PANIMALAR
ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

CURRICULUM & SYLLABUS

REGULATION 2023

for the students admitted during 2024-25

B.TECH - COMPUTER SCIENCE AND BUSINESS SYSTEMS

www.panimalar.ac.in

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Bangalore Trunk Road, Varadharajapuram,

Poonamallee, Chennai – 600 123.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

B.TECH- COMPUTER SCIENCE AND BUSINESS SYSTEMS

CURRICULUM AND SYLLABUS

REGULATION-2023

(For the Students admitted during 2024-25)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- To acquire technical knowledge and proficiency required for the employment and lifelong learning and recognized as a valued professional and effective communicator in industries related to computer science and computing technologies.
- To engage in lifelong learning and Practice their profession in a cooperative, team- oriented manner that holds the multidisciplinary and multicultural environment of suits the current business world.
- To Function as a responsible member of society and an understanding of the ethics and responsibility of their work in a global context

PROGRAM OUTCOMES (PO)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design ofexperiments, analysis and interpretation of data, and synthesis of the information.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO 1: Ability to apply the analytical and business skills to provide sustainable solutions as an engineer/researcher for the real-world problems using core topics in Computer Science with equal appreciation to IT Management.

PSO 2: Ability to understand the evolutionary changes in computing, apply innovative ideas by adapting to a rapidly changing environment by applying their knowledge in technology abstraction and common business principles to solve the real world problems and meet the challenges of the future.

PSO 3: Ability to practice high ethical, human values and professional standardswith soft-skills qualities in computer science and business disciplines and to emerge as an entrepreneur for the growth and development of the society.

B.Tech.- COMPUTER SCIENCE AND BUSINESS SYSTEMS

CHOICE BASED CREDIT SYSTEM (CBCS)

I - VIII SEMESTERS CURRICULUM AND SYLLABI (REGULATION 2023)

(For the Students admitted during 2024-25)

Semester I							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23MA1103	Introductory Topics in Statistics, Probability and Calculus	BS	3/0/0	3	3	60/40
2.	23ES1104	Fundamentals of Computer Science	ES	3/0/0	3	3	60/40
3.	23HS1102	Business Communication and Value Science I	HS	2/0/2	4	3	60/40
Theory Cum Practical Courses							
4.	23PH1102	Physics for Computing Science	BS	2/0/2	4	3	50/50
5.	23ES1105	Principles of Electrical Engineering	BS	2/0/2	4	3	50/50
6.	23MA1102	Discrete Mathematics for Computer Science	BS	3/0/2	5	4	50/50
Laboratory Courses							
7.	23ES1112	Fundamentals of Computer Science Laboratory	ES	0/0/4	4	2	40/60
Mandatory Course							
8.	23TA1101	தமிழர் மரபு Heritage of Tamils	HS	1/0/0	1	1	60/40
9.	23HS1104	Interpersonal Communication skills I	EEC	0/0/2	2	0	0/100
10.	23HS1105	Quantitative Aptitude Practices I	EEC	0/0/1	1	0	0/100
			TOTAL		**31**	**22**	

Semester II							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23CB1201	Data Structures and Algorithms	PC	3/0/0	3	3	60/40
2.	23CB1202	Fundamental of Economics	PC	3/0/0	3	3	60/40
3.	23HS1202	Business Communication and Value Science II	HS	2/0/2	4	3	60/40
Theory Cum Practical Courses							
4.	23EE1204	Principles of Electronics Engineering	EE	2/0/2	4	3	50/50
5.	23MA1204	Linear Algebra	BS	3/0/2	5	4	50/50
6.	23MA1205	Statistical Methods and Modelling	BS	3/0/2	5	4	50/50
Laboratory Courses							
7.	23CB1211	Data Structures and Algorithms Laboratory	PC	0/0/4	4	2	40/60
8.	23ES1212	Technical Skill Practices I	EEC	0/0/2	2	1	40/60
Mandatory Course							
9.	23TA1201	தமிழரும் தொழில்நுட்பமும் / / Tamils and Technology	HS	1/0/0	1	1	60/40
10.		Mandatory Course I	MC	2/0/0	2	0	0/100
11.	23HS1204	Interpersonal Communication skillsII	EEC	0/0/2	2	0	0/100
12.	23HS1205	Quantitative AptitudePractices II	EEC	0/0/1	1	0	0/100
			TOTAL		**36**	**24**	

SEMESTER - I

23MA1103	INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Analyse the various data by different statistical sampling techniques
- Understand the basic concepts of probability and the distributions with characteristics of one and two dimensional random variables
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment

UNIT - I **STATISTICS** **9**

Definition of Statistics. Basic COURSE OBJECTIVEs, Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample

UNIT - II **DESCRIPTIVES STATISTICS** **9**

Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution

UNIT - III **PROBABILIY AND MOMENTS** **9**

Probability: Concept of experiments, sample space, event. Definition of Combinatorial Probability, Conditional Probability, Bayes Theorem. Expected values: moments, and their properties, Moment generating function

UNIT - IV **PROBABILITY DISTRIBUTIONS** **9**

Discrete Probability distributions: Binomial, Poisson and Geometric distributions. Continuous Probability distributions: Uniform, Exponential, Normal distributions

UNIT - V **CALCULUS** **9**

Basic concepts of Differential and integral calculus, application of double and triple integral

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Demonstrate and apply the basic probability axioms and concepts in their core areas of random phenomena

CO2 Execute the concepts of probability distributions in an appropriate place of science and Engineering

CO3 Exemplify the basics concepts of statistics through various representations of data

CO4 Analyze the various collections of data in science / engineering problems using statistical inference techniques

CO5 Apply differential and integral calculus concepts to calculate the area and volume by appropriate vector integral theorems

TEXT BOOKS:

1. Introduction of Probability Models, S. M. Ross, Academic Press, N.Y, 1997.
2. Fundamentals of Statistics, vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press
3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, Delhi. 44th edition, 2018

REFERENCE BOOKS:

1. A first course in Probability, S. M. Ross, Prentice Hall, 2010.
2. Probability and Statistics for Engineers, (Fourth Edition), I. R. Miller, J.E.Freund and R. Johnson, PHI, 2023.
3. Introduction to the Theory of Statistics, A. M. Mood, F.A. Graybill and D.C.Boes, McGraw Hill Education, 1974.
4. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil,Thomson Learning, 7th edition, 2012.
5. Advanced Engineering Mathematics, (Second Edition) M. D. Greenberg, , Pearson Education.2nd edition,1998.
6. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar,Vidyarthi Prakashan. 2014.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc23_ma86/preview

CO&PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									1
CO2	3	3	3									1
CO3	3	3	3									1
CO4	3	3	3									1
CO5	3	3	3									1
CO6	3	3	3									1

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23ES1104	FUNDAMENTALS OF COMPUTER SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To develop simple algorithms for arithmetic and logical problems.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions, pointers and structures
- To do input/output and file handling in C.
- To learn some basic Unix system interface

UNIT - I GENERAL PROBLEM-SOLVING CONCEPTS AND IMPERATIVE LANGUAGE 9

Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops. Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C). Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations.

UNIT - II TYPES OF OPERATOR, EXPRESSIONS AND CONTROL FLOW 9

Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation proper variable naming and Hungarian Notation. If-Else-If, Switch, Loops — while, do, for, break and continue, goto Labels-structured and unstructured programming.

UNIT - III FUNCTIONS, ARRAYS AND POINTERS 9

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.

Pointers and Arrays: Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi- dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

UNIT- IV STRUCTURES, INPUT AND OUTPUT 9

Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral structures, Table look up, typedef, unions, Bit-fields

Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

UNIT - V INTRODUCTION TO UNIX 9

Unix system Interface: File Descriptor, Low level I/O – read and write, open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Ability to implement the algorithms and flow chart for solving Mathematical and Engineering problems
CO2 Develop C programs for real world/technical application using basic constructs
CO3 Explore the usage of arrays, pointers and functions in C
CO4 Implement Programs with structures and union in C
CO5 Design applications using sequential and random access file processing
CO6 Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures

TEXT BOOKS:

1. Herbert Schildt, C: The Complete Reference, Fourth Edition, , McGraw Hill,2017
2. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, and Paul Weinstein, Beginning Unix, Wiley Publishing, In, 2005
3. Reema Thareja, ¯Programming in C, Oxford University Press, Second Edition, 2016

REFERENCE BOOKS:

1. B. Gottfried, Programming in C, Third Edition, Schaum Outline Series, 2017
2. Kernighan, B.W and Ritchie,D.M, ¯The C Programming language, Second Edition, Pearson Education, 2006
3. W.Richard Stevens, Stephen A.Rago, Advanced Programming inthe UNIX Environment, Addison-Wesley , 2013

CO&PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1						2	2
CO2	3	2	2	1	1						2	2
CO3	1	1	2	2	2						1	1
CO4	1	1	2	2	2						1	1
CO5	2	2	3	2	1						2	1
CO6	1	1	2	1	1						1	1

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23HS1102	BUSINESS COMMUNICATION AND VALUE SCIENCE I	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Understand what life skills are and their importance in leading a happy and well-adjusted life
- Motivate students to look within and create a better version of self
- Understand and apply the key concepts of values of life skills and business communication
- Improve the language proficiency of students in English with an emphasis on Vocabulary and Grammar
- Improve the relevant technical writing skills necessary for Business Communication

UNIT - I HUMAN VALUES 6+6

Values – Self exploration – Values of individuals: Presentation on favourite personality and the skills and values they demonstrate – interviewing a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them

Writing: newspaper report on an IPL match – record conversation between a celebrity and an interviewer

UNIT - II GRAMMAR AND LANGUAGE DEVELOPMENT 6+6

Parts of Speech - Applications of tenses - Sentence formation, sentence structure, show sequence - Voices – Questioning –Vocabulary

Word formation: - Synonyms, antonyms, abbreviations - compound words –single word substitution

UNIT - III ESSENTIALS OF TECHNICAL COMMUNICATION 6+6

Email -: Formal and informal emails - words from General Service List (GSL) by West, Academic word list (AWL) - technical specific terms related to the field of technology - phrases, idioms, significant abbreviations - formal business vocabulary

UNIT - IV BASIC WRITING SKILLS 6+6

Reading articles – Summary writing, story writing - **writing your comprehensive CV** - Create a podcast on a topic.

UNIT - V APPLICATION OF LIFE SKILLS 6+6

Life Skills: Movie based learning – identifying skills and values - critical life skills - appreciation of diversity - **Community service** – work with an NGO and makes a presentation.

TOTAL : 60 PERIODS

COURSE OUTCOME(S):

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

CO1 Recognize the need for life skills and values

CO2 Recognize own strengths and opportunities
CO3 Apply the life skills to different situations
CO4 Understand the basic tenets of communication
CO5 To gain understanding of basic grammatical structures and use them in right context
CO6 Apply the basic communication practices in different types of communication

TEXT BOOKS:

1. Alan Mccarthy and O'dell, “English vocabulary in use”, Cambridge.
2. Ashraf Rizvi. M, “Effective Technical Communication”, SecondEdition, McGraw Hill, New Delhi, 2018.
3. Dhanavel, S.P., “English and Communication Skills for Students of Science and Engineering”, Orient Blackswan, Chennai, 2011
4. Dr. Alex K, Soft Skills, S. Chand Publications, New Delhi, 1997.
5. Dr.Saroj Hiremath, “Business Communication”

WEB REFERENCES:

1. Train your mind to perform under pressure- Simon sinek
2. Brilliant way one CEO rallied his team in the middle of layoffs
3. Will Smith's Top Ten rules for success
4. APAART: Speak Well 1 (English language and communication)
5. APAART: Speak Well 2 (Soft Skills)

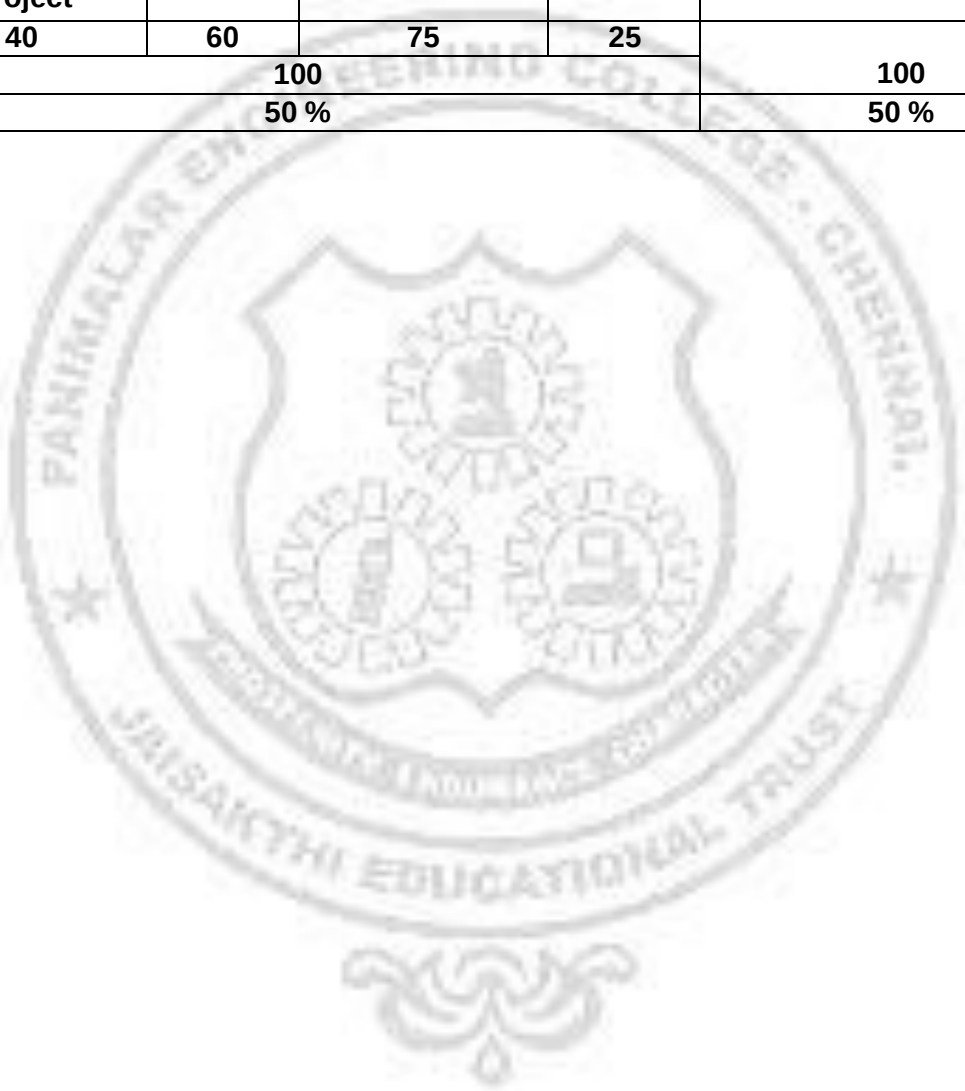
ONLINE COURSES / RESOURCES:

1. https://www.coursera.org/learn/learning-how-to-learn
2. https://www.coursera.org/specializations/effective-business-communication

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								2	3	3		3
CO2								2	3	3		3
CO3								2	2	3		3
CO4									3	3		2
CO5									2	3		3
CO6									3	3		2

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**



23PH1102	PHYSICS FOR COMPUTING SCIENCE	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Understand the characteristics of simple and damped harmonic motion and illustrate the interference, diffraction and polarization of light.
- Exemplify the interference nature of matter and polarization of light through the study of Fresnel's diffraction and Brewster's law.
- Compare the different types of lasers based on pumping method, active medium and energy levels and analyze the laws of thermodynamics and different thermodynamic processes

UNIT I OSCILLATIONS 6

Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring mass system. Resonance-definition. damped harmonic oscillator - heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators — analogy with LCR circuits and mechanical oscillation

UNIT II INTERFERENCE-PRINCIPLE OF SUPERPOSITION -YOUNG'S EXPERIMENT 6

Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel's half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence.

Polarization of light: Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

UNIT III BASIC IDEA OF ELECTROMAGNETISMS AND SEMICONDUCTOR PHYSICS 6

Basic Idea of Electromagnetisms: Continuity equation for current densities, Maxwell"s equation in vacuum and non-conducting medium.

Semiconductor Physics: Conductor, Semiconductor and Insulator; Basic concept of Band theory

UNIT IV LASER AND FIBER OPTICS 6

Einstein"s theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO_2 and Neodymium lasers; Properties of laser beams: monochromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers.

UNIT V THERMODYNAMICS 6

Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics**.**

TOTAL :30 PERIODS

COURSE OUTCOME

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

CO1 Explain the different types of harmonic oscillations and compare electrical oscillator with mechanical oscillator

CO2 Illustrate the interference, diffraction and polarization of light in Newton's rings, diffraction grating and double refraction respectively

CO3 Gain knowledge on the basics of electromagnetic waves and its properties.

CO4 Outline the different types of lasers and compare the different types of optical fibers based on mode and refractive index profile for data communication system

CO5 Acquire the fundamental knowledge of laws of thermodynamics.

TEXT BOOKS:

1. Ajoy Ghatak, Optics, 5th Ed., Tata McGraw Hill, 2012

2. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2014

3. B. K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt Ltd., New Delhi, 2017

4. Halliday and Resnick, Fundamentals of Physics, 11 th edition, John Wiley and Sons, Inc, 2018

5. Basics of laser physics: for students of science and engineering http://www.springer.com/978-3- 319- 50650-0

LIST OF EXPERIMENTS

1. Magnetic field along the axis of current carrying coil – Stewart and Gee
2. Determination of Hall coefficient of semi-conductor
3. Determination of Plank constant
4. Determination of wave length of light by Laser diffraction method
5. Determination of wave length of light by Newton's Ring method
6. Determination of laser and optical fiber parameters
7. Determination of Stefan's Constant.
8. Determination of thermal conductivity of a bad conductor – Lee's Disc method
9. Determination of thickness of thin wire – Air-wedge method

TOTAL :30 PERIODS

CO-PO MAPPING

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

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**

23ES1105	PRINCIPLES OF ELECTRICAL ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To understand the basic concepts of electric circuits
- To understand the basic concepts of magnetic circuits
- To identify the types of sensors and measure quantities in AC and DC systems

UNIT I INTRODUCTION 6

Fundamental linear passive and active elements to their functional current-voltage relation, voltage source and current sources, ideal and practical sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis. Concept of work, power, energy and conversion of energy.

UNIT II BASIC NETWORK 6

Current voltage relations of electric network by mathematical equations to analyse the network (Thevenins theorem, Nortons Theorem, Maximum Power Transfer theorem), Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem**.**

UNIT III CONCEPT OF AC 6

AC waveform definitions, form factor, peak factor, phasor representation in polar and rectangular form, concept of impedance, admittance, complex power, power factor, single phase and 3 phase concept**.**

UNIT IV ELECTROSTATICS AND ELECTRO-MECHANICS 6

Electrostatic field, electric field strength, concept of permittivity in dielectrics, energy stored in capacitors, charging and discharging of capacitors, Electro Magnetism magnetic field and Faraday's law. Magnetic materials and B-H curve. self and mutual inductance, Ampere's law, Study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, Electromechanical energy conversion**.**

UNIT V MEASUREMENTS AND SENSORS 6

Measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems (Current & Single-phase power). Basic concept of indicating and integrating instruments.

Practical considerations: Electrical Wiring types and accessories, Illumination system: Basic layout of the distribution system, Types of earthing, Safety devices & system. Battery principles and types**.**

TOTAL :30 PERIODS

COURSE OUTCOME

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

CO1 Understand the basic concepts and terminology of electrical quantities
CO2 Analyze the DC circuit using various network theorems
CO3 Analyze the electrical parameters of AC circuits with R-L-C elements
CO4 Analyze the Static and dynamic characteristics of Electro-static and Electromagnetic fields
CO5 Apply the concept of sensors in measurement of various electrical quantities

TEXT BOOKS:

1. Electric Machinery, (Sixth Edition) A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, Tata McGraw Hill, 2003
2. A Textbook of Electrical Technology, (vol. I), B. L. Theraja, Chand and Company Ltd., New Delhi 2014.
3. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (Second Edition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd 2016

REFERENCE BOOKS:

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press 2012.
3. Engineering Circuit Analysis, William H. Hayt & Jack E. Kemmerly, McGraw-Hill Book Company Inc Eight Edition 2020.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd, Second Edition, 2007.

LIST OF EXPERIMENTS

1. Familiarization of electrical circuits, sources, measuring devices and transducers.
2. Determination of resistance temperature coefficient
3. Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power Transfer theorem)
4. Simulation of R-L-C series circuits for XL>XC , XL< XC
5. Simulation of Time response of RC circuit
6. Demonstration of measurement of electrical quantities in DC and AC systems

TOTAL :30 PERIODS

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2			1					1
CO2	3	3	2	2	2		1					1
CO3	3	3	2	2	2		1					1
CO4	3	3	2	2			1					1
CO5	3	2	2	2	2		1					1
CO6	3	3	2	2			1					1

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**

23MA1102	DISCRETE MATHEMATICS FOR COMPUTER SCIENCE	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- Understand the basic concepts of propositions by various discrete structure techniques
- Analyze the combinatorics techniques in solving the system by various methodology
- Apply the concepts of graph theory and logic in solving the real time engineering problem

UNIT I BOOLEAN ALGEBRA 9

Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map

UNIT II ABSTRACT ALGEBRA 9

Set, relation, group, ring, field

UNIT III COMBINATORICS 9

Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle

UNIT IV GRAPH THEORY 9

Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler‟s formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem

UNIT V LOGIC 9

Propositional calculus - propositions and connectives, syntax; Semantics - truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness

TOTAL :45 PERIODS

COURSE OUTCOME

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

CO1 Understand the concepts and significance of lattices and boolean algebra
CO2 Familiarize the applications of algebraic structures
CO3 Interpret the concepts of Permutations, Combinations and Mathematical induction
CO4 Understand the basic concepts of combinatorics and graph theory
CO5 Acquire the knowledge in check the validity of the argument and Normal forms

TEXT BOOKS:

1. Topics in Algebra, I. N. Herstein, John Wiley and Sons second edition, 1975.
2. Digital Logic & Computer Design, M. Morris Mano, Pearson 2016.
3. Elements of Discrete Mathematics, (Second Edition) C. L. Liu McGraw Hill, New Delhi, 2012.
4. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan Press, London 1976.
5. Mathematical Logic for Computer Science, L. Zhongwan, World Scientific, Singapore, 1989.

REFERENCE BOOKS:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An AppliedIntroduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum"s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006

LIST OF EXPERIMENTS

1. Write a program in C to Display the Boolean Truth Table for AND, OR , NOT
2. Write a C Program to find Cartesian Product of two sets
3. Practice of various set operations
4. Recursion and Induction
5. Implementation of a recursive counting technique
6. Write a program in C for minimum cost spanning tree
7. Write a program in C for finding shortest path in a GraphNote

TOTAL :30 PERIODS

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									1
CO2	3	3	3									1
CO3	3	3	3									1
CO4	3	3	3									1
CO5	3	3	3									1

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**

23ES1112	FUNDAMENTALS OF COMPUTER SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE

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

To build solutions for real world problems

LISTOFEXPERIMENTS

1. Algorithm and flowcharts of small problems like GCD

2. Structured code writing with:
   i. Small but tricky codes
   ii. Proper parameter passing
   iii. Command line Arguments
   iv. Variable parameter
   v. Pointer to functions
   vi. User defined header
   vii. Make file utility
   iii. Multi file program and user defined libraries
   ix. Interesting substring matching / searching programs

   Parsing related assignments

3. Mini Project

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1 Develop the use of the C programming language to implement various algorithms
CO2 Acquire decision making and looping concepts in C
CO3 Develop C programs using Array and Pointers
CO4 Ability to define structures, functions in solving real world problem
CO5 Design applications using sequential and random access file processing
CO6 Able to interpret real world problems into software solutions in C

WEB REFERENCES

1. https://www.programiz.com/C-programming/examples
2. https://www.geeksforgeeks.org/C-programming-examples/
3. https://beginnersbook.com/2018/02/C-programs/
4. https://www.javatpoint.com/C-programs
5. https://www.w3schools.com/C/C-examples.asp
6. https://www.includehelp.com/c-programs/c-programs-pointers-solvedexamples.asp

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1						2	2
CO2	3	2	2	1	1						2	2
CO3	1	1	2	2	2						1	1
CO4	1	1	2	2	2						1	1
CO5	2	2	3	2	1						2	1
CO6	1	1	2	1	1						1	1

Internal Assessment		**End Semester Examination**
Evaluation of Laboratory Observation, Record	**Test**	**Practical**
75	**25**	**100**
60 %		**40%**

23TA1101	HERITAGE OF TAMIL	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 N ayanmars - 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, Leather puppetry, 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. கணினித் தமிழ் - முளனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)

5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published 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: InternationalInstitute of Tamil Studies

7. Historical 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 of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)

10. Studies in the History of India with Special Reference to TamilNadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational ServicesCorporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Publishedby: RMRL) – Reference Book

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23TA1101	தமிழர் மரபு	L	T	P	C
		1	0	0	1

UNIT – I **மொழி மற்றும் இலக்கியம்** **3**

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

UNIT – II **மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை** **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

UNIT – III **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்** **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

UNIT –IV **தமிழர்களின் திணைக் கோட்பாடுகள்** **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT –V **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு** **3**

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

Total : 15 PERIODS

TEXT-CUM REFERENCE BOOKS:

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

3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)
5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published 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: InternationalInstitute of Tamil Studies
7. Historical 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 of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23HS1104	INTERPERSONAL COMMUNICATION SKILLS I	L	T	P	C
		0	0	2	0

COURSE OBJECTIVES

- To induce the basic reading and writing skills among the first year engineering and technology students.
- To assist the learners to develop their listening skills, which will enable them listening to lectures and comprehend them by asking questions and seeking clarifications
- To succor the learners to develop their speaking skills and speak fluently in real contexts.
- To motivate the learners to develop vocabulary of a general kind by developing their reading skills for meeting the competitive exams like GATE, TOFEL, GRE, IELTS, and other exams conducted by Central and State governments
- To improve your English communication skills in a professional setting

CONTENTS

Listening: Listening to Specific Information – About various Professions, Professionals, Work Cultures, Demands of industry and expectation

Speaking: Sharing information with friends/colleagues/teachers/employers

Reading: Reading Comprehension – About the famous and leading personalities in the industry and various fields as motivation

Writing: Writing about personalities in one's own words

TOTAL : 30 PERIODS

TEXT BOOKS

1. Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler, 2014
2. Simply Said: Communicating Better at Work and Beyond by Jay Sullivan, 2016

REFERENCE BOOKS

1. Words That Work: It's Not What You Say, It's What People Hear by Dr. Frank Luntz,2011.
2. The Fine Art of Small Talk: How To Start a Conversation, Keep It Going, Build Networking Skills — and Leave a Positive Impression! By Debra Fine

WEB REFERENCES

1. https://teambuilding.com/blog/communication-books
2. https://unacademy.com/content/upsc/study-material/science-and-technology/famous-personalities-in-science/

ONLINE COURSES / RESOURCES

1. https://www.krisamerikos.com/blog/phone-coversation-in-english
2. https://blog.hubspot.com/service/phone-etiquette

COURSE OUTCOME

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

CO1 Comprehend conversation and short talks delivered in English.

CO2 Participate effectively in informal conversation; introduce themselves and their friends and express opinions English.

CO3 Read articles of a general kind in magazines and newspaper

CO4 Write short essays of a general kind and personal letters and emails in English.

CO5 Gain understanding of basic grammatical structures and use them in right context.

CO6 Use appropriate words in a professional context.

CO&PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									**3**	**3**		**2**
CO2									**3**	**3**		**2**
CO3									**2**	**3**		**2**
CO4									**2**	**3**		**2**
CO5									**2**	**3**		**2**
CO6									**3**	**3**		**2**

23HS1105	QUANTITATIVE APTITUDE PRACTICES I	L	T	P	C
		0	0	1	0

COURSE OBJECTIVE:

- To strengthen students understanding of number systems, algebra and assist them in developing their problem-solving skills.
- To get the abilities needed to address challenges with quantitative aptitude.

Module 1 Number system **3**

Numbers - HCF and LCM- simplification - square root - cube root.

Module 2 Algebra **3**

Algebra - decimal fraction - arithmetic progression - geometric progression.

Module 3 Blood relations **3**

Blood relations - pattern sequence - alphabet test question – clocks-calenders.

Module 4 Data Interpretation **3**

Table chart- pie chart - bar chart - line charts

TOTAL : 12 PERIODS

COURSE OUTCOME:

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

CO1 Demonstrate solid understanding to address number system and algebraic problems.

CO2 Handle problems with the blood relations and data interpretation.

TEXT BOOKS:

1. Aggarwal R.S.(2017).Quantitative Aptitude for Competitive Examinations 3rd edition NewDelhi: S.Chand Publishing.
2. Abhijit guha(2016). Quantitative Aptitude for All Competitive Examinations, 6th edition. Noida : McGraw Hill Education Pvt.Ltd.
3. FACE.(2016). Aptipedia Aptitude Encyclopedia1(Ed.).New Delhi: Wiley Publications.

REFERENCE BOOK:

1. Sharma arun.(2016).Quantitative aptitude,7th(Ed.).Noida : McGrawHill Education Pvt.Ltd.
2. Praveen. R.V 3rd edition, Quantitative aptitude and reasoning, PHI learning publication.

WEB REFERENCES:

https:// www.indiabix.com

Mode of Evaluation: Online Test

SEMESTER – II

23CB1201	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the basics of abstract data types
- Impart knowledge about the principles of linear and nonlinear data structures
- Build an application using sorting and searching

UNIT - I BASIC TERMINOLOGIES AND INTRODUCTION TO ALGORITHM &DATA ORGANISATION **9**

Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

UNIT - II **LINEAR DATA STRUCTURE** **9**

Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applicationsof Linear Data Structures

UNIT - III **NON-LINEAR DATA STRUCTURE** **9**

Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations & Applications of Non- Linear Data Structures

UNIT - IV **SEARCHING AND SORTING ON VARIOUS DATA STRUCTURES** **9**

Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap sort, Introduction to Hashing

UNIT - V **FILE AND GRAPH** **9**

Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes.

Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Explore the basics of data structures and algorithm analysis

CO2 Demonstrate the concept of linear data structures

CO3 Demonstrate the concept of non- linear data structures

CO4 Design algorithms for various searching and sorting techniques

CO5 Exemplify the concept of files and its operations

CO6 Explain the concept of graph and its operations

TEXT BOOKS:

1. Fundamentals of Data Structures in C, E. Horowitz, S. Sahni,S. A-Freed, Universities Press,2012.
2. Data Structures and Algorithms, A. V.Aho, J. E.Hopperoft, J. D.Ullman, Pearson, 1985
3. Data Structure and Algorithm through C, Brijesh Bakariya, BPB Publication, 2018

REFERENCE BOOKS:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth,1997.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest,Clifford Stein, The MIT Press, Fourth Edition 2022.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), (Thirty FirstEdition), Pat Morin, UBC Press, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2						2	1
CO2	2	3	1	2	2						1	1
CO3	1	2	1	2	2						1	1
CO4	1	3	1	2	2						1	1
CO5	3	1		3	2						1	1
CO6	2	2	1	1	1						1	1

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23CB1202	FUNDAMENTALS OF ECONOMICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To explain the fundamental principles of micro economics relevant to managing an organization.
- To understand the efficiency and equity implications of market interference, includinggovernment policy.
- To describe the fundamental principles of macroeconomics to have the understanding ofeconomic environment of business.
- To understand the various aspects of India‟s economy.

UNIT - I INTRODUCTION 9

Principles of Demand and Supply- Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve).

UNIT - II CONSUMER ANALYSIS 9

Welfare Analysis- Consumers‟ and Producers‟ Surplus - Price Ceilings and Price Floors; Consumer Behavior - Axioms of Choice - Budget Constraints and Indifference Curves; Consumer‟s Equilibrium- Effects of a Price Change, Income and Substitution Effects - Derivation of a Demand Curve.

UNIT - III PRODUCTION AND COSTING 9

Applications- Tax and Subsidies - Intertemporal Consumption - Suppliers‟ Income Effect; Theory of Production - Production Function and Iso-quants - Cost Minimization; Cost Curves- Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition.

UNIT - IV MACROECONOMIC REFORMS 9

National Income and its Components- GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector- Taxes and Subsidies; External Sector- Exports and Imports; Money- Definitions; Demand for Money-Transactionary and Speculative Demand; Supply of Money- Bank‟s Credit Creation Multiplier; Integrating Money and Commodity Markets- IS, LM Model.

UNIT - V **POLICY GOVERNANCE** **9**

Business Cycles and Stabilization- Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm- Price and Wage Rigidities - Voluntary and Involuntary Unemployment.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand the links between household behavior and the economic models of demand.
CO2 Understand government policies and programs.
CO3 Understand about approaches to consumer behaviour and relation between productionand cost function.
CO4 Describe and discuss on interaction of product and factor market.
CO5 Get awareness about importance and development of Indian economy and economic reforms.
CO6 Have thorough knowledge in the areas of inflation, unemployment, monetary policy,fiscal policy and international trade.

TEXT BOOKS:

1. Pindyck, Robert S., and Daniel L. Rubinfeld, "Microeconomics", 7th edition Pearson *2009*
2. Dornbusch, Fischer and Startz," Macroeconomics", 12th edition McGraw Hill,2018
3. Paul Anthony Samuelson, William D. Nordhaus, "Economics",19th edition, McGraw Hill,2009

REFERENCE BOOKS:

1. Hal R, Varian, "Intermediate Microeconomics: A Modern Approach", 8th edition,2009
2. N. Gregory Mankiw, "Principles of Macroeconomics", 6th edition, Cengage India, 2008

CO-PO MAPPING

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

CO6								2	3		1	1

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23HS1202	BUSINESS COMMUNICATION AND VALUE SCIENCE II	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Develop effective writing, reading, presentation and group discussion skills.
- Help students identify personality traits and evolve as a better team player.
- Introduce them to key concepts of a) Morality b) Behavior and beliefs c) Diversity & Inclusion.
- Facilitate students to broaden the writing skills in business communication.
- Impart essentials life skills for professional and personal development.

UNIT - I **MECHANICS OF WRITING** **6+3**

Listening: social issues, causes and findings

Speaking: Icebreaker - Participating in „Join Hands Movement‟ - Individual identification of socialissues – addressing social issues.

Reading: Research Reports based on social issues

Writing: Good and bad writing - Common errors, punctuation rules, use of words - writingtechniques of Catherine Morris and Joanie McMahon‟s .

Group Activity: contribute articles to the magazine – Quiz Time

UNIT - II **LAUNCHING E MAGAZINE** **6+3**

Listening: Listen to interactive e-magazines and presentations

Speaking: Introduction to basic presentation skills & ORAI app - Groups to present their ideasabout e-magazine and share their findings

Reading: Introduction to skimming and scanning, speed reading techniques.

Writing: create vision, mission, value statement, and tagline and design a logo- individual write up for E- magazine and evaluation - preparation and publication of E-Magazine.

Group Activity: Plan & Design an e- magazine as a group - SATORI- Join the dots - Quiz Time

UNIT - III **TEAM PLAY** **6+3**

Listening: Ad campaign - Brain storming session

Speaking: discussing and exploring the means of articulating and amplifying social issues

Reading: Articles on Team Building – secrets of team work

Writing: Berbin‟s 8 Team roles and Lindgren‟s big 5 personality traits

Group Activity: Designing skits: write the script - Promote the play through social media andgather audience - Enact the play- SATORI joining dots - Quiz Time

UNIT - IV **DIVERSITY AND INCLUSION** **6+3**

Listening: Video recorded interviews of people from diverse groups - Touch the target, film: "The Fish and I" by Babak Habibifar - Learn from movies - film on diversity — discussion on key take away of the film - Theory to connect and concept of empathy.

Speaking: narration of story in first person - Feedbacks by other groups- Debate on diversity with an angle of ethics, morality and respect for individual. Prepared speech

Reading: Comprehension passages on diversity and human values

Writing: Write a review in a blog about their research on a book, incident or film - Diversity & Inclusion - Different forms of Diversity in our society.

Group Activity: Create story – a person's life affected by the social issue –Discussion on TCS values, Respect for Individual and Integrity. SATORI and Quiz Time.

UNIT - V **ORGANIZING AWARENESS CAMPAIGN** **6+3**

Listening: Listening to various activities by NGOs

Speaking: Creating awareness on social welfare programs

Reading: Articles and reports about activities of different NGOs

Writing: Draft your resume - Include your recent achievements in your resume.

Group Activity:

Project-

1) Each team to look for an NGO/ social group in the city which is working on the issue theircollege group is supporting.
2) Spend a day with the NGO/ social group to understand exactly how they work and thechallenges they face.
3) Render voluntary service to the group for one day
4) Invite the NGO/ social group to address their university students for couple of hours. Plan the entire event, decide a suitable venue in the university, gather audience, invite faculty members etc. (they need to get their plan ratified their professor). COURSE OUTCOME-- Host an interactive session with the NGO spokesperson

The groups to present their experience of a day with the NGO and inspire students to work for the cause.

TOTAL : 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand and use tools of structured written communication.

CO2 Develop materials to create an identity for an organization dedicated to a social cause.

CO3 Identify individual personality types and role in a team.

CO4 Understand the basic concepts of Morality and Diversity.

CO5 Gain confidence to communicate effectively in various situations to acquire employabilityskills.

CO6 Organize an event to generate awareness and get support for a cause.

TEXT BOOKS:

1. Dr. A.P.J Abdul Kalam, ArunTiwari, "Guiding Souls : Dialogues on the purpose oflife",2005. 2 3 4 5 6 7
2. Dr. A.P.J Abdul Kalam, AcharyaMahapragya , "The Family and the Nation", 2015.
3. Dr. A.P.J Abdul Kalam, Y.S.Rajan, " The Scientific India: A twenty First Century Guide to the World around Us",2011.

REFERENCE BOOKS:

1. Dr. A.P.J Abdul Kalam , "Forge Your Future: Candid, Forthright, Inspiring" ,2014
2. Peter H. Diamandis and Steven Kotler, "Abundance: The Future is Better Than YouThink", 2012.
3. Simon Sinek , "Start With Why: How Great Leaders Inspire Everyone to Take Action",Penguin,2011.
4. Sandra Moriarty, Nancy D. Mitchell, William D. Wells," Advertising & IMC: Principles andPractice", Pearson Education India,2016

WEB REFERENCES:

1. Ethics Fundamentals and approaches to ethics, https://www.eolss.net/Sample-chapters/C14/E1- 37-01-00.pdf
2. A Framework for Making Ethical decisions https://www.brown.edu/academics/science-and-technologystudies/framework- makingethical-decisions.
3. Five Basic Approaches to Ethical Decision http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf

ONLINE COURSES / RESOURCES:

1. https://youtu.be/CsaTslhSDI

2. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									**3**	**3**		**3**
CO2								**2**	**2**	**2**		**2**
CO3									**3**	**3**		**3**
CO4								**2**	**2**	**2**		**2**
CO5									**3**	**3**		**3**
CO6								**2**	**2**	**3**		**2**

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23EE1204	PRINCIPLES OF ELECTRONICS ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- Understand about current, voltage and power, basic laws in circuits.
- Understand about semiconductor materials and its application
- Understand working principal of BJT and FET
- Understand about Integrated circuit and its application
- Understand about the fundamentals of Electronics and its applications

UNIT I INTRODUCTORY IDEA OF SEMICONDUCTORS 6

Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P- N junction, formation of depletion zone. Formation of PNP / NPN junctions, energy band diagram. Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

UNIT II DIODES AND DIODE CIRCUITS 6

V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, ideaof regulation

UNIT III TRANSISTORS AND TRANSISTOR CIRCUITS 6

Transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode. Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor

UNIT IV OPERATIONAL AMPLIFIER BASICS 6

Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Proportional, Integral, Derivative circuits

UNIT V BASIC IDEAS OF DIGITAL ELECTRONICS 6

Basic idea of switching circuit, Realization of Logic gates, multiplexers and demultiplexers, Flip flop, Registers and Counters

TOTAL :30 PERIODS

COURSE OUTCOME

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

CO1 Apply Voltage-Current laws and transformation techniques to solve linear electric circuits.

CO2 Apply the diodes in rectifier and regulator applications and also analyze its characteristics.

CO3 Explain the working of Bipolar Junction and Field Effect Transistors with different configurations and also analyze their characteristics.

CO4 Illustrate the working of analog IC with different configurations and its applications

CO5 Simplification of Boolean expressions using K-map and implementation of combinational & sequential circuits

TEXT BOOKS:

1. William Hayt,JVJack,EKemmerly and Steven M Durbin, Engineering Circuits Analysis,Tata Graw-Hill, 2013
2. L Robert Boylestead, Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Education,2012.
3. J Millman, C. Halkias&SatyabrataJIT "Electronic Devices and Circuits", Tata McGraw-Hill,2010
4. Microelectronics Circuits, Adel S. Sedra and Kenneth Carless Smith, Oxford University Press, 2019.

REFERENCE BOOKS:

1. RamakantA.Gayakwad, OP-AMP and Linear IC"s , Prentice Hall of India, 2002.
2. Thomas L.Floyd, Digital Fundamentals, Prentice Hall, 11th Edition, 2015.
3. Millman‟s Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh,McGraw Hill Education, 2001.
4. Digital Logic & Computer Design, M. Morris Mano, Pearson, second edition, 2012.

LIST OF EXPERIMENTS

1. To plot V-I characteristics of PN junction diode.
2. To plot regulation characteristics of half wave rectifier
3. To plot regulation characteristics of Full wave rectifier
4. To plot input-output characteristics of CE configuration of BJT.
5. To study Biasing techniques of BJT- to find stability factor of self-bias, collector to basebias, fixed bias circuits.
6. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find itsbandwidth.
7. To study Colpitts Oscillator.
8. Study of OP-AMP circuits: Inverting and Non-inverting Amplifier
9. Study of basic logic gates and De-Morgan's Theorem.
10. Study of half adder and full adder

CO-PO MAPPING

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

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**

23MA1204	LINEAR ALGEBRA	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To gain knowledge in using matrix algebra techniques to solve system of linear equations.
- To understand the concept of vector spaces to use in the principal component analysis.

UNIT I MATRICES AND DETERMINANTS 9

Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of aMatrix.

UNIT II APPLICATION OF MATRICES 9

Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition;Solving Systems of Linear Equations using the tools of Matrices**.**

UNIT III VECTOR SPACE 9

Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QRdecomposition.

UNIT IV EIGEN VALUES AND EIGEN VECTORS 9

Positive definite matrices; Linear transformations; Hermitian and Unitary matrices.

UNIT V PRINCIPAL COMPONENT ANALYSIS 9

Singular value decomposition and Principal component analysis (Non-credit and optional); Introduction to their applications in Image Processing and Machine Learning (one or two classes).

TOTAL :45 PERIODS

COURSE OUTCOME

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

CO1 Use matrix algebra techniques to solve system of linear equations.
CO2 Solve system of equations using the concept of matrix decomposition.
CO3 Use the concept of vector spaces in generating ortho-normal bases.
CO4 Solve problems of linear transformation using eigen values and eigen vectors.
CO5 Use principal component analysis for applications in image processing and machine learning.

TEXT BOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Cengage Learning, 7thedition, 2012
2. Advanced Engineering mathematics, (Second Edition), Michael. D. Greenberg, Pearson, 2ndedition, 1998.
3. Introduction to linear algebra, (Fifth Edition), Gilbert Strang, Wellesley- Cambridge Press, 6thedition 2023.
4. Applied Mathematics (Vol. I & II), P. N. Wartikar& J. N. Wartikar,
5. Digital Image Processing, R C Gonzalez and R E Woods, Pearson, 2010.

ONLINE COURSES / RESOURCES:

1. https://machinelearningmastery.com/introduction-matrices-machine-learning/

LIST OF EXPERIMENTS

1. Write a program which demonstrate the following
   I. Addition of two complex numbers.
   II. Displaying the conjugate of a complex number.
   III. Plotting a set of complex numbers.
   IV. Creating a new plot by rotating the given number by a degree 90, 180, 270 degrees and also by scaling b a number a=1/2, a=1/3, a=2 etc.
2. Write a program to do the following
   I. Enter a vector u as a n-list.
   II. Enter another vector v as a n-list.
   III. Find the vector au +bv for different values of a and b.
   IV. Find the dot product of u and v
3. Write a program to do the following
   I. Enter an r by c matrix M (r and c being positive integers).
   II. Display M in matrix format.
   III. Display the row and columns of the matrix M.
   IV. Find the scalar multiplication of M for a given scalar.
   . Find the transpose of the matrix M
4. Write a program to do the following
   I. Find the vector-matrix multiplication of a r by c matrix M with an c- vector u.
   II. Find the matrix- matrix product of M with a c by p matrix N.
5. Write a program to do the following
   I. Enter a vector b and find the projection of b orthogonal to a given vector u.
   II. Find the projection of b orthogonal to a set of given vectors.

TOTAL :30 PERIODS

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**									**1**
CO2	**3**	**3**	**3**									**1**
CO3	**3**	**3**	**3**									**1**
CO4	**3**	**3**	**3**									**1**
CO5	**3**	**3**	**3**									**1**

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**

23MA1205	STATISTICAL METHODS AND MODELLING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To gain knowledge of sampling techniques and use testing of hypothesis for parameterestimation.
- To understand the use of statistical models for forecasting.
- To gain the knowledge of using R programming in simulation and modelling.

UNIT I SAMPLING AND ESTIMATION THEORY 9

Random sampling. Sampling from finite and infinite populations. Estimates and standard error(sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling - Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation. Concept & examples, complete sufficiency, their application in estimation

UNIT II LINEAR STATISTICAL MODELS 9

Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. Multiple regression& multiple correlation, Analysis of variance (one way, two way with as well as without interaction).

UNIT III TEST OF HYPOTHESIS 9

Concept & formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing. Non-parametric Inference: Comparison with parametric inference, Use of order statistics.

UNIT IV NON-PARAMETRIC INFERENCE 9

Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman‟s and Kendall‟s test. Tolerance region.

UNIT V BASICS OF TIME SERIES ANALYSIS & FORECASTING 9

Stationary, ARIMA Models: Identification, Estimation and Forecasting.

TOTAL :45 PERIODS

COURSE OUTCOME

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

CO1 Apply the concept of sampling distribution and estimation theory in forecasting.
CO2 Apply the concept of correlation, regression using R programming and design experiments.
CO3 Use the concepts of Testing of Hypothesis for industrial problems.
CO4 Use the concepts of Non Parametric Testing for Non-Normal Populations.
CO5 Apply the concept of time series analysis in real life situation.

TEXT BOOKS:

1. Probability and Statistics for Engineers (9th Edition), I.R. Miller, J.E.Freund and R. Johnson,2023.
2. Fundamentals of Statistics (Vol. I & Vol. II), A. Goon, M. Gupta and B.Dasgupta, 8th edition2002.
3. The Analysis of Time Series: An Introduction, Chris Chatfield, 7th edition 2019

REFERENCE BOOKS:

1. Introduction to Linear Regression Analysis, D.C. Montgomery &E.Peck, 2006
2. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill& D.C. Boes,2017
3. Applied Regression Analysis, N. Draper & H. Smith, Third edition,1998.
4. Hands-on Programming with R,- Garrett Grolemund, 2014.
5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, 2013.

LIST OF EXPERIMENTS

1. Introduction to R, Functions, Control flow and Loops
2. Working with Vectors and Matrices
3. Reading in and Writing Data
4. Working with Data
5. Manipulating Data
6. Simulation
7. Linear model
8. Data Frame
9. Graphics in R

TOTAL :30 PERIODS

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**									**1**
CO2	**3**	**3**	**3**									**1**
CO3	**3**	**3**	**3**									**1**
CO4	**3**	**3**	**3**									**1**
CO5	**3**	**3**	**3**									**1**

Assessment (40% weightage) (Theory Component)		**Assessment** (60% weightage) (Laboratory Component)		**End Semester Examination**
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Evaluation of Laboratory Observation, Record**	**Test**	**Written Examination**
40	**60**	**75**	**25**	
100				**100**
50 %				**50 %**

23CB1211	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE

- To provide the knowledge of basic data structures and their implementations.
- To understand the Linear data structures.
- To be aware of the Non Linear data structures.
- To solve problems using data structures binary search trees, and graphs and writing programsfor these solutions.
- To efficiently implement the different data structures and solutions for specific problems.

LISTOFEXPERIMENTS

1. Stack using array
2. Queue using array
3. Towers of Hanoi using user defined stacks.
4. Singly Linked List
5. Stack using Linked List
6. Queue using Linked List
7. Reading, writing, and addition of polynomials.
8. Line editors with line count, word count showing on the screen.
9. Trees with all operations.
10. Binary Search Tree
11. Breadth First Search
12. Depth First Search
13. Reading the data from file using file operation
14. Writing the data into file using file operation
15. Mini Project

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1 Implement linear data structure such as stacks, queues and linked lists

CO2 Apply linear data structure applications.

CO3 Execute Non-linear data structure applications.

CO4 Realize basic operations on binary trees

CO5 Demonstrate the representation and traversal techniques of graphs and their applications

CO6 Demonstrate the file concepts using file operations

WEB REFERENCES:

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.programiz.com/dsa/data-structure-types

23ES1212	TECHNICAL SKILL PRACTICES I	L	T	P	C
		0	0	2	1

COURSE OBJECTIVE:

- To impart essential problem solving skills through general problem solving concepts.
- To provide basic knowledge on programming essentials using C as implementation tool.
- To introduce various programming methods using C.

LIST OF EXPERIMENTS

1. Data Types, Variables, Operators
2. Expressions, Precedence , Operators
3. Conditional Statements , Switch Statements
4. Looping, Nested Loops
5. Problems on Bit Manipulation
6. Patterns
7. Number Problems
8. Array Basics , Static vs Dynamic Array, Two Dimensional Matrix
9. Structure , Union ,Storage Classes
10. Function , Parameters passing
11. Recursion
12. Strings
13. Pointers
14. Command Line Arguments, Pre-processors
15. File Handling & Exception Handling.

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course student will be able to**:**

CO1 Propose solutions for a given problem.

CO2 Infer the fundamental programming elements in C language and learn to apply basic control structures in C.

CO3 Demonstrate the applications of structures and unions.

CO4 Visualize the capabilities of modular programming approach in C.

CO5 Understand the basic principles of pointers and their association during implementations.

CO6 Apply various input, output and error handling functions in C.

TEXT BOOKS:

1. ReemaThareja, ``Programming in C"", 2nd edition, OXFORD University Press, New Delhi, 2019.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Publication,2016.

REFERENCES BOOKS:

1. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education,2014.
2. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw Hill, 2000.

ONLINE COURSES / RESOURCES:

1. https://www.javatpoint.com/c-programming-language-tutorial
2. https://www.tutorialspoint.com/cprogramming/
3. https://nptel.ac.in/Courses/

23TA1201	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT – I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT – II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka 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 - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT –IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola 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. கணினித் தமிழ் - முளனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு

4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)

5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published 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: InternationalInstitute of Tamil Studies

7. Historical 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 of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)

10. Studies in the History of India with Special Reference to TamilNadu (Dr.K.K.Pillay) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational ServicesCorporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Publishedby: RMRL) – Reference Book

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23TA1201	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

UNIT – I **நெசவு மற்றும் பானைத் தொழில்நுட்பம்** **3**

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

UNIT – II **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்** **3**

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

UNIT – III **உற்பத்தி தொழில்நுட்பம்** **3**

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

UNIT –IV **வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம்** **3**

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

UNIT –V **அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்** **3**

அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Total : 15 PERIODS

TEXT-CUM REFERENCE BOOKS:

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

2. கணினித் தமிழ் - முளனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்
(தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை)
5. Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
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7. Historical 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 of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
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11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational ServicesCorporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Publishedby: RMRL) – Reference Book

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23MC1001	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVE:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection

UNIT - I **ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** **6**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers– energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In situ and ex-situ conservation of biodiversity.

UNIT - II **ENVIRONMENTAL POLLUTION** **6**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards– solid waste management: causes, effects and control measures of municipal solid wastes, biomedical wastes and e-wastes – role of an individual in prevention of pollution – pollution case studies.

UNIT - III **NATURAL RESOURCES** **6**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction,

mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Land resources: Land as a source, land degradation, man induced landslides, soil erosion and desertification-role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT - IV **SOCIAL ISSUES AND THE ENVIRONMENT** **6**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion. environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards Public awareness.

UNIT - V **HUMAN POPULATION AND THE ENVIRONMENT** **6**

Population growth, variation among nations – population explosion – family welfare Programme– environment and human health – human rights – value education – HIV / AIDS - women and child welfare – role of information technology in environment and human health - case studies.

TOTAL : 30 PERIODS

COURSE OUTCOME(S):

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

CO1 To recognize and understand the functions of environment, ecosystems, biodiversity and their conservation.

CO2 To identify the causes, effects and control measures of environmental pollution and to implement the preventive measures.

CO3 To identify the various types of natural resources, their exploitation, consequences and to apply methodologies for its conservation.

CO4 To describe and analyse the concept of sustainable development, the fundamental key concepts of various social issues and environmental Acts.

CO5 To outline the reasons for human population and the role of information technology in environment and human health.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6 th Edition, New Age International Publishers (2018).

2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,(2016)

3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004)..

REFERENCE BOOKS:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient BlackswanPvt. Ltd. (2013).

WEB REFERENCES:

1. https://www.nationalgrid.com/stories/energy-explained
2. https://www.conservationindia.org/articles/human-elephant-conflict
3. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/pollutant-monitoring
4. https://www.undp.org/sustainable-development-goals

ONLINE COURSES / RESOURCES:

1.https://nptel.ac.in/courses/105107213

2.https://nptel.ac.in/courses/105107181

3.https://nptel.ac.in/courses/103106162

4.https://nptel.ac.in/courses/103107212

23HS1204	INTERPERSONAL COMMUNICATION SKILLS II	L	T	P	C
		0	0	2	0

COURSE OBJECTIVES

* To induce the basic reading and writing skills of the freshers.
* To enhance the active listening skills of the learners through practice to develop their listening skills, which will enable them listening to lectures and comprehend them by asking questions and seeking clarifications
* To succor the learners to develop their speaking skills and speak fluently in real contexts.
* To motivate the learners to develop vocabulary of a general kind by developing their reading skills for meeting the competitive exams like GATE, TOFEL, GRE, IELTS, and other exams conducted by Central and State governments
* To improve communication skills of the learners in a professional setting

CONTENTS

Listening: Listening to Telephonic Conversation- on various jobs , recruitments and processes and professional etiquette

Speaking: Answering Telephonic Calls Attending telephonic interviews Presenting Work Activities, Presentation on Business Ideas and Iconic Personalities

Reading: Inferring information from business/professional letters Newspaper activities (Skimming / scanning) acquiring knowledge related to leading successful personalities and business consultancies.

Writing: Art of Letter Writing – Business Letters and Emails – acknowledging the performances and promoting the base and superstructures.

TOTAL : 30 PERIODS

TEXT BOOKS:

1. Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler, 2014
2. Simply Said: Communicating Better at Work and Beyond by Jay Sullivan, 2016

REFERENCE BOOKS:

1. Words That Work: It's Not What You Say, It's What People Hear by Dr. Frank Luntz, 2011.
2. Fine Art of Small Talk: How To Start a Conversation, Keep It Going, Build Networking Skills — and Leave a Positive Impression! By Debra Fine

WEB REFERENCES:

1. https://teambuilding.com/blog/communication-books
2. https://www.helpguide.org/articles/relationships-communication/effective-communication.htm

ONLINE COURSES / RESOURCES:

3. https://in.indeed.com/career-advice/career-development/letter-of-recommendation
4. https://in.indeed.com/career-advice/career-development/types-of-business-letters

COURSE OUTCOME:

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

CO1	Comprehend conversation and short talks delivered in English.
CO2	Participate effectively in informal conversation; introduce themselves and their friends and express opinions English.
CO3	Read articles of a general kind in magazines and newspaper
CO4	Write short essays of a general kind and personal letters and emails in English.
CO5	Gain understanding of basic grammatical structures and use them in right context.
CO6	Use appropriate words in a professional context.

CO&PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									**3**	**3**		**2**
CO2									**3**	**3**		**2**
CO3									**2**	**3**		**2**
CO4									**2**	**3**		**2**
CO5									**2**	**3**		**2**
CO6									**3**	**3**		**2**

23HS1205	QUANTITATIVE APTITUDE PRACTICES II	L	T	P	C
		0	0	1	0

COURSE OBJECTIVE:

- To improve students comprehension of geometry and mensuration, average as well as help them hone their problem-solving abilities
- To develop students ability to use the techniques for resolving riddles, streams, boats, and coding problems.

Module 1 Geometry and Mensuration **3**

Lines and angles – circles – triangles – quadrilaterals – polygons - coordinate geometry area &volume of 2D and 3D figures.

Module 2 Average, Time, Work **3**

Logarithm - Average - time and work - time and distance

Module 3 Boats and streams **3**

Relative speed – problems on trains – boats and streams – races and games

Module 4 Logical Reasoning - I **3**

Odd man out and series – venn diagram - seating arrangement – decision making

TOTAL : 12 PERIODS

COURSE OUTCOME:

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

CO1 Acquire knowledge of solving geometry and mensuration, average, percentage, time and work questions effortlessly.

CO2 Understand and exhibit sound knowledge to the boats and streams, venn diagram and decision making.

TEXT BOOKS:

1. AggarwalR.S.(2017). Quantitative Aptitude for Competitive Examinations 3rd edition New Delhi: S. Chand Publishing.

2. Abhijit guha(2016). Quantitative Aptitude for All Competitive Examinations, 6th edition. Noida: McGraw Hill Education Pvt.Ltd.

3. FACE.(2016).Aptipedia Aptitude Encyclopedia1(Ed.).New Delhi: Wiley Publications.

REFERENCE BOOK:

1. Sharma arun.(2016).Quantitative aptitude,7th(Ed.).Noida : McGraw Hill Education Pvt.Ltd.
2. Praveen. R.V 3rd edition, Quantitative aptitude and reasoning, PHI learning publication.

WEB REFERENCES:

https:// www.indiabix.com

Mode of Evaluation: Online Test