Paragraph writing, Short Report on an event (Industrial visits etc.); **Grammar** - Question types: Framing "WH" Questions & Yes or No Questions and Tenses; **Vocabulary** - Word forms (prefixes & suffixes), Antonyms, Phrasal verbs.

UNIT III	DESCRIPTION OF A PROCESS / PRODUCT	9

Listening - Listening to advertisements about products and process descriptions and summarize them: **Speaking** - Giving instruction to use the product; Presenting a product; **Reading** - Reading advertisements, gadget reviews; user manuals; **Writing** - Writing definitions; instructions; and Product /Process description; **Grammar** - Tenses, Subject - Verb Agreement; **Vocabulary** - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words)

UNIT IV	CLASSIFICATION AND RECOMMENDATIONS	9

Listening - Listening to TED Talks; differentiate instructions and recommendations; **Speaking** – Short Talk ; Mini presentations and making recommendations; **Reading** - Newspaper articles - interviews, Non Verbal Communication (infographics, tables, pie charts etc) to understand and classify information **Writing** - Writing recommendations; Transferring information from non -verbal (chart, graph etc, to

verbal mode) **Grammar** - Articles, Degrees of comparison; **Vocabulary** - Collocations; Fixed / Semi fixed expressions.		
UNIT V	**EXPRESSIONS**	**9**
Listening - Listening to debates/ discussions; different viewpoints on an issue; and panel discussions; **Speaking** - Group discussions, Debates, and Expressing opinions through Simulations & Role-play; **Reading** - Reading editorials; and Opinion Blogs; **Writing** - Essay Writing (Descriptive or narrative); **Grammar** -Phrases & Clauses, Simple, Compound & Complex Sentences; **Vocabulary** - Connotations- Content vs. Function words.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Identify listening cues and respond appropriately in real-time communication.

C02: Deliver spoken messages clearly and appropriately in varied contexts.

CO3: Use new vocabulary in context and summarize main ideas from texts.

CO4: Create and organize clear written compositions.

CO5: Express and justify opinions through oral, written, and digital formats

TEXT BOOK:

1. Shoba. K N.& Lourdes Joavani Rayen. "Communication Skills", New Delhi, Cambridge University Press, 2021
2. Board of Editors, Fluency in English-A Course book for Undergraduate Engineers and Technologists. Orient Blackswan Pvt Ltd, Hyderabad: 2018
3. Jawahar, Jewelcy & Rathna.P. Communicative English Workbook. VRB Publishers Pvt Ltd. Chennai. 2018.

REFERENCE BOOKS:

1. Department of English. Mindscapes English for Technologists and Engineers. Orient Black swan Ltd, Hyderabad: 2012
2. Verma, Shalini. Technical Communication for Engineers. Vikas Publishing House Pvt Ltd. New Delhi. 2015
3. Rizvi, Ashraf.M. Effective Technical Communication. MCGraw Hill Education Pvt Ltd. New Delhi. 2016.
4. Leech Geoffrey and Svartvik Jan. A Communicative Grammar of English. Third Edition, Routledge, New York. 2013

WEB SOURCES:

1. www.esl.org
2. elt.oup.com/learning resources
3. a4esl.org

BoS-CHAIRMAN

MA25C02	APPLIED MATHEMATICS FOR ENGINEERS *(Common to B.E. Civil, CSE, EEE &B.Tech. IT Programmes)*	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

- To establish the matrix concepts in Engineering applications
- To obtain the solution of different types of differentiation equations involved in differential calculus
- To make use of the concept of functions of several variables and partial derivatives in various fields of Engineering
- To prepare the student to use mathematical tools in evaluating multiple integrals and its applications
- To obtain a solution of ordinary differential equations that model engineering problems.

UNIT I	MATRICES	12

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem - Diagonalization of matrices by orthogonal transformation - Reduction of a quadratic form to canonical form by orthogonaltransformation – Nature of quadratic forms – Applications of matrices : Principal Component Analysis, Stretching of elastic membrane..

UNIT II	DIFFERENTIAL CALCULUS	12

Differentiation – Implicit differentiation – Logarithmic differentiation – Applications: Maxima and minima of functions of one variable, Radius of curvature - Centre of curvature – Circle of curvature.

UNIT III	FUNCTIONS OF SEVERAL VARIABLES	12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV	INTEGRAL CALCULUS	12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Double integrals –Area enclosed by plane curves – Triple integrals – Volume of solids.

UNIT V	ORDINARY DIFFERENTIAL EQUATIONS	12

Linear equations of second order with constant and variable coefficients-Homogeneous equations of Euler type – Equations reducible to homogeneous form –Variation of parameters-Simultaneous first order

differential equation with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply the matrix algebra for Eigen value related application problems.

CO2: Apply differential calculus tools in solving various Engineering problems

CO3: Determine the solutions for functions of more than one variable.

CO4: Solve the practical problems of finding area and volume using multiple integrals.

CO5: Apply ordinary differential equations to model real world problems.

TEXT BOOKS:

1.Grewal.B.S. "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2018.

2.Bali N.P and Manish Goyal "A Text Book of Engineering Mathematics",9th Edition Lakshmi Publications Pvt., Ltd., New Delhi, 2016

3.Kreyszig.E, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons, New Delhi, 2016

REFERENCES:

1. James Stewart, "Calculus: Early Transcendentals", 9th Edition, Cengage Learning, 8th edition New Delhi, 2015
2. Ramana. B.V., "Higher Engineering Mathematics", 6th Edition, McGraw Hill Education Pvt. Ltd, New Delhi, 2010.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", 5th Edition, Narosa Publications, New Delhi, 2016.

PH25C01	ENGINEERING PHYSICS *(Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To illustrate the effective understanding of mechanics.
- To gain knowledge on oscillations and thermal physics.
- To explain the working of laser and its applications.
- To outline the importance of quantum mechanics.
- To understand crystal structures and its applications.

UNIT I	MECHANICS OF MATERIALS	9

Rigid body – Centre of mass: 1D & 3D – Elasticity –Hooke's law - Poisson's ratio - stress-strain diagram for ductile and brittle materials(basic) – Uses - Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young's modulus determination - I shaped girders.

UNIT II	OSCILLATIONS AND THERMAL PHYSICS	9

Simple harmonic motion - Torsional pendulum –Introduction to Damped and Forced oscillations – Shock absorber – Resonance - Introduction to conduction, convection and radiation - Thermal expansion – Expansion joints – Bimetallic strip – Seebeck effect – thermocouple.

UNIT III	LASERS	9

Laser – characteristics – Spontaneous and Stimulated emission- population – inversion - Metastable states - CO_2 laser, Semiconductor laser - Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication.

UNIT IV	QUANTUM MECHANICS	9

Black body radiation (Qualitative) – Planck's hypothesis - Matter waves–de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Physical significance of wave function - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope.

UNIT V	CRYSTAL PHYSICS	9

Crystal Bonding – Ionic – covalent – metallic and van der Wall's molecular bonding - Introduction to Crystal systems (unit cell, Bravais lattices, Miller indices) - Crystal structures - atomic packing density of BCC, FCC and HCP structures - crystal imperfections - point defects - edge and screw dislocations – grain boundaries. X-ray diffractometer.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the basic properties of materials

CO2: Express the knowledge based on applications of oscillations and thermal Physics.

CO3: Know the basics of optics, lasers and its applications

CO4: Demonstrate the importance of quantum physics.

CO5: Apply the significance of crystal physics.

TEXT BOOKS:

1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, First Edition 2013.
2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, Tenth Edition, 2015.
3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer- Verlag, First Edition, 2012.
4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, First Edition ,2012.

REFERENCES

1. R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 1st Edition, 2016.
2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 1st Edition, 2017.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 1st Edition, 2012.

CH25C01	ENGINEERING CHEMISTRY *(Common to all B.E. / B.Tech. Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To inculcate the sound understanding of water quality parameters and water treatment techniques.
- To acquire basic principles and preparatory methods of nanomaterials.
- To describe the characteristics, applications of polymeric materials and composites.
- To illustrate the operating principles in electrochemistry and working processes and applications of storage devices.
- To use appropriate synthetic fuels and fuel additives for better combustion characteristics.

UNIT I	WATER AND ITS TREATMENT	9

Water: Sources and impurities, **Water quality parameters:** Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. **Municipal water treatment:** primary treatment and disinfection (UV, Ozonation, break-point chlorination). **Boiler troubles:** Scale and sludge, boiler corrosion, caustic embrittlement, priming & foaming. **Treatment of boiler feed water**: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and external treatment – Ion exchange demineralization and zeolite process. **Desalination of brackish water**: Reverse Osmosis (RO) method.

UNIT II	NANOCHEMISTRY	9

Basics: Distinction between molecules, nanomaterials and bulk materials; **Size-dependent properties** (optical, electrical, mechanical and magnetic). **Preparation of nanomaterials:** sol-gel, solvothermal, laser ablation, chemical vapour deposition, and electrochemical deposition. **Applications** of nanomaterials. **Sensors**: Basic components, types and applications. Chemiresistive sensors - environmental monitoring – CO_2 sensor.

UNIT III	POLYMERS AND COMPOSITES	9

Polymers: Classification, functionality of monomers, Types of polymerizations, free radical mechanism, degree of polymerization, weight and number average molecular weights (definition only). **Engineering Plastics** - Properties and types. **Composites:** Definition & need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and reinforcement (fiber, particulates, flakes and whiskers). **Properties and applications**: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites.

UNIT IV	ELECTROCHEMICAL POWER SOURCES	9

Electrochemical cells – EMF, electrode potential, dependence of emf on electrolyte concentration – Nernst equation. Electrochemical series and its applications. **Batteries:** Types of batteries, primary battery - dry cell, secondary battery - lead acid battery, Zn-Carbon, and lithium-ion-battery; **Fuel cells:** H_2-O_2 fuel cell, Supercapacitors: Storage principle, types and examples. **Electric vehicles** - working principles

UNIT V	FUELS AND COMBUSTION	9

Fuels: Introduction, classification of fuels; **Coal and coke**: Analysis of coal (proximate and ultimate), Carbonization, and manufacture of metallurgical coke (Otto Hoffmann method). **Petroleum and Diesel:** Manufacture of synthetic petrol (Bergius process), knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. **Combustion of fuels:** Introduction, calorific value - higher and lower calorific values, Theoretical calculation of calorific value; **Ignition temperature**: spontaneous ignition temperature, Explosive range; **Flue gas analysis** - ORSAT Method. CO_2 emission and carbon foot print.

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

CO2: Describe the basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.

CO3: Apply the knowledge of polymers and composites for material selection requirements.

CO4: Illustrate the basics of electrochemistry and apply them for suitable applications in energy sectors.

CO5: Utilize different fuels and predict their performance and combustion characteristics.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", 12th Edition, S. Chand Publishing, 2018.

BoS Chairman

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B.B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-II M Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" 2nd Edition, McGraw Hill Education (India) Private Limited, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", 2nd Edition, Cambridge University Press, Delhi, 2019.
5. V. R. Gowarikar, N.V. Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International (P) Ltd., 2015

CS25C01	PROBLEM SOLVING USING C PROGRAMMING *(Common to B.E. Civil, CSE, ECE, EEE, CSE(CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the constructs of C Programming.
- To apply conditional and looping constructs in C Programming to manage program execution flow.
- To develop applications that effectively use arrays and strings for data storage and manipulation
- To develop modular applications using functions and pointers.
- To design and implement applications using structures and unions for efficient handling of complex data types.

UNIT-I	INTRODUCTION	7

Evolution of Programming Languages - Programming Paradigms : Structured programming - Object Oriented programming - Functional programming -Algorithms - Pseudo code and Flowchart - Structure of C Program - Compilation Process -Preprocessor Directives - C Tokens.

UNIT-II	CONTROL FLOW STATEMENTS	9

Expressions –I/O Statements - Operators: Precedence and Associativity -Decision Making Statements: if -else if ladder, Nested if, Switch statements - Iterative Statements: For, While, Do while statements-Break, Continue Statements

UNIT-III	ARRAYS AND STRINGS	9

Arrays: Declaration, Initialization – One Dimensional Array – Multi Dimensional Arrays - String: String Operations - Sorting: Selection Sort - Searching: Linear and Binary Search.

UNIT-IV	FUNCTIONS AND POINTERS	11

Modular Programming: Function Prototype, Function Definition, Function Call, Built-in Functions: String Functions and Math Functions - User Defined Functions – Recursion - Pointers: Pointer Operators, Pointer Arithmetic, Arrays and Pointers, Array of Pointers - Parameter Passing: Pass by Value and Pass by Reference.

UNIT-V	STRUCTURES AND UNION	9

Structure: Defining and Processing a Structure - Nested Structures - Passing Structure to Functions -Array of Structure – Self referential Structure- Pointer to Structure - Union - Dynamic Memory Allocation - File Processing.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Demonstrate the constructs of C Programming

CO2: Build applications using Conditional and Looping constructs in C

CO3: Design applications using Arrays and Strings in C

CO4: Make use of Functions and Pointers and develop applications

CO5: Make use of Structure and Union to design applications

TEXT BOOKS:

1. ReemaThareja," Programming in C",3rd edition, Oxford University Press,2023
2. Deitel.H.M, Deitel.P.J , "C: How to Program", Pearson, 9th Edition, New Delhi, 2022
3. PradipDey, ManasGhosh, "Programming in C", Oxford University, New Delhi, 2018

REFERENCES:

1. Gottfried B, "Programming with C", McGraw Hill, 4th Edition, Noida, 2018
2. Herbert Schildt, "C: The Complete Reference", McGraw Hill, 4th Edition, Noida, 2017
3. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

TA25C01	HERITAGE OF TAMILS / தமிழர் மரபு *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		1	0	0	1

UNIT I	LANGUAGE AND LITERATURE	3

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

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

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III	FOLK AND MARTIAL ARTS	3

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

UNIT IV	THINAI CONCEPT OF TAMILS	3

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு மக்களும் பண்பாடும் கே. கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித்தமிழ் முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

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

CS25C02	PROGRAMMING IN C LABORATORY *(Common to B.E. Civil, CSE, ECE, EEE, CSE (CS), EE(VLSI) and B.Tech. IT, AI&DS Programmes)*	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To describe the basics of algorithmic problem solving
- To develop programs in C using basic constructs.
- To develop programs in C using arrays and strings
- To develop applications in C using functions.
- To develop applications in C using Pointers, Structures, Union

LIST OF EXPERIMENTS

Exercise 1: Basics of C programming

a. Identification and solving of simple real life or scientific or technical problems, and developing flow charts and Pseudo code for the same (Electricity Billing, Retail shop billing)

b. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats using escape sequences.

c. Write a Program to print different data types in 'C' and their ranges.

d. Write a Program to initialize, assignment & printing variables of different data types.

Exercise 2: Operators

a. Write a Program to demonstrate arithmetic, logical and relational operators.

b. Write a Program to demonstrate pre increment and post increment (++a, a++), pre decrement and post decrement (--a, a--)

c. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.

d. Write a Program to calculate simple interest.

e. Write a Program to convert temperature from Fahrenheit –Centigrade and vice-versa.

Exercise 3: Control Statements

a. Write a Program to read marks of a student in six subjects and print whether pass or Fail. (using if-else).

b. Write a Program to calculate roots of quadratic equation.

c. Write a Program to calculate electricity bill. Read starting and ending meter reading. The charges are as follows.

Usage Slab(in Units)	Rate per unit(Rs)
Upto 400	4.80
401-500	6.45
500-600	8.55
601-800	9.65
800-1000	10.70
>1000	11.80

d. Write a Program to perform arithmetic operations using case control statement.

e. Write a Program to display names of days in a Week using case control statement.

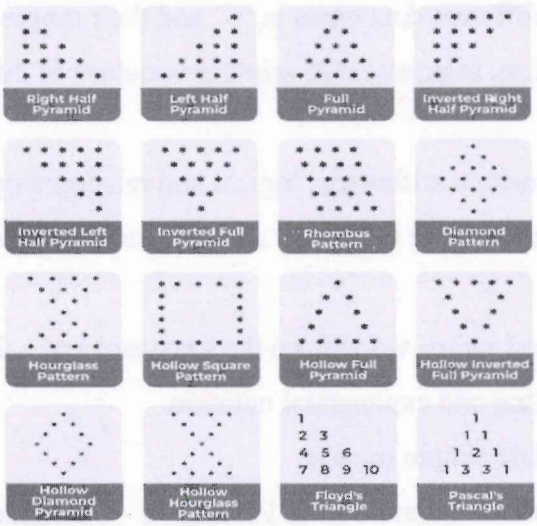
Exercise 4: Looping operations

a. Write a program to calculate sum of individual digits of a given number.

b. Write a program to check whether given number is palindrome or not.

c. Write a program to print prime numbers in the given range.

d. Write a program to print the Fibonacci series for given 'N' value.



e. Write a program to print the following formats.

Exercise 5: 1-D and 2-D arrays

a. Write a program to store 10 elements in a 1-D array and print sum of the array, maximum and minimum element in an array.

b. Write a program to count no. of positive numbers, negative numbers and zeros in an array.

c. Write a program to count all subsets of given array with sum equal to given sum.

d. Write a program to search an element using linear search algorithm.

e. Write a program to sort the given elements using bubble sort algorithm.

f. Write a program to perform matrix addition, subtraction and multiplication.

Exercise 6: Strings

a. Write a program to perform various string manipulations using built-in functions.

b. Write a program to verify the given string is palindrome or not.

c. Write a program to Check if two strings are anagrams of each other.

d. Write a program to concatenate two strings using arrays.

e. Write a program to print the given strings in ascending order.

Exercise 7: Non recursive and recursive functions

a. Write an application to simulate basic calculator (+, -, *, /) using functions.

b. Write a program to find nth Fibonacci number using recursive and non-recursive number.

c. Write a program to find factorial of a number using recursive and non-recursive number.

d. Write a program to swap two numbers using Call by Value and Call by Reference.

Exercise 8: Pointers

a. Write a program to illustrate Pointers to array, strings, Pointers to Pointers, Array of Pointers

b. Write a program to sort an array using pointers.

c. Write a program to perform matrix multiplication using pointers.

Exercise 9: Structures and Union

a. Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of 'n' account holders.

b. Write a program to find total marks of individual student and average marks for 'n' students using structures.

c. Write a program to illustrate the functions of union.

Mini project

TOTAL :60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational Problems using flow chart and Pseudo code

CO2: Develop simple applications using basic C components.

CO3: Solve applications adopting array and string concepts in C.

CO4: Construct and implement applications in C using functions and pointers.

CO5: Make use of Structures and Union concepts to prepare applications in C.

PC25C01	PHYSICS AND CHEMISTRY LABORATORY *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To explain the proper use of various kinds of laboratory equipment.
- To extend how data can be collected, presented and interpreted in a clear and concise manner.
- To infer problem solving skills and interpretation of experimental data.
- To summarize error in experimental measurements and techniques used to minimize such error.
- To translate the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS: PHYSICS LABORATORY

1. Laser- Determination of the wavelength of the laser using grating. (Common to ALL)
2. Photoelectric effect – Determination of Planck's constant. (Common to ALL)
3. Hall effect – determination of Hall parameters. (Common to ALL)
4. a) Optical fibre -Determination of Numerical aperture and acceptance angle.
   b) Compact disc- Determination of width of the groove using the laser. (Common to CSE, IT, AI&DS,CS(Cyber),ECE,EEE,EE(VLSI))
5. Spectrometer-Determination of the wavelength of light using grating. (Common to CSE, IT, AI&DS,CS(Cyber),ECE,EE(VLSI))
6. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects. (Common to CIVIL,EEE,MECH)
7. Determination of Young's modulus–cantilever method. (Common to CIVIL,MECH)

LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any 7 experiments)

1. Determination of chloride content of water sample by Argentometric method.
2. Determination of total hardness of water by EDTA method.
3. Determination of strength of acids in a mixture of acids using conductivity meter.
4. Conductometric titration of strong acid against strong base.
5. Determination of DO content of water sample by Winkler's method.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Estimation of iron content of the given solution using potentiometer.
8. Conductometric titration of barium chloride against sodium sulphate. (precipitation titration)

9. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method.
10. Determination of types and amount of alkalinity in water sample.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply the knowledge, to gain hands-on experience with laboratory equipment.

CO2: Relate the graphical models to interpret the laboratory data.

CO3: Interpret quantitative reasoning and describing physical reality.

CO4: Apply the principle and process to access the scientific information.

CO5: Translate students to solve problems individually and collaboratively.

REFERENCES :

1. "Physics Laboratory Manual", Department of Physics, Velammal College of Engineering & Technology, Madurai (2021)
2. P. Mani, "Physics Laboratory", Dhanam Publications, Third Edition 2021.
3. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Vogel's Textbook of Quantitative Chemical Analysis" 2009.

EM25C01	ENGINEERING PRACTICES LABORATORY *(Common to B.E.CIVIL, CSE, CSE(CS) ,EEE, EE(VLSI), IT, and MECH)*	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To draw pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
- To demonstrate the basic switch board wiring, fluorescent lamp wiring and stair case wiring using various electrical components.
- To choose various joints in steel plates using arc welding work and machining various simple processes like turning, drilling, tapping in parts
- To build a tray out of metal sheet using sheet metal work.
- To develop electronic circuit and testing for soldering and desoldering using PCB board.

LIST OF EXPERIMENTS:

GROUP – A

PART – I

PLUMBING WORK:

- Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household using Power Tools.

WOOD WORK:

- Planning and Making Dovetail joint.

CENTRIFUGAL PUMP:

- Assembly and Dismantling of Centrifugal pump.

AIR-CONDITIONER:

- Trouble shooting of AC

MODERN MANUFACTURING:

- Laser engraving and 3D printing* - Demo

ROBOTICS:

- Application of Robot In Automation* - Demo

PART – II

CYCLE I

- Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with l lamp, fan and three pin socket
- Staircase wiring
- Energy meter wiring and related calculations calibration
- Roof top solar panel connection and EV connection
- Study of BLDC Fan.

GROUP – B

PART - III

MECHANICAL ENGINEERING PRACTICES

WELDING WORK:

- Welding of Butt Joints using arc welding.
- Robot welding* (Demo)

BASIC MACHINING WORK:

- Facing and Turning*. (Demo)

SHEET METAL WORK:

- Making of a rectangular tray

AUTOMOBILE:

- Mantling and dismantling of Tyre's for 4 wheeler.
- Assembly and disassembly of Bearing.

PART- IV

CYCLE II

- Construction of series and parallel circuits using resistors.
- Measurement of resistance to earth of electrical equipment.
- Introduction of electronic components (Resistance, Capacitor, Diode, BJT, UJT, SCR,JFET)
- Soldering Simple electronic Circuits and Checking Continuity
- Generation of Signals (DSO, Function generator).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Build various plumbing joints

CO2: Develop various carpentry joints.

CO3: Construct various wiring electrical joints in common household electrical wire work

CO4: Construct various welded joints, sheet metal and basic machining operations

CO5: Develop the electronic circuit for soldering

SEMESTER-II

MA25C03	PROBABILITY AND STATISTICS *(Common to B.Tech. . IT AI&DS , B.E. CSE ,CSE (Cyber Security))*	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To develop the concepts of probability and distributions.
- To compute different measures of central tendency, dispersion and to interpret the data
- To explain the knowledge of testing of hypothesis for small and large samples.
- To describe the concepts of non-parametric tests which involved in statistics.
- To make use of the notion of control and measurement charts in statistics and its techniques in engineering and management problems.

UNIT I	PROBABILITY	12

Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Uniform, Exponential and Normal distributions .

UNIT II	STATISTICS	12

Measures of central tendency - Arithmetic mean - Geometric mean - Harmonic mean - Median - Mode - Measures of dispersion - Range - Standard deviation - Coefficient of variation - Correlation - Coefficient of correlation - Lines of regression.

UNIT III	TESTING OF HYPOTHESIS	12

Large sample test based on Normal distribution for single mean and difference of means – Tests based on t, $\chi 2$ and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.

UNIT IV	NON- PARAMETRIC TESTS	12

Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test - The Kolmogorov Tests .

UNIT V	STATISTICAL QUALITY CONTROL	12

Control charts for measurements (π and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.

CO2: Investigate the Various measures of central tendency and measures of dispersion.

CO3: Explain the test of hypothesis for small and large samples by using various test like t-test,F-test, Z- test and $\chi 2$ test.

CO4: Apply the non-parametric tests of signed test, Rank test, U test and H test in the field of statistical quality control.

CO5: Use the notion of control and measurement charts in statistics and its techniques used in Engineering problems.

TEXT BOOKS:

1:Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44rd Edition, 2018

2:Piegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.

3:Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2007.

REFERENCES:

1: Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand &Sons, New Delhi, 12th Edition, 2020.

2: T. Veerarajan, Probability, Statistics and Random Processes, Tata Mc Graw Hill, 3rd Edition, 2008.

3: Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning,New Delhi, 8th Edition, 2014.

PH25C02	PHYSICS FOR INFORMATION SCIENCE *(Common to B.E./B.Tech.AI & DS,CSE,IT,CS(Cyber) Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To infer the importance of studying electrical properties of materials.
2. To extend the students knowledge in semiconductor physics and display devices.
3. To illustrate knowledge of magnetic and optical data storage techniques.
4. To summarize the different properties of sensors and applications.
5. To translate an idea of quantum confinement and quantum computing.

UNIT I	ELECTRON THEORY OF MATERIALS	9

Classical and quantum free electron theory of metals – merits and demerits - Fermi-Dirac statistics– density of states - band theory of solids (qualitative) - Intrinsic semiconductors: energy band – diagram - direct and indirect band gap semiconductors - carrier concentrations and conductivity - extrinsic semiconductors: n, p-type doping.

UNIT II	SEMICONDUCTORS AND DISPLAY DEVICES	9

Semiconductors: Hall Effect - Schottky junction - Ohmic contacts – Schottky diode - optical absorption and solar cell – LED construction and working (White LED's – organic LEDs) – Laser diode - LCD construction and working.

UNIT III	MAGNETIC AND OPTICAL DATA STORAGE TECHNIQUES	9

Introduction – Ferromagnetic materials – Ferrites - Soft and Hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Materials for magnetic data storage - Optical data storage capacity of CD – advantages of CD – DVD – Blu-ray DVD - holographic storage.

UNIT IV	SENSORS	9

Introduction – piezoelectric pressure sensor - capacitance pressure sensor - Capacitor plate sensor- piezoelectric devices for motion sensing - Hall effect based speed sensor – photodiodes –phototransistors - photovoltaic devices - Pyroelectric detector - semiconductor based IR sensors.

UNIT V	QUANTUM COMPUTING	9

Introduction - quantum states – classical bits – quantum bits or qubits – multiple qubits - quantum gates - CNOT gate - Quantum cellular automation – Advantages of quantum computing over classical computing – Silicon based Quantum Computer.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Demonstrate the classical and quantum electron theories, and semiconductors.

CO2: Infer knowledge on the basics of semiconductor physics and its applications in various devices.

CO3: Summarize magnetic properties of materials and their applications in data storage.

CO4: Extend the functioning of sensors.

CO5: Translate the basics of quantum structures towards quantum computing.

TEXT BOOKS:

1. Jasprit Singh, "Semiconductor Devices Basic Principles", 1st Edition (Indian Edition), Wiley, 2007.
2. S.O. Kasap,"Principles of Electronic Materials and Devices", 4th Edition (Indian Edition), McGraw-Hill Education, 2020.
3. Ian R Sinclair, Sensors and Transducers‖, 3rd Edition, Newnes publishers, 2011.
4. Parag K. Lala, "Quantum Computing: A Beginner's Introduction", 1st Edition (Indian Edition) McGraw-Hill Education, 2020.

REFERENCES

1. Charles Kittel, "Introduction to Solid State Physics", 1st Edition (Indian Edition) Wiley,2019.
2. Y.B.Band and Y.Avishai, "Quantum Mechanics with Applications to Nanotechnology and Information Science", 1st Edition, Academic Press, 2013.
3. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, "Introduction to Nanoelectronics", 1st Edition, Cambridge University.Press, 2008.
4. G.W. Hanson, "Fundamentals of Nanoelectronics", 1st Edition (Indian Edition), PearsonEducation 2009.
5. B.Rogers, J.Adams and S.Pennathur, "Nanotechnology: Understanding Small Systems", 1st Edition, CRC Press, 2014.
6. Krzysztof Iniewski, Smart sensors for industrial applications, CRC Press Taylor and Francis, 1st Edition, 2019.

IT25C01	OBJECT ORIENTED PROGRAMMING USING C++ *(Common to B.Tech. IT and B.E CSE,CSE(CS))*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the principles of Object oriented programming.
- To know the principles of C++ Classes and objects.
- To understand the concepts of inheritance and polymorphism.
- To implement concepts of Templates and Files in C++
- To introduce the concepts of Exception Handling and STL in C++

UNIT I	BASICS OF OOPS WITH C++	9

Object-Oriented Paradigm, Data abstraction / Control abstraction, Object Oriented Programming principles , Origin of C++ , Structure of C++ program, Simple C++ program, Dynamic initialization of variables ,Reference variables, New and Delete, C++ keywords, Type casting.

UNIT II	CLASSES AND OBJECTS	9

Class: Definition, Structure, Nested classes, Friend Classes, **Objects**, Scope-'this' pointer, Friend function, Static class members, Constant member functions, Constructors and Destructors – Copy Constructor, Dynamic creation and destruction of objects, Operator Overloading, Type Conversions.

UNIT III	INHERITANCE AND POLYMORPHISM	9

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class constructor, Virtual base class. **Virtual Functions and Polymorphism**: Static and Dynamic binding, Function overloading, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes.

UNIT IV	TEMPLATES AND FILE OPERATIONS	9

Templates, Function templates, Class Templates, Overloading of Template Functions, Member function Templates, **File** stream operations- ostream, istream, fstream, File Access Modes, File position pointer – fseek get, fseek put, ftell get, ftell put, Sequential Input and Output operations Random Access, Error handling during file operation.

UNIT V	EXCEPTION HANDLING AND STL	9

Exception handing mechanism, throwing mechanism, catching mechanism, rethrowing an exception, C++ Standard Exception Library, runtime error, logic failures, user defined exceptions, Exception handling in inheritance, specifying exceptions. C++ standard **STL**- List, Vector and Set

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

CO1: Apply the concepts of object-oriented programming for problem solving.

CO2: Build basic C++ programs using the concepts of classes and objects.

CO3: Develop C++ programs using Inheritance and Polymorphism.

CO4: Make use of files and Templates to develop C++ programs.

CO5: Develop C++ programs to handle Exceptions and STL.

TEXT BOOKS:

T1: Walter Savitch,"Problem solving with C++: The Object of Programming", 10th Edition , Pearson Education, 2018.

T2: E.Balagurusamy, "Programming with C++", 7th Edition, Tata McGraw Hill, 2017.

REFERENCES

R1:B. Stroutstrup,"The C++ Programming Language", 4th Edition, , Pearson Education, 2013.

R2: Herbert Scheldt , "The Complete Reference C++", 5th Edition, Tata McGraw Hill, 2012.

R3: Rick Mercer, "Computing fundamentals with C++ Object Oriented Programming & design", Mac Millan Press 2nd Edition 1995.

CH25C02	ENVIRONMENTAL SCIENCE *(Common to all B.E / B.Tech. Programmes)*	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To appreciate the structure and function of an ecosystem and biodiversity
- To realize the environmental impacts of natural resources.
- To recognize causes, effects and control measures of different types of pollution.
- To comprehend the importance of disaster management, environmental ethics and values.
- To appreciate the relevance of the environment by evaluating its impact on the surrounding environment and its functions.

UNIT-I	ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY	6

Definition, scope and importance of environment – need for public awareness - ecosystem- general structure and function of an ecosystem- ecological succession-biodiversity-types-values of biodiversity- endangered and endemic species-red data book- hot spots of biodiversity-criteria- hot spots in India-threats to biodiversity(man-animal conflicts, habitat loss, poaching) - case studies - conservation of biodiversity- in-situ and ex-situ conservation – case studies for conservation of biodiversity in Mudumalai.

UNIT-II	NATURAL RESOURCES AND ITS ENVIRONMENTAL IMPACTS	6

Natural resources-forest resource-ecological functions – causes, effects and control measures of deforestation-water resource-sources-conflict over water-dams benefits and problems-food resource-overgrazing- impacts of over grazing- impacts of modern agriculture-**Energy Resources**: Growing energy needs, renewable and nonrenewable energy sources, use of alternative energy sources, - wind mills and solar panels- case studies.

UNIT III	ENVIRONMENTAL POLLUTION AND CONTROL	6

Air pollution-causes, effects and control methods - water pollution- causes, effects-waste water treatment-soil pollution-causes, effects-solid waste management - causes, effects and management - **E- waste**: composition and generation of E-waste pollutants, hazardous properties, Effects of pollutant on human health and environment, domestic E- waste disposal, Basic principles of E waste management, Component of E-waste management. Pollution control acts - air, water- wildlife - E- waste management rules - case studies - role of an individual in control of pollution.

UNIT IV	DISASTER MANAGEMENT AND ENVIRONMENTAL ETHICS	6

Disaster management-causes, effects and management of- flood, landslide, earthquake and tsunami-case studies-environmental ethics - value education-traditional value systems in India-water conservation-rain water harvesting-watershed management.

UNIT V	SUSTAINABLE MANAGEMENT AND PRACTICES	6

Social issues - climate change - causes, effects and control measures - global warming - causes, effects and control measures - Acid rain - causes, effects and control measures - ozone layer depletion - causes, effects and control measures - nuclear accident and holocausts – Sustainability - concept, needs and challenges - economic, social and aspects of sustainability - from unsustainability to sustainability - EIA - Sustainable development – goals, target - green buildings - ISO 14000 series.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Elucidate the concept, structure and function of an ecosystem and biodiversity.

CO2: Demonstrate the environmental impressions of natural resources.

CO3: Illustrate the appropriate management approach for pollution control.

CO4: Practice the proper way of managing disaster with environmental ethics.

CO5: Assess the impact of the environment on humans, and consider its roles and worth.

TEXT BOOKS:

1. A. Kaushik, and C. P. Kaushik. "Environmental Science and Engineering", 6th Edition, New Age International, 2018.
2. S. K. Garg and K. Garg, Ecological and Environmental studies, Khanna Publishers, 2015.
3. Wright and Nebel, Environmental science towards a sustainable future, 12th Editon, Prentice Hall of India Ltd, 2015.

REFERENCE BOOKS:

1. Erach Bharucha, "Text book of Environmental studies for Undergraduate courses", 3rd Edition, UGC, 2021.
2. P. Ravi, and Agrahari, Environmental ecology, Biodiversity, climatic change & Disaster management, 1st Edition, McGraw Hill, 2020
3. Benney Joseph, "Environmental Science and Engineering", 1st Edition, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2017.

EC25C01	FUNDAMENTALS OF DIGITAL ELECTRONICS *(Common to B.E. CSE, and B.Tech. IT Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To present the digital fundamentals, Boolean algebra and its applications in digital systems.
- To introduce the gate level minimization techniques.
- To familiarize with the design of various combinational digital circuits using logic gates.
- To introduce the design procedures for sequential circuits.
- To explain the various semiconductor memories.

UNIT-I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Digital Systems-Binary Numbers-Number base conversions-Octal and Hexadecimal Numbers-complements of numbers-Signed binary numbers-Binary codes - Binary Logic-Axiomatic definition of Boolean Algebra- Basic theorems and properties of Boolean algebra-Boolean functions-canonical and standard forms-other logic operations-Digital logic gates.

UNIT-II	GATE – LEVEL MINIMIZATION	9

The Map Method-Four-variable K Map -Five Variable K Map - Product of Sums, Sum of Products simplification - Don't-care conditions- NAND and NOR implementation – AND-OR-INVERT Implementation – Exclusive-OR Functions

UNIT-III	COMBINATIONAL LOGIC	9

Combinational Circuits- Half Adder - Full Adder – Half Subtractor – Full Subtractor- Decimal Adder - Magnitude comparator- multiplexers- Decoder - Encoder - Priority encoders and its application

UNIT-IV	SEQUENTIAL LOGIC	9

Sequential circuits – latches - Flip-Flops -Types of Flipflops - Realization of Flipflops - Flipflop Conversions - Registers - Shift Registers - Synchronous Counters - Asynchronous Counters - Modulo Counters – Counter Applications

UNIT-V	MEMORY DEVICES	9

Introduction- Random Access Memory -Memory Decoding - Read-only memory – Programmable Read Only Memory - Programmable Logic Devices - Programmable Logic Array

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Demonstrate the Number system conversions and build basic logic gates.

CO2: Make use of minimization techniques to simplify Boolean algebraic equations.

CO3: Build various combinational circuits using logic gates.

CO4: Develop sequential circuits using flip flops.

CO5: Explain various semiconductor memories and Programmable Logic Devices.

TEXT BOOKS:

1. M. Morris Mano, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", Pearson Education, 6th Edition, 2020.
2. Albert Paul Malvino and Donald P. Leach, "Digital Principles and Applications" TATA McGraw HillEdition, 9th Edition , 2021.
3. Charles.H.Roth, "Fundamentals of Logic Design" , CI Engineering, 7th Edition, 2022

REFERENCES:

1. Thomas L. Floyd, "Digital Fundamentals", Pearson Education Inc, 11th Edition, 2018.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Private Limited, 4th Edition, 2022.
3. Soumitra Kumar Mandal, "Digital Electronics", McGraw Hill Education Private Limited, 2018.

ME25C01	ENGINEERING GRAPHICS AND DESIGN *(Common to B.Tech..IT & AIDS, B.E.CSE, CSE(CS), EEE ,EE(VLSI) and MECH)*	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- Apply fundamental concepts of engineering graphics and orthographic projections using basic 2D CAD software.
- Interpret and sketch the projection of simple solids and understand basic 3D CAD modeling techniques.
- Create sectional views and develop true shapes of solids through manual sketching and CAD tools.
- Apply isometric projection techniques and use basic AR/VR tools to visualize engineering objects.
- Sketch orthographic projections and understand the fundamentals of design for 3D printing and additive manufacturing.

UNIT I	BASICS OF ENGINEERING GRAPHICS AND VISUALIZATION	9

Introduction to Engineering Graphics: Importance, applications, and tools. Use of Drafting Instruments: Lettering, dimensioning, line types, and scales. Orthographic Projections: Principles, projection of points, straight lines

Introduction to CAD Software: Basics of 2D drawing and layout views. Demo on 2D CAD practice – Demo.

Introduction to UX/UI in Engineering Design: Overview of the importance of user interface (UI) and user experience (UX) in engineering applications (e.g., dashboards, software interfaces) - Demo

UNIT II	PROJECTION OF SOLIDS	9

Projection of Solids: Prisms, pyramids, cylinders, cones, with the axis inclined to principal planes.

Basic CAD Modelling of Solids: Introduction to simple 3D modelling in CAD tools. Demo on 3D CAD practice – Demo.

UNIT III	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	9

Sectioning of Solids: Sectional views of simple solids with cutting planes inclined to horizontal plane. True Shape of Sectional Views: Obtaining true shape and development of sections.

UNIT IV	ISOMETRIC PROJECTIONS	9

Isometric Projection: Principles, isometric scale, and isometric views of simple solids like prisms, pyramids, cones and cylinders.

Introduction to Visualization Tools: Use of simple AR/VR applications for viewing isometric and perspective projections. Demo on AR/VR – Demo.

UNIT V	ORTHOGRAPHIC PROJECTIONS AND DESIGN APPLICATIONS	9
Freehand Sketching: Sketching orthographic views of simple isometric solids. Design for 3D Printing: Basics of modelling for additive manufacturing. Demo on 3D Printing – Demo.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Construct orthographic projections of points, lines, and simple objects using drafting tools and 2D CAD software.

CO2: Sketch projections of prisms, pyramids, cylinders, and cones and create basic 3D models using CAD software.

CO3: Generate sectional views and develop true shapes of simple solids using manual and CAD tools.

CO4: Create isometric projections and use AR/VR tools for enhanced spatial visualization of engineering objects.

CO5: Apply freehand sketching to produce orthographic projections and understand basic 3D printing design considerations.

TEXT BOOKS:

1. Natarajan K.V., "A text book of Engineering Graphics", 31st Edition, Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", 15th Edition, New Age International (P) Limited, 2018.
3. Bhatt N.D. and Panchal V.M., "Engineering Drawing", 53rd Edition, Charotar Publishing House, 2014.

REFERENCES:

1. S.S. Sashikiran., "The 7S Design Framework", 1st Edition, Notion Press, 2024.
2. Rajiv Chopra, "Virtual and Augmented Reality" 1st Edition, Khanna Publishing House, 2021.
3. Sabrie Soloman, "3D Printing & Design", 1st Edition, Khanna Publishing House, 2020.

TA25C02	TAMILS AND TECHNOLOGY / தமிழரும் தொழில்நுட்பமும் *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		1	0	0	1

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3

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

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3

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

UNIT III	MANUFACTURING TECHNOLOGY	3

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

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3

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

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு மக்களும் பண்பாடும் கே. கே.பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித்தமிழ் முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

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

EN25CO2	ENGLISH PROFICIENCY AND SOFT SKILLS (*Common to B.E./B.Tech. AI&DS, CIVIL, CSE,CSE(CS), EEE, IT , VLSI, CSBS& AIML) Theory with Practical*	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- Strengthen LSRW (Listening, Speaking, Reading, Writing) competencies in English.
- Demonstrate effective communication skills in meeting academic requirements.
- Integrate and interpret graphical data in logical writing using verbal reasoning.
- Produce formal writings for effective internal and external communication.
- Present and adapt concepts according to the target audience, fostering essential soft skills.

UNIT I	INTRODUCTION TO COMMUNICATION PROFICIENCY	6

Listening: Listening to native speaker's Telephone Conversations; **Speaking:** Sharing Childhood Experiences, dialogues (Informal & Formal), Talking about Favorite Personalities; **Reading:** Technical texts from - Newspapers /websites, Job Advertisements - Telephone Phrases; **Writing:** Statements, Issue based essay writing , Graphs, Checklist; **Grammar:** Error Spotting; **Vocabulary:** Misspelt Words; **Soft Skills:** Leadership Skills

UNIT II	TECHNICAL TALKS AND TEAM DYNAMICS	6

Listening: Listening to Technical Talks, Scientific lectures and Short conversations; **Speaking:** Career choice, describing recent innovations in Technology; **Reading:** Speed-reading - Identifying the various transitions in a text - Paragraphing; **Writing:** Precis writing - Letter of Enquiry, Quotation, Order, Claim Letters- Response to complaints; **Grammar:** Numerical Adjectives, Active & Passive Voice, Use of Impersonal Passive form; **Vocabulary:** Jumbled sentences. **Soft Skills:** Teamwork

UNIT III	CAREER INSIGHTS AND DECISION MAKING	6

Listening: Job Interviews, Interview Skills, FAQs - Sports commentaries/Animated stories/Anecdotes / Event narration; **Speaking:** Interviewing Celebrities and Entrepreneurs; **Reading:** Short stories - Critical reading; **Writing:** Cover letter & Resume, Project Proposal writing using AI tools **Grammar:** Embedded sentences; **Vocabulary:** Foreign words used in English (from other languages); **Soft Skills:** Decision Making.

UNIT IV	PROFESSIONAL WRITING AND ANALYTICAL SKILLS	6

Listening: TED Talks; **Speaking:** Presentation Skills; **Reading:** Developing analytical skills - Company profiles; **Writing:** Writing Statement of Purpose (SOP)-Emails, Memos, Notices and Circulars, Internship Application letters; **Grammar:** Punctuation, If Conditionals; **Vocabulary:** Verbal reasoning; **Soft Skills:** Time Management

UNIT V	ART OF REPORTING AND PANEL DISCUSSIONS	6

Listening: Model debate and reviewing the performance of each participant - Panel discussion; **Speaking:** Group communication- Discussing social issues, current affairs and debate; **Reading:** Fitting sentences in a paragraph - Cause and Effect Essays, Technical papers and case studies; **Writing:** Accident Report and Feasibility Report, Minutes of the Meeting; **Grammar:** Cause and Effect expressions , Reported speech; **Vocabulary:** Verbal Analogies; **Soft Skills:** Conflict Resolution

PRACTICAL COURSE

PRACTICAL SYLLABUS	**INTRAPERSONAL, INTERPERSONAL, ORGANIZATIONAL AND MASS COMMUNICATION**	**15**

Listening: Listening to TED Talks and Practice Exercises - Making a Critical Appreciation of Video content - Answering cloze test based on listening.

Speaking: Self-Introduction-Introducing Resource persons and Chief guests - Developing stories using picture prompts - Language etiquette in different situations - Expressing Agreement and Conflict management and seeking information - Expressing feelings - Affection, Anger, Regret etc. - Team reviewing and Appraisal on any Social event, Short talk on Technical topics.

Reading: Making Inference in Reading - Reading Longer Texts with Time frame - Reading and Interpreting data using different types of Texts, Magazines and Internet Materials - Editing/Proof reading - Reading research papers.

Writing: Abstract Writing - Mind Mapping and Brainstorming on any Social event/Issue - Creating a Product Review Blog, Making PowerPoint Presentations (MS Power point & Google Slides) and Creating PPT using AI tools.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Demonstrate improved LSRW competencies in English.

CO2: Perform enhanced academic communication skills

CO3: Analyze graphical data to develop logical written content

CO4: Compose formal documents for communication.

CO5: Evaluate concepts for diverse audiences using appropriate soft skills

TEXT BOOKS:

1. Gangalakshmi, C, Rathika, B, Saranraj, L. Professional English for Engineers. New Delhi: Cengage, 2022.
2. Shoba K. N. and Lourdes Joavani Rayen, "Communicative English", Cambridge University Press, Cambridge, 2021.
3. Raymond Murphy, "Intermediate English Grammar", Cambridge University Press, New Delhi, 2020.

REFERENCE BOOKS:

1. Raman, Meenakshi and Sangeetha Sharma. Communication Skills. New Delhi: OUP, 2018.
2. Jawahar, Jewelcy & Rathna.P. Communicative English Workbook. VRB Publishers Pvt Ltd. Chennai. 2018.
3. R. C. Sharma Krishna Mohan - Business Correspondence and Report Writing a Practical Approach to Technical Communication - McGraw Hill India (2017).

Website Resources:

1. Open Online Repositories from Oxford/ Cambridge/ British Council/ Voice of America
2. https://www.youtube.com/@TEDx
3. https://youtu.be/dzR4E49zNLI?si=0RL4C_vV1i1Kz2iR
4. AI tools : www.magicschool.ai, www.typeset.io, www.gamma.app, www.veed.io

IT25C02	OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY *(Common to B.Tech. IT and B.E CSE,CSE(CS))*	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To practice the design and implementation of C++ programs using classes and objects as representations of real-world entities
- To practice reusability through inheritance in C++.
- To design and implement object-oriented programming (OOP) concepts such as polymorphism.
- To develop programs using C++ templates.
- To explore exception handling techniques and the Standard Template Library (STL).

LIST OF EXPERIMENTS

1. Write simple C++ programs using classes and objects.
2. Execute C++ programs with constructors and destructors.
3. Implement programs using operator overloading.
4. Test type conversions for various data types.
5. Design programs demonstrating all types of inheritance.
6. Implement dynamic binding using virtual functions and pure virtual functions.
7. Develop programs using C++ functions and function overloading.
8. Develop programs using class templates and function templates.
9. Experiment with sequential file access.
10. Experiment with random file access.
11. Write programs using exception-handling mechanisms.
12. Develop programs utilizing the Standard Template Library (STL)

TOTAL :60 PERIODS

LABORATORY REQUIREMENT:

- INTEL based desktop PC with min 8GB RAM, 17'' or higher TFT Monitor , Keyboard and Mouse
- Operating Systems: Linux / Windows
- Front End Tools: Eclipse IDE / Netbeans IDE

COURSE OUTCOMES:

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

CO1: Apply concepts of object-oriented programming for solving real time problems.

CO2: Develop programs using classes, objects and operator overloading.

CO3: Develop programs by applying the concepts of inheritance.

CO4: Utilize file handling and templates to develop and implement C++ programs.

CO5: Make use of error-handling mechanisms and the Standard Template Library (STL) to improve the efficiency and reliability of C++ programs.

COURSE OFFERED TO OTHER DEPARTMENTS

CS25C03	PYTHON WITH FOUNDATIONS OF DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To utilize Python for effective problem-solving.
- To make use of Python data structures for representing complex datasets.
- To learn the foundational principles of Data Science with Python.
- To develop Python programs for data analysis using Python libraries.
- To understand probability distributions and make statistical inferences.

UNIT - I	INTRODUCTION TO PYTHON PROGRAMMING	9

Python interpreter and interactive mode- Variables and Data Types- Operators-Control Structures - functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

UNIT – II	COLLECTIONS AND FILE HANDLING	9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Files: reading and writing files and exceptions Handling

UNIT – III	OVERVIEW OF DATA SCIENCE	9

Introduction: Need for data science – Benefits and uses – Facets of data, Data science process: Retrieving data – Cleansing, integrating, and transforming data – Data analysis – Build the models – Presenting findings and building applications.

UNIT – IV	DATA PREPROCESSING	9

Data manipulation: Reading and selection – Filtering missing data – Sorting – Grouping – Ranking and Plotting- Fundamental Python Libraries for Data Science- Data Manipulation with Pandas-Sample programs to pre-processand visualize data.

UNIT – V	DESCRIPTIVE STATISTICS &STATISTICAL INFERENCE	9

Data Preparation – Exploratory Data Analysis: Data summarization – Data distribution –Estimation: Mean-Variance – Sampling – Covariance – Correlation. Frequentist Approach – Measuring the Variability in Estimates: Point estimates – Confidence intervals; Hypothesis Testing

45 PERIODS

COURSE OUTCOMES:

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

CO1: Utilize strings, functions and control statements to solve real-world problems.
CO2: Build programs by utilizing Python data structures.
CO3: Illustrate the importance of data science and its processes.
CO4: Develop Python programs to conduct data analysis.
CO5: Make use of descriptive and statistical techniques to interpret and analyze data.

TEXT BOOKS:

1. Vijay Kumar Sharma, Vimal Kumar, Swati Sharma, Shashwat Pathak, "Python Programming – A Practical Approach", CRC Press, First Edition, 2022
2. Davy Cielen, Arno D B Meysman, Mohamed Ali, "Introducing Data Science – Big data, Machine Learning, and more using Python tools", Manning Publications Co, 2016.
3. Laura Igual, Santi Segua, "Introduction to Data Science – A Python Approach to Concepts, Techniques and Applications", Springer Nature, 2017

REFERENCES:

1. Urban, Michael., Murach, Joel. "Murach's Python Programming", United States: Mike Murach& Associates, Incorporated, Second Edition, 2021.
2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016

CS25C04	PYTHON WITH FOUNDATIONS OF DATA SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand basic Python concepts, including variables, data types, operators, control structures, functions, and strings.
- To learn data structures like lists, tuples, and dictionaries, and file-handling techniques.
- To introduce the data science process, including retrieval, cleaning, analysis, and modeling.
- To develop skills in data manipulation and preprocessing with pandas.
- To gain foundational knowledge in descriptive statistics and statistical inference.

Practical Syllabus:

1. Practice using the Python interpreter and interactive mode. Explore variable assignments, basic data types, and type conversions. Use operators to perform simple arithmetic and logical operations.
2. Create conditional statements and loops to work with control structures. Define functions to modularize code and explore string manipulations, slicing, and formatting.
3. Store and organize data using lists, tuples, and dictionaries. Practice adding, updating, and retrieving elements and comparing mutable and immutable data structures.
4. Practice reading from and writing to files. Use exception handling for common file errors, and learn about data handling techniques when working with external files.
5. Practice basic data exploration techniques to identify data types, check for missing values, and understand data distributions.
6. Use simple data cleansing and transformation techniques, such as handling missing data, and practice integrating data from multiple sources. Conclude by creating a summarized report of the cleaned data.
7. Use `pandas` to manipulate datasets by performing filtering, grouping, and sorting operations. Practice handling missing data and ranking data based on specific attributes.
8. Plot data for better visualization and insight. Use `matplotlib` for creating bar charts, histograms, and scatter plots, and explore fundamental data science libraries in Python.
9. Calculate descriptive statistics on a dataset, including measures of central tendency and variability. Use these statistics to interpret data distributions.
10. Perform statistical inference by creating confidence intervals, performing hypothesis testing, and interpreting p-values and statistical significance.
11. Team Based Mini Project – Data Analysis and Visualization for a real world problem.

60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop skills in basic Python syntax, variables, and control structures to create simple programs.

CO2: Make use of collections and handle text and CSV files for data input and output.

CO3: Demonstrate the steps in the data science process and apply basic data preparation techniques.

CO4: Develop data manipulation abilities, including filtering, sorting, and grouping data.

CO5: Apply statistical methods to analyze data distributions and test hypotheses.

REFERENCES:

1. Vijay Kumar Sharma, Vimal Kumar, Swati Sharma, Shashwat Pathak, "Python Programming – A Practical Approach", CRC Press, First Edition, 2022

2. Davy Cielen, Arno D B Meysman, Mohamed Ali, "Introducing Data Science – Big data, Machine Learning, and more using Python tools", Manning Publications Co, 2016.

3. Laura Igual, Santi Segua, "Introduction to Data Science – A Python Approach to Concepts, Techniques and Applications", Springer Nature, 2017

CS25C05	PROBLEM SOLVING AND PYTHON PROGRAMMING *(Common to B.E. ECE, Mech Programmes)*	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To solve problems using Python conditionals and loops.
- To make use of Python data structures - lists, tuples, and dictionaries to represent complex data.
- To illustrate Python functions and use function calls to solve problems.
- To explain input/output with files in Python.
- To solve the complex problems using OOP concepts in Python.

UNIT I	BASICS OF PYTHON	9

Python - Variables – Executing Python from the Command Line - Editing Python Files - Python Reserved Words - Comments – Simple Input and Output—Indenting. Data types: Numeric, Boolean Data Types. Conditional Statements: if Statements – Loops: while Loop – break and continue – for Loop -String data type –methods.

Lab Component: Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).

UNIT II	COLLECTIONS	9

Lists, Tuples - Sets – frozen sets -Mapping types: Dictionaries - Standard Modules: math- sys- time – dir Function, Packages: Importing from package.

Lab Component: Implementing real-time/technical applications using Lists, Tuples. (Components of a car/ Materials required for construction of a building –operations of list & tuples)

UNIT III	FUNCTIONS	9

Definition – Passing parameters to a Function - recursive functions –Scope – Passing Functions to a Function – Lambda functions- Modules: Creating modules. Introduction to numpy – matplotlib.

Lab Component: Implementing programs using Functions. (Factorial, largest number in a list)

UNIT IV	FILE ORGANIZATION	9

Access Modes : Writing data to a File –Reading data From a file – seek –tell- Error Handling: Run Time Errors – Exception Model - Exception Hierarchy - Handling Multiple Exceptions – raise exceptions.

Lab Component: Implementing real-time/technical applications using File handling. (copy

from one file to another, word count)		
UNIT V	**OBJECT ORIENTED FEATURES**	**9**
Principles of Object Orientation – Creating Classes, objects – Instance Methods –Special Methods – Class Variables – Inheritance – Polymorphism – Type Identification. **Lab Component**: Implementing Python program to create a class representing a bank. Include methods for managing customer accounts and transactions.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Solve simple programs using conditionals, loops and functions for solving problems.

CO2: Construct compound data using Python lists, tuples, dictionaries etc.

CO3: Develop and execute programs using functions.

CO4: Build Python programs to read and write data in files.

CO5: Construct Complex programs using OOP Concepts.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Mark Summerfield. "Programming in Python 3: A Complete introduction to the Python Language", Addison-Wesley Professional, 2009.
3. Reema Thareja ,"Python Programming : Using Problem Solving Approach", Oxford university Press 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", 1st Edition, Pearson Education, 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", 3rd Edition, MIT Press, 2021

SEMESTER-III

MA25C04	DISCRETE MATHEMATICS *(Common to B.E. CSE ,CSE(CS) and B.Tech. AI&DS,IT Programmes)*	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To extend student's logical ability to deal with abstraction.
- To familiarize students with advanced counting techniques.
- To enhance the fundamental concepts and terminology of graph theory.
- To explore the applications of algebraic structures.
- To explain the fundamental concepts and significance of Lattices and Boolean algebra.

UNIT I	LOGIC AND PROOFS	12

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT II	COMBINATORICS	12

Mathematical induction – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III	GRAPHS	12

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

UNIT IV	GROUP THEORY	12

Groups – Permutation Group - Dihedral group - Cyclic Group - Subgroups –Group Homomorphism –Cosets – Normal subgroup - Quotient group - Lagrange's theorem.

UNIT V	LATTICES AND BOOLEAN ALGEBRA	12

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Some special lattices: Bounded, Modular, Distributive, complemented.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Translate statements between natural language and formal logical expressions, including propositional and predicate logic.

CO2: Explain the basic concepts of Combinatorics.

CO3: Make use of the concept of graph theory in computer science and engineering.

CO4: Disseminate the concepts of group theory in computer applications.

CO5: Illustrate Lattice structures using Hasse diagrams and interpret their theoretic properties

TEXT BOOKS:

1. Veerarajan T. "Discrete Mathematics with Graph Theory and Combinatorics",8th reprint Tata McGraw Hill Publication Ltd., New Delhi, 2017.
2. Tremblay J.P. & Manohar.R,"Discrete Mathematics Structures with Application to Computer Science", 1st Edition 30th reprint, Tata McGraw Hill Publication Ltd., New Delhi, 2011

REFERENCE BOOKS:

1. Grimaldi.R.P. "Discrete and Combinatorial Mathematics: An applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2019.
2. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2017
3. Bernard Kolman, Robert C Busby, Sharon Cutler Ross, "Discrete Mathematical Structures", 3rd Edition, Prentice Hall, New Delhi, 2017

CS25C06	DATA STRUCTURES *(Common to B.E. CSE ,CSE(CS) and B.Tech. ,IT Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To derive the concepts of List Abstract Data types
- To develop stack and queue data structures and its applications.
- To Inspect the various tree data structures concepts
- To organize graph data structures in real time Scenario.
- To test searching, sorting and hashing Techniques

UNIT-I	LISTS	9

Basic Terminology-Classifications of data structures-Abstract Data Types (ADTs) – List ADT – Array based implementation – Linked list implementation — Singly linked lists- Doubly-linked lists – Circular linked lists-Applications of list- Polynomial ADT – Radix Sort – Multilists.

UNIT-II	STACKS AND QUEUES	9

Stack ADT–Operations- Applications- Evaluating arithmetic expressions- Conversion of infix to postfix expression-Queue ADT–Operations –Circular queue–Priority queue- Deques.

UNIT-III	TREES	9

Tree ADT–Tree traversals-Binary Tree ADT–Expression trees–Binary search tree ADT–AVL Trees–B-Tree-B+ Tree-Binary Heaps-Applications of heap

UNIT-IV	GRAPHS	9

Definition–Representation of Graph–Breadth-first traversal-Depth-first traversal–Shortest Path Algorithms-Dijkstra's algorithm-Floyd's algorithm- Minimum Spanning Tree-Prim's algorithm-Kruskal's algorithm.

UNIT-V	SEARCHING,SORTING AND HASHING TECHNIQUES	9

Searching-Linear Search-Binary Search; Sorting: Selection Sort-Insertion Sort-Heap Sort-Shell Sort. Hashing-Hash Functions –Different Hash Functions-Collisions-Applications of hashing

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Use the List ADT concepts for various applications.

CO2: Determine the stack and queue concepts for computational problems.

CO3: Categorize the various tree data structures for data organization and retrieval.

CO4: Optimize graph data structure algorithms for solving real world applications.

CO5: Analyze appropriate searching, sorting and hashing techniques to manage data.

TEXT BOOKS

1. Reema Thareja,"Data Structures Using C", 3rd Edition ,Oxford University Press, 2023
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest & Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press, 2022.

REFERENCE BOOKS:

1. Allen B Drowney " Think Data Structures", 1st Edition,O'Reilly,2017
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2013.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C",2nd Edition, University Press, 2008.

CS25C07	JAVA PROGRAMMING *(Common to B.E. CSE and B.Tech. ,IT Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To solve Java program using basic object oriented Programming Concepts
- To perform exception handling and string operations in Java programs.
- To explore multithreading and I/O concepts for developing efficient Java applications.
- To express generics and collection frameworks for effective data handling.
- To construct interactive graphical user interfaces using Event Handling and Swing.

UNIT I	INTRODUCTION TO OOP AND JAVA	10

Basic OOPs concepts –Characteristics of Java- Data types , Variables and Arrays-Classes – constructors, methods – Inheritance- Packages – Abstract classes - Interfaces-Inner Classes

UNIT II	EXCEPTION HANDLING AND STRINGS	8

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements – Object Class - Strings-String Comparison-String Methods-String buffer-String Tokenizer

UNIT III	MULTITHREADING AND INPUT/OUTPUT	9

Multi-threading Vs Multitasking-Java Thread model- Creating single and Multiple threads-Thread Methods- Synchronization- Inter thread Communication - Input / Output Basics – Reading and Writing Console – Reading and Writing Files

UNIT IV	GENERICS AND COLLECTIONS	9

Generic Programming – Generic classes – generic methods – Bounded Types- The Collections framework – The Collections Interfaces - The Collections classes

UNIT V	EVENT DRIVEN PROGRAMMING	9

Event handling Mechanisms-Event classes- Event Interfaces- Using Delegation event Model- Adapter classes-Introduction to Swing –Swing Frames - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists-Menus – layout management- Dialog Boxes

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Produce Java programs using object oriented programming concepts.

CO2: Examine exception handling and string manipulation for real time applications.

CO3: Use of threads and I/O techniques to perform Multitasking.

CO4: Experiment generics and collections for handling data.

CO5: Develop GUI-based Java applications using Event Listeners and Swing components.
TEXT BOOKS: 1. Herbert Schildt, "Java: The Complete Reference", 13th Edition, McGraw Hill Education, 2023 2. Cay S. Horstmann, Gary Cornell, "Core Java Volume – I: Fundamentals", 13th Edition, Pearson Education, 2024.
REFERENCE BOOKS: 1. Paul Deitel, Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson Education, 2015. 2.DT Editorial Services, "Java 8 Programming Black Book",1st Edition, Dreamtech Press, 2015. 3.Joshua Bloch, **"Effective Java"**, 3rd Edition, Addison-Wesley Professional, 2018.

IT25C03	COMPUTER ORGANIZATION AND ARCHITECTURE *(Common to B.Tech. ,IT and B.E. CSE,CSE(CS) Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe the basic organization and operation of computer system.
- To explore the Arithmetic and Logical unit.
- To deduce the building of data path using the concept of pipelining.
- To investigate the parallelism and multi-core processors.
- To inspect the memory system and I/O technologies.

UNIT-I	BASIC ORGANIZATION	9

Eight Great Ideas in Computer Architecture - Functional Units- Performance -Operations and Operands of the Computer Hardware - Representing Instructions in the Computer-Logical Operations-Instructions for Making Decisions-MIPS Addressing and Addressing Modes

UNIT-II	ARITHMETICAL AND LOGICAL UNIT	9

Signed and Unsigned Numbers- Addition and Subtraction- Multiplication: Sequential Multiplication Algorithm and Hardware-Booth Multiplication algorithm- Division Algorithm and Hardware - Signed Division - Floating-point representation - Floating point Addition and Subtraction - Floating point Multiplication

UNIT-III	PROCESSOR AND CONTROL	9

Basic MIPS Implementation - Building a Datapath - Simple Implementation Scheme - Pipelining: Overview - Designing Instruction Sets for Pipelining - Pipeline Hazards: Data Hazards- Forwarding versus Stalling - Control Hazards - Handling Control Hazards– Exceptions

UNIT-IV	PARALLELISM	9

Parallel processing challenges- SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors-Clusters, Warehouse Scale Computers and Other Message Passing Multiprocessors

UNIT-V	MEMORY AND I/O ORGANIZATION	9

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual machines-virtual memory-Input and output Interface- Interrupts -Direct Memory Access

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Illustrate the basics structure of computers, operations and instructions.

CO2: Construct arithmetic and logic unit to perform the arithmetic operations.

CO3: Use the data path to develop control unit.

CO4: Apply multithreading techniques to achieve parallelism.

CO5: Analyse the performance characteristics of various memory and I/O technologies.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann / Elsevier 2014. (UNIT I TO UNIT V)
2. Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Publication, 2018. (UNIT V)
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw-Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", 11th Edition, Pearson Education, 2019.
2. John P. Hayes, "Computer Architecture and Organization", 3rd Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach" , 5th Edition, Morgan Kaufmann and Elsevier Publishers, , 2012.

IT25C04	OPERATING SYSTEMS *(Common to B.Tech. ,IT and B.E. CSE ,CSE(CS) Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the functions of operating systems
- To categorize the scheduling algorithms and deadlock handling methods
- To explore various memory management systems
- To utilize various I/O management and file systems
- To summarize the architecture and benefits of virtual machines

UNIT-I	INTRODUCTION	9

Computer System Organization - Computer System Architecture- Operating System Operations- Operating System Services - User and Operating System Interface - System Calls –Design and Implementation – Operating System Structure – Building and Booting an Operating System.

UNIT-II	PROCESS MANAGEMENT	9

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication. Threads -Multithread Models – Threading issues. CPU Scheduling - Scheduling criteria - Scheduling algorithms. Process Synchronization - The Critical-Section problem -Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization. Deadlock Characterization-Methods for handling deadlocks- Deadlock prevention- Deadlock avoidance - Deadlock detection - Recovery from deadlock.

UNIT-III	MEMORY MANAGEMENT	9

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

UNIT-IV	STORAGE MANAGEMENT AND FILE SYSTEMS	9

Mass Storage Structure –HDD Scheduling – Error Detection and Correction -I/O Systems – I/O Hardware - Application I/O interface - Kernel I/O subsystem. File System Interface - File concept - Access methods - Directory Structure –File System Implementation- Allocation Methods –Free Space Management - File system mounting - File Sharing and Protection.

UNIT-V	VIRTUAL MACHINES	9

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Outline the basics and functions of operating systems.

CO2: Test the CPU scheduling algorithms and deadlock handling methods for various Scenarios.

CO3: Classify memory management schemes for efficient usage of memory.

CO4: Examine the functionality of I/O systems and file system implementation.

CO5: Discuss the basics of virtual machines.

TEXT BOOKS:

1: Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

2: Andrew S Tanenbaum, "Modern Operating Systems", 5th Edition, Pearson education,2022.

3: William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.

REFERENCE BOOKS:

1: Ramaz Elmasri, A. Gil Carrick, David Levine, " Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.

2: Achyut S. Godbole, AtulKahate, "Operating Systems", 3rd Edition, McGraw Hill Education, 2017.

3: D M Dhamdhere, "Operating Systems: A Concept-Based Approach", 2nd Edition, Tata McGraw-Hill Education, 2007.

CS25C08	DATA STRUCTURES LABORATORY *(Common to B.E.CSE,CSE(CS) and B.Tech.IT Programmes)*	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To perform the operations of List Abstract Data types
- To apply stack and queue data structures and its applications.
- To experiment with nonlinear data structures and its traversals.
- To test the searching, sorting and hashing Techniques
- To construct real time application using the concepts of data structures.

LIST OF EXPERIMENTS

1. **Implementation of Singly Linked List**
   - Creating a Singly-linked List
   - Accessing a Node of a Singly-linked List
   - Inserting a Node in a Singly-linked List
   - Removing a Node of a Singly-linked List
   - Complete Deletion of a Singly-linked List
2. **Implementation of Doubly Linked List**
   - Creating a Doubly Linked List
   - Accessing a Node of a Doubly Linked List
   - Inserting a Node of a Doubly Linked List
   - Deleting a Node of a Doubly Linked List
   - Deleting a Doubly Linked List
3. **Application of Linked List**
   - Polynomial Addition
   - Polynomial Subtraction
   - Polynomial Multiplication
4. **Implementation of Stack**
   - **Push**- push an element onto the top of the stack
   - **Pop**- pop an element from the top of the stack
   - **Top**- Retrieve the element at the top of the stack
   - **Delete**-delete the whole stack
5. **Implementation of Queues:**
   - enqueue – place an element at the tail of the queue;

- dequeue – take out an element form the front of the queue;
- delete – delete the whole queue

6. Application of Stack

- Tower of Hanoi
- Infix to Postfix
- Expression Evaluation

7. Implementation of Tree Traversal:

- Creating a Binary Tree
- Traverse the nodes in preorder
- Traverse the nodes in inorder
- Traverse the nodes in postorder

8. Implementation of Binary Search tree:

- Inserting a Node in a BST
- Finding a Node of a Given Key in a BST
- Finding the Minimum and Maximum element in a BST
- Deleting a Node in a BST

9. Implementation of Balanced Tree

- Inserting a node in AVL Tree
- Deleting a node in AVL Tree
- All Rotations

10. Implementation of Graph traversal Algorithms

- Breadth First Traversal
- Depth First Traversal

11. Shortest path Algorithms

- Dijikstra Algorithms
- Floyds Algorithms

12. Searching and Sorting

- Linear and Binary
- Selection and Heap Sort

13. Create a hash table using open addressing with the following operations:

- Create a Hash table
- Insert an element

- find an Element
- Delete an Element

14. Mini Project

TOTAL : 45 PERIODS

LABORATORY REQUIREMENTS:

Hardware :

Standalone desktop PC with minimum 8 GB RAM,17" or higher TFT Monitor ,Keyboard and Mouse

Software:

Turbo C Compiler or GCC Compiler

COURSE OUTCOMES:

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

CO1: Develop List ADT for solving polynomial manipulations.

CO2: Express infix to postfix conversion ,tower of Hanoi and arithmetic expression evaluation using stack and queue ADT

CO3: Explore Tree and Graph ADT for AVL tree, Binary search tree, shortest path ,spanning tree and its traversals.

CO4: Experiment searching, sorting algorithms and hashing techniques for manipulation

CO5: Design a real time application incorporating the concepts involved in Data structures.

CS25C09	JAVA PROGRAMMING LABORATORY *(Common to B.E.CSE and B.Tech.IT Programmes)*	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To experiment concepts of OOPS through hands-on exercises
- To explore runtime errors, file operations, and multithreading effectively
- To apply generics and collections for efficient data manipulation
- To develop interactive GUI applications using event-driven programming
- To design a GUI based java applications incorporating OOPS Concepts.

LIST OF EXPERIMENTS

1. Arrays and Classes

- Write a Java program to find the largest and smallest elements in an array.
- Implement a program to sort an array of strings in ascending order.
- Create a class Student with data members for roll number, name, and marks. Read and display details for multiple students using arrays of objects.

2. Inheritance and Interfaces

- Create a base class Employee and a derived class Manager to calculate total salary including incentives.
- Implement an interface Shape with methods area() and perimeter(). Write classes Circle and Rectangle to implement the interface.
- Demonstrate multilevel inheritance and use of super keyword.

3. Packages and String Handling

- Create a user-defined package college.staff containing a class Staff and access it in another program.
- Write a program to perform string operations: concatenation, comparison, substring extraction, and reversal.
- Use StringBuffer and StringBuilder to demonstrate mutability and method chaining.

4. Exception Handling

- Write a program to demonstrate try, catch, throw, throws, and finally keywords.
- Develop a program that takes two numbers from the user and performs division with appropriate exception handling (e.g., divide by zero).
- Create a user-defined exception InvalidAgeException for voting eligibility.

5. Multi-Threading

- Write a program to create and run multiple threads using Thread class and Runnable interface.
- Display numbers from 1 to 10 using two threads running concurrently.
- Demonstrate thread priorities and sleep method.

6. Thread Synchronization

- Write a program that demonstrates synchronization using a shared resource (e.g., banking transaction).
- Implement producer–consumer problem using synchronized methods.
- Show the difference between synchronized and non-synchronized blocks.

7. File I/O

- Write a program to read from one file and write its content into another file.
- Count the number of lines, words, and characters in a text file.
- Serialize and deserialize an object using ObjectOutputStream and ObjectInputStream.

8. Generic Programming

- Write a generic class Box<T> that stores any data type and display its content.
- Implement a generic method to exchange the positions of two elements in an array.
- Create a generic interface and implement it for different data types.

9. Collections

- Use ArrayList, LinkedList, and HashSet to store and display student names.
- Write a program using HashMap to store employee IDs and names, and perform search operations.
- Demonstrate sorting of collection elements using Comparator and Comparable.

10. Event-Driven Programming (Swing)

- Create a GUI with buttons and text fields to perform basic arithmetic operations.
- Design a login form using Swing components (JLabel, JTextField, JButton, JPasswordField).
- Implement an event listener to handle button clicks and display messages in dialog boxes.

11.Mini Project

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Construct Java programs using classes, inheritance and Interfaces.

CO2: Develop programs involving multithreading, exception Handling and file I/O

CO3: Use of generics and collections for managing complex data structures.

CO4: Perform GUI-based applications using event-driven programming and Swing components.

CO5: Evaluate a java application incorporating OOPS Concepts.

LABORATORY REQUIREMENTS:

- Netbeans/Eclipse 21
- Standalone Desktop

IT25C05	OPERATING SYSTEMS LABORATORY *(Common to B.Tech.IT and B.E.CSE,CSE(CS) Programmes)*	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To perform the installation of windows operating systems.
- To test various CPU scheduling algorithms.
- To explore various memory allocation strategies for efficient memory utilization.
- To investigate various file organization and file allocation strategies.
- To apply disk scheduling algorithms to assess their performance.

LIST OF EXPERIMENTS

1. Perform the installation of windows operating system.
2. Analyze the performance of the various CPU Scheduling Algorithms
3. Test the inter process communication strategy
4. Inspect the concept of Deadlock Avoidance using Banker's Algorithm.
5. Develop and execute paging Technique using C program.
6. Express the role of the following Memory Allocation Methods.
   a. First Fit b. Worst Fit c. Best Fit
7. Use the C programs to implement the various Page Replacement Algorithms.
8. Construct the various File Organization Techniques.
9. Investigate the following File Allocation Strategies using C programs.
   a. Sequential b. Indexed c. Linked
10. Examine the implementation of various disk scheduling algorithms.
11. Install any guest operating system like Linux using VMware

TOTAL :45 PERIODS

LABORATORY REQUIREMENTS

- **Hardware:**
  Standalone desktop PC with minimum 8 GB RAM,17" or higher TFT Monitor ,Keyboard and Mouse
- **Software:**
  Turbo C, Virtual Box or Equivalent Software

COURSE OUTCOMES:

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

CO1: Verify the installation of Operating System and configure a virtual machine.

CO2: Analyze the performance of various CPU scheduling algorithms and Deadlock.

CO3: Use various Memory Allocation Methods for memory allocation problems.

CO4: Experiment with various File Organization and File Allocation Strategies.

CO5: Interpret the performance of various Disk Scheduling Algorithms.

MA25C07	NUMERICAL ANALYSIS AND LINEAR ALGEBRA *(Common to B.E. CSE &B.Tech. IT Programmes)*	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To explain the method for solving algebraic and transcendental equations using numerical techniques.
- To develop the knowledge of Numerical techniques in interpolation and differentiation.
- To determine the solutions of ordinary differential equations by various numerical techniques of Integration
- To evaluate basis and dimension of a vector space and linear transformation of a matrix.
- To construct an orthogonal basis with the concepts of inner products.

UNIT I	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	12

Newton Raphson method –Fixed Point iteration - Iterative methods: Gauss Jacobi - Gauss Seidel –Eigen values of a matrix by power method.

UNIT II	INTERPOLATION AND NUMERICAL DIFFERENTIATION	12

Lagrange's interpolation, Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Numerical differentiation using Newton forward and backward difference formulas.

UNIT III	NUMERICAL INTEGRATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	12

Numerical integration using Trapezoidal and Simpson's 1/3 rules, $3/8^{th}$ rule – Single step methods: Taylor series – Euler – Modified Euler and Runge Kutta method of fourth order for solving first order equations.

UNIT IV	VECTOR SPACES	12

Vector Space – Subspaces - Linearly Independence of Vectors- Basis and Dimension - Linear Transformation: Matrix Representation of a Linear Transformation - Range and Kernel of a linear mapping – Rank and Nullity.

UNIT V	INNER PRODUCT SPACE	12

Inner product space – Norms – Cauchy Schwarz in equality – triangle in equality – Orthogonal Space - Orthonormal Sets – Orthonormal Basis – Gram Schmidt Orthogonalization Process.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Solve the system of equations and Eigen value problems using Numerical iterative procedure.

CO2: Compute the suitability of different interpolation and differentiation methods for specific numerical problems.

CO3: Apply numerical techniques in integration and ordinary differential equation problems.

CO4: Use the fundamental concepts of vector spaces and representation of linear transformation in various fields.

CO5: Explain the basic concepts of Inner product spaces, orthonormal set and orthonormal basis.

TEXT BOOKS:

1. Veerarajan.T and Ramachandran T, "Numerical Methods with Programming in C" ,2nd Edition Tata McGraw Hill Publication Ltd, New Delhi 2007
2. Friedberg.A.H. Insel.A.J. and Spence.L. "Linear Algebra", 4th Edition Prentice Hall of India,New Delhi, , 2004

REFERENCES:.

1: Grewal. B.S., and Grewal. J.S., "Numerical Methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2014.

2: Gerald. C.F., and Wheatley. P.O. "Applied Numerical Analysis", 7th Edition, Pearson Education, Asia, New Delhi, 2007.

3: Chapra. S.C., and Canale. R.P, "Numerical Methods for Engineers", 5th Edition, Tata McGraw Hill, New Delhi, 2007.

CS25C10	DESIGN AND ANALYSIS OF ALGORITHMS *(Common to B.E.CSE,CSE(CS) and B.Tech.IT Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To determine the efficiency of alternative algorithmic solutions for the same problem
- To interpret brute force and divide and conquer design techniques.
- To examine dynamic programming and greedy techniques for solving various problems.
- To compute programming problems using back tracking and branch and bound.
- To explore the concepts behind NP Completeness, Approximation algorithms and randomized algorithms.

UNIT I	INTRODUCTION	9

Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types –Fundamentals of the Analysis of Algorithm Efficiency – The Analysis Framework - Asymptotic Notations and Basic efficiency Classes- Mathematical analysis of Recursive and Non-recursive algorithms

UNIT II	BRUTE FORCE AND DIVIDE AND CONQUER	9

Brute Force: Selection Sort, Bubble sort, Sequential search; Pattern search: The naïve string matching algorithm - Rabin-Karp algorithm - Knuth-Morris-Pratt algorithm; Exhaustive Search: Travelling Salesman Problem-Knapsack Problem- Assignment problem. Divide and Conquer: Binary Search-Merge sort – Quick sort- Finding maximum and minimum.

UNIT III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9

Dynamic programming: Coin-row problem, Computing a Binomial Coefficient –The Knapsack problem and Memory functions- Optimal Binary Search Trees –Warshall's and Floyd's algorithm. Greedy Technique: Prim's Algorithm, Kruskal Algorithm-Dijikstra's Algorithm - Huffman Trees and codes.

UNIT IV	BACK TRACKING AND BRANCH & BOUND TECHNIQUES	9

Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem – Knapsack Problem - Travelling Salesman Problem

UNIT V	NP-COMPLETE AND APPROXIMATION ALGORITHM	9

Tractable and intractable problems: Polynomial time algorithms – Venn diagram representation – NP algorithms - NP-hardness and NP-completeness – Bin Packing problem - Problem reduction: TSP . Approximation Algorithms: TSP - Randomized Algorithms: concept and application - randomized quick sort - Finding k th smallest number

TOTAL :45 PERIODS

COURSE OUTCOMES :

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

CO1: Predict mathematically the efficiency of algorithms in terms of asymptotic notations.

CO2: Investigate Brute force and divide and conquer design techniques for computing feasible solutions.

CO3: Apply dynamic programming and greedy techniques to obtain optimal solutions.

CO4: Use of state space tree for Backtracking and Branch & Bound algorithmic techniques.

CO5: Solve problems using approximation algorithms and randomized algorithms

TEXT BOOKS:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2012.

2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI Learning Private Limited, 2022.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, 2nd Edition, Universities Press, 2019.

2.S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.

3.Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

CS25C11	DATABASE MANAGEMENT SYSTEMS *(Common to B.E.CSE,CSE(CS) and B.Tech.IT Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explore the fundamentals of data models and ER Diagram.
- To use query languages for database design.
- To Examine logical design and improve the database by normalization
- To perform transaction processing and concurrency control techniques
- To demonstrate Storage and Query processing Techniques.

UNIT I	DATABASE FUNDAMENTALS	9

Purpose of Database Systems – View of Data - Database System Architecture – Data Models - Entity Relationship Model- E-R Diagrams - Extended E-R Features. Introduction of Relational Model – E-R Reduction to Relational Schemas - Structure of Relational Databases – Relational Query Languages - Relational Algebra.

UNIT II	RELATIONAL DATABASE MODELS	9

Data Definition Language - Integrity Constraints – Data Manipulation Language - Basic Queries in SQL – Set Operations – Aggregate Operations – Sub Queries - Joins – Views – Authorization. Advanced SQL – Anonymous PL/SQL - Cursor - Triggers – Functions and Procedures– Embedded SQL – Dynamic SQL

UNIT III	LOGICAL DATABASE DESIGN	9

Need for good database design – Functional Dependencies and Keys – Closure of Functional Dependencies Set – Closure of attributes - Dependency Preservation - Functional dependencies. Atomic domains and First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies and Fourth Normal Form-Join Dependencies and Fifth Normal Form.

UNIT IV	TRANSACTIONS AND CONCURRENCY CONTROL	9

Transaction Model– ACID properties – Transaction States - Serializability - Conflict serializability – View Serializability – Testing Serializability - Concurrency Control – Lock Based Protocols – Deadlocks – Time Stamp Based Protocols – Validation Based Protocols. Recovery System – Failure Classification – Recovery and Atomicity – Recovery Algorithm

UNIT V	IMPLEMENTATION TECHNIQUES	9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Query optimization using Heuristics and Cost Estimation.

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Construct the database for enterprise applications using Entity Relationship Diagrams

CO2: Build and manipulate relational database using Structured Query Language

CO3: Apply normalization to reduce cost due to data redundancy

CO4: Examine different types of scheduling and recovery techniques for concurrent transactions

CO5: Construct data structures like indexes and hash tables for the fast retrieval of data and Validate the query evaluation plan

TEXT BOOKS:

1.Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 7th Edition, McGraw Hill, 2020.

2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2017

REFERENCE BOOKS:

1: Elvis C Foster, "Database Systems-A pragmatic Approach"2nd Edition CRC Press,2023.

2: Raghu Ramakrishnan, Database Management Systems‖, 4th Edition, McGraw-Hill College Publications, 2015

3: G.K.Gupta,"Database Management Systems, 1st Edition, Tata McGraw Hill, 2011.

4: C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2006.

CB25C01	DATA COMMUNICATION AND NETWORKS *(Common to B.E. CSE(CS),CSE Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the fundamentals of data communication, reference models, and physical components.
- To describe link-layer functionalities including framing, error control, and MAC protocols.
- To understand IPv4 addressing, subnetting techniques, and routing algorithms.
- To illustrate the process-to-process delivery models and congestion control principles.
- To summarize the services of various protocols in Application layer.

UNIT-I	INTRODUCTION AND PHYSICAL LAYER	9

Introduction-Network Criteria-Physical structure-Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Transmission media -Connecting Devices.

UNIT-II	DATA LINK LAYER	9

Introduction – Data Link Control: Framing-Error Control (Parity-Check Code, Cyclic Redundancy Check)-HDLC- Media Access Control : Random Access(Aloha, CSMA/CD) -Controlled Access-Link-Layer Addressing – Ethernet

UNIT-III	NETWORK LAYER	9

Network Layer Services–Packet Switching-Performance-IPV4 Addressing: Classful Addressing-Classless Addressing-Subnetting-IPV4 Datagram format- ICMP -DHCP- Routing Algorithm: Distance Vector Routing-Link State Routing-Routing Protocols-Routing Information Protocol-Open Shortest Path First-IPV6 Addressing representation

UNIT-IV	TRANSPORT LAYER	9

Transport Layer Services: Addressing-Sliding Window-Transport Layer Protocols: Services and Port Numbers – User Datagram Protocol –Transmission Control Protocol: TCP Segment format-TCP Connection -TCP Congestion Control-SCTP

UNIT-V	APPLICATION LAYER	9

Client/Server Paradigm World Wide Web and Hyper Text Transfer Protocol – File Transfer Protocol – Electronic Mail –Telnet –Secure Shell – Domain Name System – Simple Network Management Protocol.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Understand the fundamentals of data communication, physical media, layered architectures, and network components.

CO2: Apply mechanisms of the data link layer, such as framing, error detection, flow control, and MAC schemes, to maintain reliable link performance.

CO3: Experiment with subnetting to optimize network configuration and various routing algorithms for unicast routing.

CO4: Determine the protocols for Process to Process communication in various application.

CO5: Use application layer protocols for real time Scenario

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data Communications and Networking", 6th Edition, Tata McGraw Hill, 2022.

REFERENCE BOOKS:

1. Nader F. Mir, "Computer and Communication Networks", 2nd Edition, Prentice Hall, 2015.
2. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", 8th Edition, Pearson Education, 2022
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012

CS25401	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe various Software Development Lifecycle Models
- To develop system requirements models using UML and formal specification techniques.
- To apply software designs using design principles and patterns.
- To test the various strategies of software quality assurance.
- To produce project plans using estimation, scheduling, and risk analysis.

UNIT-I	SOFTWARE PROCESS AND AGILE DEVELOPMENT	9

Introduction to Software Engineering, The Nature of Software, Software Process, Software Engineering Practice and principles, Prescriptive and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process-Other Agile Process Models

UNIT-II	REQUIREMENTS ANALYSIS AND SPECIFICATION	9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification –Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Data Flow Diagram.

UNIT-III	SOFTWARE DESIGN	9

Software design –Overview of Design process – Cohesion – Coupling – Design patterns – Expert-Creator-Façade-Observer-Model-view-controller – Publish-Subscribe – Proxy–User interface design.

UNIT-IV	SOFTWARE TESTING	9

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Testing Object Oriented Programs– Debugging – Program analysis – Issues associated with Testing.

UNIT-V	PROJECT MANAGEMENT	9

Project Management Concepts-Project Planning- Metrics for Project Size Estimation- Project Estimation Techniques- Scheduling- PERT Charts- Gantt Charts- Organization and Team Structures- Risk Management- Software Configuration Management.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Compare various Software Development Lifecycle Models.
CO2: Apply principles of Requirements Engineering to model system structure and behavior.
CO3: Explore software designs to build functional applications.
CO4: Analyze the effectiveness of testing techniques for validating software.
CO5: Sketch a software project plan to ensure effective project execution

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", 9th Edition, McGraw Hill International Edition, 2023.
2. Rajib Mall, Fundamentals of Software Engineering, 5th Edition, PHI Learning Pvt. Ltd., 2018.
3. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", 3rd Edition, Pearson Education, 2009.

REFERENCES

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", 2nd Edition, PHI Learning Pvt. Ltd., 2010.
2. Stephen Schach, "Object-Oriented and Classical Software Engineering", 8th Edition, McGraw-Hill, 2010.
3. Craig Larman, "Applying UML and Patterns", 3rd Edition, Pearson Education, 2005.

CS25402	FOUNDATIONS OF DATA SCIENCE	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To perform Python programming for effective problem-solving.
- To use Python data structures for representing complex datasets.
- To explore the foundational principles of Data Science with Python.
- To examine data analysis using Python libraries.
- To determine probability distributions and make statistical inferences.

UNIT – I	INTRODUCTION TO PYTHON PROGRAMMING	9

Python interpreter and interactive mode- Variables and Data Types- Operators-Control Structures – functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

UNIT – II	COLLECTIONS AND FILE HANDLING	9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Files: reading and writing files and exceptions Handling

UNIT – III	OVERVIEW OF DATA SCIENCE	9

Introduction: Need for data science – Benefits and uses – Facets of data, Data science process: Retrieving data – Cleansing, integrating, and transforming data – Data analysis – Build the models – Presenting findings and building applications.

UNIT – IV	DATA PREPROCESSING	9

Data manipulation: Reading and selection – Filtering missing data – Sorting – Grouping – Ranking and Plotting- Fundamental Python Libraries for Data Science- Data Manipulation with Pandas-Sample programs to pre-process and visualize data.

UNIT – V	DESCRIPTIVE STATISTICS &STATISTICAL INFERENCE	9

Data Preparation – Exploratory Data Analysis: Data summarization – Data distribution –Estimation: Mean-Variance – Sampling – Covariance – Correlation. Frequentist Approach – Measuring the Variability in Estimates: Point estimates – Confidence intervals; Hypothesis Testing.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS
1. Basic Data Types & Operators, control Structures, Functions & String Operations 2. Lists, Tuples & Dictionaries Handling, File Handling & Exception Management 3. Basic Data Exploration Techniques 4. Data Cleaning & Transformation 5. Data Manipulation Using Pandas 6. Data Visualization with Matplotlib 7. Descriptive Statistics & Data Interpretation 8. Statistical Inference & Hypothesis Testing
TOTAL:45+30 PERIODS
COURSE OUTCOMES: At the end of the course, learners will be able to CO1: Experiment with strings, functions and control statements to solve real-world problems. CO2: Construct programs by utilizing Python data structures. CO3: Investigate the importance of data science and its processes. CO4: Develop Python programs to conduct data analysis. CO5: Deduce descriptive and statistical techniques to interpret and analyze data.
TEXT BOOKS: 1: Vijay Kumar Sharma, Vimal Kumar, Swati Sharma, Shashwat Pathak, "Python Programming – A Practical Approach", CRC Press, 1st Edition, 2022 2: Davy Cielen, Arno D B Meysman, Mohamed Ali, "Introducing Data Science – Big data, Machine Learning, and more using Python tools", Manning Publications Co, 2016. 3: Laura Igual, Santi Segua, "Introduction to Data Science – A Python Approach to Concepts, Techniques and Applications", Springer Nature, 2017
REFERENCE BOOKS: 1: Urban, Michael., Murach, Joel. "Murach's Python Programming", United States: Mike Murach& Associates, Incorporated, 2nd Edition, 2021. 2: Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016

CS25C12	DATABASE MANAGEMENT SYSTEMS LABORATORY *(Common to B.E.CSE.CSE(CS), B.Tech.IT Programmes)*	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To experiment with data definitions and data manipulation commands
- To illustrate the use of nested and join queries
- To describe functions, procedures and procedural extensions of data bases
- To use front end tool for interactive database applications
- To construct the database applications for real world problems.

LIST OF EXPERIMENTS

1. Data Definition Language Commands
2. Data Manipulation Language Commands
3. Data Control Language Commands, Nested queries
4. Set Operators and Join Queries
5. Views, Sequences, Synonyms
6. Database Programming using PL/SQL
7. PL/SQL – Triggers
8. PL/SQL – Functions
9. PL/SQL – Procedures
10. PL/SQL – Cursors
11. Database Connectivity with Front End Tools
12. Case Study using real life database applications

TOTAL :45 PERIODS

LABORATORY REQUIREMENTS:

Hardware:

Standalone Desktop PC with minimum8GB RAM,17" or higher TTT Monitor ,Keyboard and Mouse

Software:

MySQL Workbench 8.0

COURSE OUTCOMES

At the end of the course, learners will able to

CO1: Apply Data Definition, Manipulation, and Control Language commands to create, modify, and manage database objects effectively.

CO2: Construct complex SQL queries using set operators, joins, nested queries, views, sequences, and synonyms for efficient data retrieval and management.

CO3: Develop PL/SQL programs including procedures, functions, triggers, and cursors to automate and enhance database operations.

CO4: Establish integration of database with front-end tools for interactive database application.

CO5: Analyze and implement a real-life case study demonstrating the application of database concepts, SQL, and PL/SQL programming in solving practical business problems.

CB25C02	NETWORKS LABORATORY *(Common to B.E. CSE(CS) ,CSE Programmes)*	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To demonstrate the use of fundamental networking tools and commands to observe network behaviour.
- To demonstrate the basic and intermediate network topologies and configure devices for understanding data flow.
- To perform switching operations such as MAC learning and ARP using simulation tools.
- To examine error detection and correction techniques for reliable communication.
- To develop subnetted and routed network scenarios using RIP/OSPF and evaluate end-to-end connectivity.

LIST OF EXPERIMENTS

1. Make use of various networking commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Design a topology using PCs and Switch with configuration of IP address and Observe the flow of data from host to host by creating network traffic.
3. Create a Network scenario and examine dynamically learning configured Switch MAC address table and ARP Cache table using simulation tool.
4. Simulation of Error correction and detection techniques.
5. Create a Network Scenario and assign subnet IP Addresses to various Network Devices and Verify the Connectivity using simulation tool.
6. Create a Network scenario with multiple routers and configure using RIP Routing in simulation tool.
7. Create a Network scenario with multiple routers and configure using OSPF Routing in simulation tool.
8. Create a Network scenario and generate the network traffic to examine the TCP/UDP communication using Simulation tool.
9. Design a network scenario in Cisco Packet Tracer using the Sample IP network 192.168.1.0/24. Subnet the network into Four equal subnets and create a topology. Tasks to Perform:
   i.Calculate all four subnets (network address, usable range, broadcast).
   ii.Assign each PC the first usable IP from each subnet.
   iii.Configure subnet mask and default gateway on each PC.
   iv.Verify communication within each subnet and between subnets (observe results)

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Apply essential networking commands and protocol-analysis tools to observe, capture, and interpret network traffic behaviour.

CO2: Construct networks using appropriate network devices, assign IP addressing schemes and functional network topologies.

CO3: Analyze switch operations such as MAC address learning, ARP resolution, and frame forwarding in simulated network scenarios.

CO4: Examine error detection and correction mechanisms and evaluate their effectiveness in maintaining reliable data communication.

CO5: Organize with subnetting and routing (RIP/OSPF) in multi-router environments and assess end-to-end connectivity and protocol behaviour.

COURSES OFFERED TO OTHER DEPARTMENT

CS25C13	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To learn algorithm analysis techniques and data structures for efficient data handling.
- To understand the concepts and applications of stack and queue data structures.
- To study tree structures for various tree traversal and manipulation techniques.
- To introduce disjoint set operations and graph algorithms for real-world problems.
- To gain knowledge on hashing concepts and apply different sorting algorithms for data organization and retrieval.

UNIT I	ALGORITHM ANALYSIS AND LIST DATA STRUCTURE	9

Definition of an Algorithm – Running Time Calculations – Algorithm Complexity: Time and Space – Asymptotic notation, List ADT: array based & linked list based implementation – singly linked lists – circularly linked lists – doubly linked lists – Polynomial Addition using lists

UNIT II	QUEUE AND STACK DATA STRUCTURES	9

Queue ADT: array-based & linked list based implementation – Types of Queue- Applications

Stack ADT: array-based & linked list based implementation – Applications of Stack: Balancing Symbols, Infix to Postfix Conversion, Postfix Expression Evaluation

UNIT III	TREE DATA STRUCTURES	9

Tree ADT – Representation – Traversals – Binary Tree – Expression trees – Binary Search Tree – AVL Trees

UNIT IV	DISJOINT SET AND GRAPH	9

Disjoint Set ADT – Dynamic equivalence problem – Smart union algorithms – Path compression – Applications Graph – Traversals – Topological Sort – Prim's and Kruskal's Algorithms – Dijkstra's Algorithm

UNIT V	HASHING AND SORTING ALGORITHMS	9

Hashing: Hash Table – Hash Function – Load Factor – Collision- Collision Resolution: Separate Chaining, Open Addressing Sorting Algorithms: Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Stack ADT – Array and Linked List implementations
2. Queue ADT – Array and linked list implementations
3. Implementation of Search Tree ADT – Binary Search Tree
4. Implementation of Graphs- Breadth first and Depth first search
5. Implementation of sorting the array elements using Insertion sort
6. Implementation of sorting the array elements using Quick Sort

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Apply algorithm analysis techniques and implement list data structures for efficient data management.

CO2: Interpret stack and queue data structures for computational problems.

CO3: Establish the tree structures and traversal techniques for hierarchical data processing.

CO4: Use of disjoint set operations and graph algorithms to solve real-world network problems.

CO5: Apply hashing and sorting algorithms to manage and retrieve data effectively.

TEXT BOOKS:

1. Mark Allen Weiss, "Data structures and algorithm analysis in C++", 4th edition, Pearson, 2014.
2. Cormen T, Leiserson C., Rivest R., Stein C, "Introduction to Algorithms", 4th Edition, MIT Press, 2022.

REFERENCES:

1. Tremblay, Jean-Paul, and P. G. Sorenson, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw-Hill, 2017.
2. arumanchi, Narasimha, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5th Edition, Careermonk Publications, 2017.
3. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Cengage India Private Limited; 2nd edition, 2007.
4. Thareja, Reema. Data Structures Using C, 2nd Edition, Oxford University Press, 2020.

CS25C14	PROBLEM SOLVING USING PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To describe the problem solving approaches.
- To solve the basic programming constructs in Python.
- To illustrate various computing strategies for Python-based solutions to real world problems.
- To make use of Python data structures – lists, tuples, and dictionaries.
- To explain input/output with files in Python.

LIST OF EXPERIMENTS

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern).
3. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
4. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
5. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
6. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
7. Implementing programs using written modules and Python Standard Libraries (pandas,numpy. Matplotlib, scipy)
8. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter"s age validity, student mark range validation).
10. Implementation of Python Basic Libraries such as Statistics, Math, Numpy and Scipy.
11. Implementation of Python Libraries for ML application such as Pandas and Matplotlib.

TOTAL:60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational Problems. CO2: Illustrate and execute basic Python programs using simple statements.

CO3: Build program for scientific problems using strings, functions and control statements. CO4: Utilize compound data types lists, tuples and dictionaries for real-time applications.

CO5: Experiment the python packages, files and exceptions for developing software applications.

CS25C15	DATA STRUCTURES AND ALGORITHMS USING C++	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To learn algorithm analysis techniques and data structures for efficient data handling.
- To understand the concepts and applications of stack and queue data structures.
- To study tree structures for various tree traversal and manipulation techniques.
- To introduce disjoint set operations and graph algorithms for real-world problems.
- To gain knowledge on hashing concepts and apply different sorting algorithms for data organization and retrieval.

UNIT I	ALGORITHM ANALYSIS AND LIST DATA STRUCTURE	9

Definition of an Algorithm - Running Time Calculations - Algorithm Complexity : Time and Space – Asymptotic notation, List ADT: array based & linked list based implementation - singly linked lists - circularly linked lists - doubly linked lists - Polynomial Addition using lists

UNIT II	QUEUE AND STACK DATA STRUCTURES	9

Queue ADT: array-based & linked list based implementation - Types of Queue- Applications Stack ADT: array-based & linked list based implementation - Applications of Stack: Balancing Symbols, Infix to Postfix Conversion, Postfix Expression Evaluation

UNIT III	TREE DATA STRUCTURES	9

Tree ADT - Representation - Traversals - Binary Tree - Expression trees - Binary Search Tree - AVL Trees

UNIT IV	DISJOINT SET AND GRAPH	9

Disjoint Set ADT - Dynamic equivalence problem - Smart union algorithms - Path compression – Applications Graph - Traversals - Topological Sort - Prim's and Kruskal's Algorithms - Dijkstra's Algorithm

UNIT V	HASHING AND SORTING ALGORITHMS	9

Hashing: Hash Table - Hash Function - Load Factor - Collision- Collision Resolution: Separate Chaining, Open Addressing Sorting Algorithms: Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Stack ADT - Array and Linked List implementations
2. Queue ADT – Array and linked list implementations
3. Implementation of Search Tree ADT - Binary Search Tree
4. Implementation of Graphs- Breadth first and Depth first search
5. Develop a C++ program for sorting the array elements using Insertion sort
6. Develop a C++ program for sorting the array elements using Quick Sort

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Apply algorithm analysis techniques and implement list data structures for efficient data management.

CO2: Interpret stack and queue data structures for computational problems.

CO3: Establish the tree structures and traversal techniques for hierarchical data processing.

CO4: Use of disjoint set operations and graph algorithms to solve real-world network problems.

CO5: Apply hashing and sorting algorithms to manage and retrieve data effectively.

TEXT BOOKS:

1. Cormen T, Leiserson C., Rivest R., Stein C, "Introduction to Algorithms", 4th Edition, MIT Press, 2022.
2. Mark Allen Weiss, "Data structures and algorithm analysis in C++", 4th edition, Pearson, 2014.

REFERENCES:

1. Tremblay, Jean-Paul, and P. G. Sorenson, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw-Hill, 2017.
2. arumanchi, Narasimha, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5th Edition, Careermonk Publications, 2017.
3. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Cengage India Private Limited; 2nd edition, 2007.
4. Thareja, Reema. Data Structures Using C, 2nd dition, Oxford University Press, 2020.