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 2023-24

B.E - ELECTRONICS AND COMMUNICATION ENGINEERING

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 Electronics and Communication Engineering

B.E- Electronics and Communication Engineering

Curriculum and Syllabus

Regulation 2023

(Students admitted during the year 2023-2024)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

To emerge as a centre of excellence in providing quality education and produce technically competent Electronics and Communication Engineers to meet the needs of the industry and society.

MISSION

M1: To Provide the best facilities, infrastructure and environment to our students, researchers and faculty members to meet the challenges in the field of Electronics and Communication Engineering.

M2: To provide quality education through effective teaching learning process for their future career, viz placement and higher education.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To prepare students to analyze, design and implement electronic circuits and systems using the knowledge acquired from basic science and mathematics.

PEO 2: To train students with good scientific and engineering knowledge so as to comprehend, analyze, design and create novel products and solutions for real life problems.

PEO 3: To introduce the research world to the graduates not only in their own domain but also in multidisciplinary domain, so that they feel motivated for higher studies.

PEO 4: To prepare graduates to exhibit professionalism, ethical attitude, communication skills, team work and leadership qualities in their profession and adapt to current trends by engaging in lifelong learning.

PEO 5: To practice professionalism in a collaborative, team-oriented manner that embraces the multicultural environment of today's business world.

PROGRAM OBJECTIVES (PO'S)

PO1 (Engineering knowledge): Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 (Problem Analysis): Identify, formulate, research literature, and analyze complex engineering problem reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 (Design/development of solutions): Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 (Conduct investigations of complex problems): Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 (Modern tool usage): Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 (The engineer and society): Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Professional engineering practice.

PO7 (Environment and sustainability): Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 (Ethics): Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO9 (Individual and team work): Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO10(Communication): Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11(Project management and finance): Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12(Life-long learning): Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Graduates should demonstrate an understanding of the basic concepts in the primary area of Electronics and Communication Engineering, including: analysis of circuits containing both active and passive components, electronic systems, control systems, electromagnetic systems, digital systems, computer applications and communications.

PSO2: Graduates should demonstrate the ability to utilize the mathematics and the fundamental knowledge of Electronics and Communication Engineering to design complex systems which may contain both software and hardware components to meet the desired needs.

PSO3: The graduates are capable of excelling in Electronics and Communication Engineering industry/Academic /Software companies through professional careers.

B.E.- ELECTRONICS AND COMMUNICATION ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

I – VIII SEMESTERS CURRICULUM AND SYLLABI (REGULATION 2023)

(For the Students admitted during 2023-24)

Semester I							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23MA1101	Matrices and Calculus	BS	3/1/0	4	4	60/40
2.	23ES1101	Problem Solving using C Programming	ES	3/0/0	3	3	60/40
3.	23ES1103	Engineering Graphics	ES	2/0/2	4	3	60/40
Theory Cum Practical Courses							
4.	23HS1101	Communicative English and Language Skills	HS	2/0/2	4	3	50/50
5.	23PH1101	Engineering Physics	BS	2/0/2	4	3	50/50
Laboratory Courses							
6.	23ES1111	Problem solving using C Programming Laboratory	ES	0/0/4	4	2	40/60
Mandatory Course							
7.	23TA1101	தமிழர்மரபு/ Heritage of Tamils	HS	1/0/0	1	1	60/40
			TOTAL		**24**	**19**	

Semester II							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23MA1201	Complex Variables and Laplace Transform	BS	3/1/0	4	4	60/40
2.	23EC1201	Electronic Devices	PC	3/0/0	3	3	60/40
3.	23ES1201	Python Programming	ES	3/0/0	3	3	60/40
Theory Cum Practical Courses							
4.	23HS1201	Communicative and Aptitude Skills	HS	2/0/2	4	3	50/50
5.	23ES1204	Basic Electrical Circuits and Engineering	ES	3/0/2	5	4	50/50
Laboratory Courses							
6.	23EC1211	Circuits and Devices Laboratory	PC	0/0/4	4	2	40/60
7.	23ES1211	Python Programming Laboratory	ES	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
			TOTAL		**32**	**23**	

Semester III							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23MA1302	Linear Algebra and Numerical Analysis	BS	3/1/0	4	4	60/40
2.	23EC1301	Signals and Systems	PC	3/0/0	3	3	60/40
3.	23EC1302	Electronic Circuits I	PC	3/0/0	3	3	60/40
4.	23EC1303	Digital Electronics	PC	3/0/0	3	3	60/40
5.	23EC1304	Control Systems Engineering	PC	3/0/0	3	3	60/40
Laboratory Courses							
6.	23EC1311	Electronic Circuits and Simulation Laboratory I	PC	0/0/4	4	2	40/60
7.	23EC1312	Control Systems Engineering Laboratory	PC	0/0/4	4	2	40/60
8.	23ES1312	Coding Practices I	EEC	0/0/2	2	1	40/60
Mandatory Course							
9.		Mandatory Course II	MC	2/0/0	2	0	0/100
			TOTAL		**28**	**21**	

Semester IV							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23MA1402	Probability and Random Processes	BS	3/1/0	4	4	60/40
2.	23CS1403	Principles of Data Structures	ES	3/0/0	3	3	60/40
3.	23EC1401	Communication Theory	PC	3/0/0	3	3	60/40
4.	23EC1402	Electronic Circuits II	PC	3/0/0	3	3	60/40
5.	23EC1403	Analog Integrated Circuits	PC	3/0/0	3	3	60/40
6.	23EC1404	Electromagnetic Fields	PC	3/0/0	3	3	60/40
Laboratory Courses							
7.	23EC1411	Electronic Circuits and Simulation Laboratory II	PC	0/0/4	4	2	40/60
8.	23EC1412	Analog and Digital Circuits Laboratory	PC	0/0/4	4	2	40/60
9.	23CS1412	Principles of Data Structures Laboratory	ES	0/0/4	4	2	40/60
10.	23ES1412	Coding Practices II	EEC	0/0/2	2	1	40/60
			TOTAL		**33**	**26**	

Semester V							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23EC1501	Digital Communication	PC	3/0/0	3	3	60/40
2.	23EC1502	Discrete Time Signal Processing	PC	3/0/0	3	3	60/40
3.	23EC1503	Microprocessors and Microcontrollers	PC	3/0/0	3	3	60/40
4.	23EC1504	Transmission Lines and Waveguides	PC	3/0/0	3	3	60/40
5.		Professional Elective I	PE	3/0/0	3	3	60/40
6.		Open Elective I	OE	3/0/0	3	3	60/40
Laboratory Courses							
7.	23EC1511	Discrete Time Signal Processing Laboratory	PC	0/0/4	4	2	40/60
8.	23EC1512	Microprocessors and Microcontrollers Laboratory	PC	0/0/4	4	2	40/60
9.	23EC1513	Analog and Digital Communication Laboratory	PC	0/0/4	4	2	40/60
10.	23ES1512	Coding Practices III	EEC	0/0/2	2	1	40/60
			TOTAL		**32**	**25**	

Semester VI							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23EC1601	Wireless Communication	PC	3/0/0	3	3	60/40
2.	23EC1602	Antenna and Wave Propagation	PC	3/0/0	3	3	60/40
3.	23EC1603	Data Communication Networks	PC	3/0/0	3	3	60/40
4.	23EC1604	VLSI Design	PC	3/0/0	3	3	60/40
5.	23EC1605	Artificial Intelligence and Machine Learning for Communication Engineers	PC	3/0/0	3	3	60/40
6.		Professional Elective II	OE	3/0/0	3	3	60/40
Laboratory Courses							
7.	23EC1611	Wireless Communication and Networks Laboratory	PC	0/0/4	4	2	40/60
8.	23EC1612	VLSI Design Laboratory	PC	0/0/4	4	2	40/60
9.	23EC1613	Artificial Intelligence and Machine Learning for Communication Engineers Laboratory	PC	0/0/4	4	2	40/60
10.	23ES1612	Coding Practices IV	EEC	0/0/2	2	1	40/60
			TOTAL		**32**	**25**	

Semester VII							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.	23EC1701	Embedded Systems and IoT Applications	PC	3/0/0	3	3	60/40
2.	23EC1702	Optical Communication and Networks	PC	3/0/0	3	3	60/40
3.	23EC1703	Microwave Engineering	PC	3/0/0	3	3	60/40
4.		Professional Elective III	PE	3/0/0	3	3	60/40
5.		Professional Elective IV	PE	3/0/0	3	3	60/40
6.		Open Elective II	OE	3/0/0	3	3	60/40
Laboratory Courses							
7.	23EC1711	Embedded Systems and IoT Applications Laboratory	PC	0/0/4	4	2	40/60
8.	23EC1712	Optical and Microwave Communication Laboratory	PC	0/0/4	4	2	40/60
9.	23EC1713	Community Service Project	EEC	0/0/4	4	1	40/60
			TOTAL		**30**	**23**	

Semester VIII							
S. No	**COURSE CODE**	**COURSE TITLE**	**Category**	**L/T/P**	**Contact Hours**	**Credit**	**Ext / Int Weightage**
Theory Courses							
1.		Professional Elective V	PE	3/0/0	3	3	60/40
2.		Professional Elective VI	PE	3/0/0	3	3	60/40
Laboratory Courses							
1.	23EC1811	Project Work	PC	0/0/16	16	8	40/60
			TOTAL		**22**	**14**	

Total No. of Credits: 176

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Sl. No	Vertical I **Biomedical Technologies**	Vertical II **IoT Architecture and Applications**	Vertical III **Signal Processing**	Vertical IV **Advanced Communication Technology**	Vertical V **VLSI Design and Testing**	Vertical VI **RF Technologies**	Vertical VII **Sensor System Technology**	Vertical VIII **Emerging Technologies**
1.	23EC1901 Biomedical Instrumentation	23EC1908 Wireless Networks	23EC1915 DSP Architecture and Programming	23EC1922 Cognitive Radio Networks	23EC1929 ASIC Design	23EC1936 Electromagnetic Interference and Compatibility	23EC1943 Principles of Sensors	23EC1950 Cryptography and Security Practices
2.	23EC1902 Diagnostic and Therapeutic Equipments	23EC1909 IoT Architectures and Protocols	23EC1916 Advanced Digital Signal Processing	23EC1923 High Speed Access Technologies	23EC1930 CAD for VLSI Design	23EC1937 RFID system and Applications	23EC1944 Sensors and Actuators	23EC1951 Block chain Technologies and Applications
3.	23EC1903 Wearable Devices	23EC1910 IoT Security	23EC1917 Digital Image and Video Processing	23EC1924 Advanced Wireless Communication Techniques	23EC1931 System Verilog	23EC1938 RF MEMS	23EC1945 Flexible and Wearable Sensors	23EC1952 Data Science and Analytics
4.	23EC1904 Body Area Networks and its Applications	23EC1911 Data Analytics for IoT	23EC1918 Biosignal Processing	23EC1925 Massive MIMO Networks	23EC1932 Low-Power IC Design	23EC1939 Smart Antennas	23EC1946 Microsystems and Hybrid Technology	23EC1953 Machine Learning Algorithms
5.	23EC1905 Telemedicine and Telehealth	23EC1912 IoT for Industry Automation	23EC1919 Speech Processing	23EC1926 5G and Beyond Communication Networks	23EC1933 VLSI Testing and Design for Testability	23EC1940 RF System Design	23EC1947 Nanomaterials and Sensors	23EC1954 Space Communication
6.	23EC1906 Medical Image Analysis	23EC1913 IoT for Smart Cities	23EC1920 Computer Vision	23EC1927 Machine Learning For Future Wireless Communication	23EC1934 System On Chip	23EC1941 Signal Integrity for High Speed Design	23EC1948 Data Acquisition and Hardware Interfaces	23EC1955 Human Computer Interaction
7.	23EC1907 Brain Computer Interface	23EC1914 IoT and Edge Computing	23EC1921 Underwater Imaging Systems and Image Processing	23EC1928 Terahertz Communication	23EC1935 Network On Chip	23EC1942 Computational Electro Magnetics	23EC1949 Wireless Sensor Networks	23EC1956 Virtual Reality and Augmented Reality

Credit Distribution

Sl.No	Subject Area	CREDITS PER SEMESTER								Total	Percentage (%)
	Semester	I	II	III	IV	V	VI	VII	VIII		
1.	**HS**	4	4	-	-	-	-	-	-	8	4.54
2.	**BS**	7	4	4	4	-	-	-	-	19	10.79
3.	**ES**	8	9	-	5	-	-	-	-	22	12.5
4.	**PC**	-	5	16	16	18	21	13	8	97	55.11
5.	**PE**	-	-	-	-	3	3	6	6	18	10.22
6.	**OE**	-	-	-	-	3	-	3	-	6	3.4
7.	**EEC**	-	1	1	1	1	1	1	-	6	3.4
8.	**MC**	-	0	0	-	-	-	-	-	0	0
TOTAL		**19**	**23**	**21**	**26**	**25**	**25**	**23**	**14**	**176**	**100**

SEMESTER – I

23MA1101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

- To comprehend matrices as mathematical structures used to represent data, equations,and transformations in various engineering applications.
- To introduce the concepts of limits, continuity, derivatives and maxima and Minima.
- To familiarize the functions of two variables and finding its extreme points.
- To provide understanding of various techniques of integration.
- To introduce integral ideas in solving areas, volumes and other practical problems.

UNIT - I MATRICES 9+3

Eigenvalues and Eigenvectors of a real matrix - Characteristic equation -Properties of Eigenvalues and Eigenvectors -Cayley Hamilton theorem -Diagonalization of matrices- Reduction of a quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms.

UNIT - II DIFFERENTIAL CALCULUS 9+3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (Sum, Product & Quotient rule, Chain rule, logarithmic and implicit differentiation) - Maxima and Minima of functions of one variable and its applications**.**

UNIT - III FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial differentiation - Total derivative - Change of variables –Jacobian's- Taylor's series for functions of two variables - Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT - IV INTEGRAL CALCULUS 9+3

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts -Bernoulli's formula- Integration of rational functions by partial fraction - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT - V MULTIPLE INTEGRALS 9+3

Double integrals in Cartesian and polar coordinates - Change of order of integration in Cartesian coordinates - Area enclosed by plane curves - Change of variables in double integrals -Triple integrals - Volume of Solids.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Apply matrix operations to solve engineering problems efficiently.

CO2 Apply limit definition and rules of differentiation to differentiate functions.

CO3 Understand familiarity in the knowledge of Maxima and Minima, Jacobian,Taylor series and apply the problems involving Science and Engineering.

CO4 Understand the knowledge of Integration by parts, Integration of rational functions by partial fraction.

CO5 Understand the knowledge of Area enclosed by plane curves, Change of variables in double integrals, Triple integrals, Volume of Solids.

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, NewDelhi,44rd Edition,2018.
2. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 9th Edition, NewDelhi,2015.
3. Bali N., Goyal M. and Walkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvtt. Ltd.,), New Delhi, 7th Edition, 2015.

REFERENCE BOOKS:

1. Sundar Raj. M and Nagarajan. G, “Engineering Mathematics-I”,3rd Edition, Sree Kamalamani Publications, Chennai, 2020.
2. Sivaramakrishna Dass, C. Vijayakumari, “Engineering Mathematics”, Pearson Education India, 4th Edition 2019.
3. Srimantha Pal and Bhunia,S.C, "Engineering Mathematics "Oxford University Press, 2015.
4. Erwin Kreyzig, Advanced Engineering Mathematics, JohnWiley sons, 10th Edition,2015.
5. Narayanan, S. and Manicavachagom Pillai, T. K., “Calculus" Volume I and II, S. Viswanathan Publishers Pvt., Ltd., Chennai, 2007.
6. B.V. Ramana “Higher Engineering Mathematics”, McGraw Hill Education, India.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma60/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma58/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

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 %**

23ES1101	PROBLEM SOLVING USING C PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To learn the syntax for C programming
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions, pointers
- To develop applications using structures and union

UNIT - I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms – Algorithms – Flowchart - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Type Conversion Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Format specifiers, Assignment statements – Decision making statements - Switch statement – Break – Continue - Goto statement - Looping statements – Pre-processor directives - Compilation process.

UNIT - II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Multiplication, Determinant and Transpose) - String operations: length, compare, concatenate, copy, Reverse and Palindrome – Selection sort, Insertion sort - linear and binary search.

UNIT - III FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

UNIT - IV STRUCTURES AND UNION 9

Structure - Nested structures– Pointer and Structures– Array of structures – Example Program using structures and pointers – Self-referentials structures – Dynamic memory allocation – Singly linked list– typedef and Union.

UNIT - V FILE PROCESSING 9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Learn the syntax for C programming

CO2 Develop simple applications in C using basic constructs

CO3 Design and implement applications using arrays and strings

CO4 Develop and implement applications in C using functions and pointers.

CO5 Develop applications in C using structures and union.

CO6 Design applications using sequential and random access file processing.

TEXT BOOKS:

1. Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, —The C Programming language, Second Edition, Pearson Education, 2006.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, — C How to Program, Seventh edition, Pearson Publication, 2015
2. Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt. Ltd., 2011.
3. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C, Dorling Kindersley (India) pvt., Ltd., Pearson Education in South Asia, 2011.
4. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009.
5. Byron S. Gottfried, "Schism's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

WEB REFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

ONLINE COURSES / RESOURCES:

1. https://www.programiz.com/c-programming
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.geeksforgeeks.org/c-programming-language/
5. https://en.wikibooks.org/wiki/C_Programming
6. https://www.cprogramming.com/tutorial/c-tutorial.html?inl=hp

CO-PO MAPPING

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

23ES1103	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To draw engineering curves
- To draw orthographic projections of lines and planes
- To draw orthographic projections of solids
- To draw section and development of the surfaces of objects
- To draw isometric views and intersection curves of simple solids
- To draw free hand sketches of basic geometrical shapes, multiple views of objects and Applications of Engineering Graphics

UNIT - 0 CONCEPTS AND CONVENTIONS (Not for Examination) 2

Importance of drawing in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning - Introduction to Scales - Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons. Introduction to drafting packages like CAD and demonstration of their use in engineering fields.

UNIT - I ENGINEERING CURVES AND PROJECTION OF POINTS AND LINES 6+6

Basic construction of cycloid, epicycloid and hypocycloid - Drawing of tangents and normal to the above curves. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

Orthographic projection – Introduction to Principal Planes of projections - First angle projection - Projection of points. Projections of straight lines (only in First angle projections) inclined to both the principal planes - Determination of true lengths, true inclinations and traces by rotating line method

UNIT - II PROJECTIONS OF PLANES AND PROJECTIONS OF SOLIDS 6+6

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method and auxillary plane method.

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to one principle planes by rotating object method.

UNIT - III SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES 6+6

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple solids and frustum and truncated solids – Prisms, pyramids cylinders and cones.

UNIT - IV INTERSECTION OF SOLIDS AND ISOMETRIC PROJECTIONS 6+6

Line of intersection - Determining the line of intersection between surfaces of two interpenetrating two square prisms and Intersection of two cylinders with axes of the solids intersecting each other perpendicularly, using line method.

Principles of isometric projection – isometric scale –Isometric projections and isometric views of simple solids and frustum and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.

UNIT - V FREE-HAND SKETCHING 5+5

Steps in free hand sketching - Orthographic views (front, top and side views) of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views (front, top and side views)

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

- **CO1** Draw the engineering curves and draw orthographic projections of lines and planes
- **CO2** Draw orthographic projections of planes and solids
- **CO3** Draw the sections and development of the surfaces of objects
- **CO4** Draw isometric projections and intersection of curves of simple solids.
- **CO5** Draw free hand sketching of basic geometrical shapes, multiple views of objects

TEXT BOOKS:

1. Natarajan, K. V., “A text book of Engineering Graphics”, 28th Ed., Dhanalakshmi Publishers, Chennai, 2015.
2. Venugopal, K. and Prabhu Raja, V., “Engineering Graphics”, New Age Publications, 2008.

REFERENCE BOOKS:

1. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.
2. Bhatt, N.D.,Panchal V M and Pramod R. Ingle, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
3. Agrawal, B. and Agrawal C.M., “Engineering Drawing”, Tata McGraw, N.Delhi, 2008.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/104/105104148/

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/112/103/112103019/

CO-PO MAPPING

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

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 %**

23HS1101	COMMUNICATIVE ENGLISH AND LANGUAGE SKILLS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- 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 learn to use basic grammatical structures in suitable contexts

UNIT - I INFORMAL COMMUNICATION 6

Listening: Listening and filling details, Listening to Speeches by Specialists and Completing Activities such as Answering Questions, Identifying the Main Ideas, Style, etc. **Speaking**: Introducing One-self – Introducing a Friend/ Family. **Reading**: Descriptive Passages (From Newspapers / Magazines).**Writing**: Autobiographical Writing, Developing Hints. **Grammar**: Noun, Pronoun & Adjective. **Vocabulary Development**: One Word Substitution

UNIT - II CONVERSATIONAL PRACTICE 6

Listening: Listening to Conversations (Asking for and Giving Directions).**Speaking**: Making Conversation Using (Asking for Directions, Making an Enquiry), Role Plays, and Dialogues. **Reading**: Reading a Print Interview and Answering Comprehension Questions. **Writing**: Writing a Checklist, Dialogue Writing **Grammar**: Tenses and Voices, Regular and Irregular Verbs. **Vocabulary Development**: Prefix &Suffix, Word formation.

UNIT - III OFFICIAL COMMUNICATIONS 6

Listening: Listening for specific information. Speaking: Giving Short Talks on a given Topic. **Reading**: Reading Motivational Essays on Famous Engineers and Technologists (Answering Open-Ended and Closed Questions).**Writing**: Writing Permission Letters/Editor, Complaint, and Invitation. Emails and Review Writing-Books, Films. **Grammar**: Adverb, Prepositions & Conjunctions. **Vocabulary Development**: Collocations – Fixed Expressions.

UNIT - IV COMMUNICATION AT WORK PLACE 6

Listening: Listening to Short Talks (5 Minutes Duration and Fill a Table, Gap-Filling Exercise) Note Taking/Note Making .**Speaking**: Small Group Discussion, Giving Recommendations. **Reading**: Reading Problem – Solution Articles/Essays Drawn From Various Sources .**Writing**: Making Recommendations. **Grammar**: Subject-Verb Agreement, Framing Questions. **Vocabulary Development**: Infinitives and Gerunds, Reference Words, Technical Vocabulary.

UNIT - V **DEFINITIONS AND PRODUCT DESCRIPTION** **6**

Listening: Listening to a Product Description (Labelling and Gap Filling) Exercises. **Speaking**: Describing a Product and Comparing and Contrasting it with Other Products. **Reading**: Reading Graphical Material for Comparison (Advertisements).**Writing**: Essay Writing. Compare and Contrast Paragraphs, Essay writing. **Grammar**: Phrasal Verbs – Cause and Effect Sentences –Compound Nouns and Definitions. **Vocabulary Development:** Use of Discourse Markers.

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student 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.

TEXT BOOKS:

1. N P Sudharshana& C Savitha. English for Technical Communication Delhi: CUP, 2019.
2. Board of Editors. English for Engineers and Technologists Volume 1 Orient Black Swan Limited, 2020.

REFERENCE BOOKS:

1. Board of Editors. Using English-A course book for Undergraduate engineers and Technologists Orient Black Swan Limited, 2017.
2. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2011.
3. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011.
4. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning, USA:2007.
5. Redston, Chris &Gillies Cunningham Face2Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005.

WEB REFERENCES:

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabulary-exams/wordformation
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/20180316 21.pdf
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.html.
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/

ONLINE COURSES / RESOURCES:

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions

LANGUAGE SKILLS LAB
LIST OF EXPERIMENTS

1. Listen to lectures- articulate a complete idea as opposed to producing fragmented utterances- Tedtalks, Science Fiction- My Fair Lady
2. Listening – following, responding to explanations, giving directions and instructions in academic and business contexts- IELTS,TOEFL.
3. Listening to transcripts and answer to the questions.
4. Listening for specific information: accuracy and fluency – BEC.
5. Reading: Different Text Type.
6. Reading: Predicting Content using pictures and titles.
7. Reading: Use of Graphic Organizers to review.
8. Reading: Aid Comprehension.
9. Reading: Speed Reading Techniques.
10. Reading and Comprehending the passages in the competitive exams like GATE, TOEFL, GRE, IELTS, and other exams conducted by Central and state governments.

TOTAL: 30 PERIODS

REFERENCE BOOKS:

1. Suresh Kumar.E and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Blackswan: Hyderabad,2012
2. Davis, Jason and Rhonda Liss. Effective Academic Writing (level 3) Oxford University Press: Oxford,2006
3. Withrow, Jeans and et al. Inspired to write. Reading and Tasks to develop writing skills. Cambridge University Press: Cambridge,2004

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

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 %**

23PH1101	ENGINEERING PHYSICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To impart knowledge in basic concepts of physics relevant to engineering applications
- To introduce advances in technology for engineering applications

UNIT - I PROPERTIES OF MATTERS 6

Elasticity: Stress, strain, Hooke's law and elastic moduli – stress-strain diagram – twisting couple per unit twist for solid cylinder – torsional pendulum (theory) – bending moment of beam – non-uniform and uniform bending (theory)– I-shape girder.

Thermal Physics: Mode of heat transfer: conduction, convection and radiation – thermal expansion of solids – bimetallic strips – thermal conductivity – Forbe's method and Lee's disc method; theory and experiment – thermal insulation – applications

UNIT - II SEMINCONDUCTING AND MAGNETIC MATERIALS 6

Semiconducting Materials: Intrinsic Semiconductors – energy band diagram – carrier concentration in intrinsic semiconductors – extrinsic semiconductors (N-type & P-type) – variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration –Zener and avalanche breakdown in p-n junctions – Ohmic contacts – Schottky diode – tunnel diode.

Magnetic Materials: Magnetism in materials – Basic definitions – Classifications of Magnetic Materials- Ferromagnetic Domain theory – M versus H ehavior- Hard and Soft Magnetic materials- Magnetic principle in Computer data storage – Magnetic Hard Disc and Embedded systems**.**

UNIT - III MODERN OPTICS 6

Laser: Population of energy levels, Einstein's A and B coefficients derivation – optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction**– Fiber Optics**: components and principle of fiber optics – numerical aperture and acceptance angle derivation – types of optical fibers (material, refractive index, mode) – losses associated with optical fibers– fiber as pressure and displacement sensors.

UNIT - IV QUANTUM PHYSICS AND NANOSCIENCE 6

Quantum Physics: Blackbody radiation – Planck's hypothesis and derivation – wave particle duality of light: concepts of photon – de Broglie hypotheses – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations.

Nanoscience: Introduction – Classification of nanomaterials – preparation (bottom up and top down approaches), mechanical, optical and electrical properties – applications: NEMS and MEMS– carbon nanotubes: types.

UNIT - V **ELECTROMAGNETIC WAVES** **6**

Divergence – curl – integral calculus – Gauss divergence theorem – Stoke's theorem – equation of continuity – displacement current – Maxwell's equations – Gauss's laws – Faraday's law –Ampere-Maxwell law – mechanism of electromagnetic wave propagation – Hertz observation – production and detection of electromagnetic wave – properties of electromagnetic waves.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS

1. Determination of Moment of Inertia of the disc and Rigidity Modulus of the material of the wire – Torsional Pendulum
2. Determination of Young's Modulus – Non - Uniform Bending
3. Determination of Thermal Conductivity of the Bad Conductor – Lee's Disc Method
4. Determination of thickness of a thin wire – Air wedge method
5. (i) Determination of wavelength of Laser using Grating and Particle size determination
   (ii) Determination of Numerical Aperture and Acceptance angle of an Optical Fibre
6. Determination of Velocity of ultrasonic waves in a liquid and compressibility of the liquid – Ultrasonic Interferometer.
7. Determination of wavelength of Hg source using Grating by normal incidence method using spectrometer
8. Determine the band gap energy of a semiconductor.

TOTAL: 30 PERIODS

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. Karl F. Renk, Basics of laser physics: for students of science and engineering, 2017.

REFERENCE BOOKS:

1. Halliday, D., Resnick, R. & Walker, J.-Principles of Physics, Wiley, 2015.
2. Tipler, P.A. &Mosca, G.- Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.
3. Ruby Das, C.S. Robinson, Rajesh Kumar, Prashant Kumar Sahu, A Textbook of Engineering Physics Practical, University Science Press, Delhi, II Edition (2016).

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Understand the basics properties of materials, especially elastic and thermal properties of materials.

CO2 Acquire the knowledge on the concepts of lasers, fiber optics and their technological applications.

CO3 Adequate knowledge on the concepts of semiconducting and magnetic materials and their applications in memory storage.

CO4 Knowledge on fundamental concepts of quantum theory, nanoscience its applications

CO5 Gain knowledge on the basics of electromagnetic waves and its properties.

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						1
CO4	3	3	1	1	2	1						
CO5	3	3	1	1	2	1						
CO6	3	3	2	1	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 %**

23ES1111	PROBLEM SOLVING USING C PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To write, test, and debug simple C programs.
- To implement C programs with conditional and looping statement
- To develop applications in C using strings, pointers, functions.
- To implement C programs with structures and union.
- To develop applications in C using file processing
- To develop an application in real time situation

LIST OF EXPERIMENTS

1. Programs using I/O statements and expressions.

2. Programs using decision-making constructs.

3. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)

4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.

5. Check whether a given number is Armstrong number or not?

6. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions
a) if it is a perfect cube
b) if it is a multiple of 4 and divisible by 6
c) if it is a prime number
d) Sort the numbers based on the weight in the increasing order as shown below
<10,its weight>,<36,its weight><89,its weight>

7. Populate an array with height of persons and find how many persons are above the average height.

8. Given a string —a$bcd./fgll find its reverse without changing the position of special characters. (Example input:a@gh%;j and output:j@hg%;a)

9. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.

10. From a given paragraph perform the following using built-in functions:
a) Find the total number of words.
b) Capitalize the first word of each sentence.
c) Replace a given word with another word.

11. a) Sort the list of numbers using Selection sort and insertion sort
b) Sort the list of numbers using pass by reference.

12. a) Search an element from an unsorted array using linear search
b) Search an element in an array using Binary search recursion call.

13. Generate salary slip of employees using structures and pointers.

14. a) Programs using Pointers
    b) Pointer demonstration the use of & and *
    c) Access Elements of an Array Using Pointer
    d) Perform the string operations like Length of the String , Concatenation of string and compare the string using Pointer
    e) Count number of words, digits, vowels using pointers
    f) Add two matrices using Multidimensional Arrays with pointers
    g) Multiply two matrices using pointers
    h) Multiply two numbers using Function Pointers
15. Compute internal marks of students for five different subjects using structures and functions.
16. Program to demonstrate the difference between unions and structures
17. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
18. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
19. **MINI PROJECT**

    Create a —Railway reservation systemll with the following modules
    a) Booking
    b) Availability checking
    c) Cancellation
    d) Prepare chart

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Write, test, and debug simple C programs.

CO2 Implement C programs with conditionals and loops.

CO3 Develop C programs for simple applications making use arrays and strings.

CO4 Develop C programs involving functions, recursion, pointers, and structures and union.

CO5 Design applications using sequential and random access file processing.

CO6 Perform task as an individual and / or team member to manage the task in time

WEB REFERENCES:

1. https://www.programiz.com/c-programming/examples
2. https://beginnersbook.com/2015/02/simple-c-programs/
3. https://www.programmingsimplified.com/c-program-examples
4. https://www.tutorialgateway.org/c-programming-examples/
5. https://www.javatpoint.com/c-programs
6. https://www.tutorialspoint.com/learn_c_by_examples/simple_programs_in_c.html

CO-PO MAPPING

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

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

23TA1101	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT - I LANGUAGE AND LITERATURE 3

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

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

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

UNIT - III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, 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

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

UNIT - I **மொழி மற்றும் இலக்கியம்** **3**

இந்திய மொழிக்குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயசார்பற்றதன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக்கருத்துக்கள் – 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 - சிற்பக்கலை** **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் – தேர்செய்யும் கலை – சுடுமண் சிற்பங்கள் - நாட்டுப்புறத்தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

UNIT - III **நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்** **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

UNIT - IV **தமிழர்களின் திணைக்கோட்பாடுகள்** **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT - V **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்தமிழர்களின் பங்களிப்பு** **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப்புத்தகங்களின் அச்சுவரலாறு.

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 வெளியீடு)
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–(inprint)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute 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 Civilization 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) (Published by: The Author)
11. Porunai Civilization(Jointly Published by: Department of Archaeology &Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by:RMRL)

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 %**

SEMESTER – II

23MA1201	COMPLEX VARIABLES AND LAPLACE TRANSFORM	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

- To solve the linear differential equations with constant coefficients.
- To help the engineering students with vectors as it gives the insight into how to trace along the different types of curves.
- To develop an understanding of the standard technique of a complex variable theory in particular of analytics functions and its mapping property.
- To study complex variable techniques used in a wide areas of engineering.
- To learn Laplace Transform to solve the problems in engineering and technology.

UNIT - I ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients -Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous first order linear differential equations with constant coefficients.

UNIT - II VECTOR CALCULUS 9+3

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration: Green's theorem in a plane - Gauss divergence and Stokes' theorem (excluding proofs) – Simple applications involving cubes, rectangular parallelepiped, sphere and cylinder**.**

UNIT - III ANALYTIC FUNCTIONS 9+3

Functions of a complex variable–Analytic functions -Cauchy-Riemann equations – Necessaryandsufficientconditions–Harmonicandorthogonalpropertiesofanalytic function – Harmonic conjugate – Construction of analytic functions by Milne Thomson method– Conformal mapping: w =z+c,cz,1/z and bilinear transformation.

UNIT - IV COMPLEX INTEGRATION 9+3

Line integrals- Cauchy's integral theorem-Cauchy's integral formula - Singularities – Residues– Cauchy's residue theorem - Taylor's and Laurent's series expansions – Application of residue theorem for evaluation of real definite integrals – Use of circular contour and semi- circular contour (excluding poles on the real axis).

UNIT - V LAPLACE TRANSFORM 9+3

Laplace transform: Sufficient conditions for existence – Transform of elementary functions –Basic properties–Transforms of derivatives and integrals of functions-Derivatives and integrals of transforms - Transforms of unit function, unit step function and UNIT - Impulse functions – Transforms of periodic functions– Initial and final value theorems. Inverse Laplace transforms: Convolution theorem–Solution of linear ODE of second order with constant coefficients using the techniques of Laplace transformation.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Apply various techniques in solving differential equations.

CO2 Identify the gradient, divergence and curl of a vector point function and related identities. Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.

CO3 Understand the concepts of analytic functions, harmonic functions and conformal mapping.

CO4 Determine the types of singularities, residues and contour integration.

CO5 Solve differential equations using Laplace transform.

TEXT BOOKS:

1. Grewal B.S.,- "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition,2018.
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hill Education, India.
3. Bali N., Goyal M. and Walkins C., "Advanced Engineering Mathematics", Firewall.

REFERENCE BOOKS:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John wiley and Sons, 10th Edition, New Delhi.
2. Sastry, S.S, "Engineering Mathematics", Vol.I& II, PHI LearnigPvt. Ltd, 4th Edition, New Delhi, 2014.
3. Wyile, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt Ltd, 6thEdition, New Delhi, 2012.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
5. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt. Ltd, New Delhi, 2007.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma69
2. https://onlinecourses.nptel.ac.in/noc21_ma57

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

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 %

23EC1201	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the working of PN junction diode.
- To study the basic working of BJT.
- To gain knowledge on FET.
- To acquaint the knowledge on special semiconductor and power devices.
- To know the operation of optical devices.

UNIT - I SEMICONDUCTOR DIODE 9

PN junction behavior, PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.
Characteristics of PN diode using simulation tool.

UNIT - II BIPOLAR JUNCTION TRANSISTORS 9

NPN -PNP - Operations-Early effect -Current equations – Input and Output characteristics of CE, CB, CC - h-parameter model, Ebers Moll Model, Multi Emitter Transistor. Case studies.
Characteristics of BJT using simulation tool.

UNIT - III FIELD EFFECT TRANSISTORS 9

JFETs – Drain and Transfer characteristics, -Current equations -Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E- MOSFET- Characteristics – Comparison of MOSFET with JFET.
Characteristics of JFET and MOSFET using simulation tool.

UNIT - IV SPECIAL SEMICONDUCTOR DEVICES AND POWER DEVICES 9

Semiconductor Devices: Metal-Semiconductor Junction- MESFET, DUAL GATE MOSFET, Zener diode-Varactor diode - Gallium Arsenide device, LDR.
Power Devices: UJT, SCR, Diac, Triac, Power BJT.
Characteristics of Zener diode, UJT, and SCR using simulation tool.

UNIT - V OPTICAL DEVICES 9

Optical absorption, solar cells, Photodetector, Photoluminescence, electroluminescence, Photo transistor, Opto- Coupler, LCD, CCD.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Understand the V − I characteristics of semiconductor diode.
CO2 Classify the configurations of BJT and understand its equivalence circuits.
CO3 Explain the drain – transfer characteristics of FET.
CO4 Illustrate the concepts of special semiconductor devices.
CO5 Explain the concepts of power devices.
CO6 Outline the operation of optical devices.

TEXT BOOKS:

1. Donald A Neaman, —Semiconductor Physics and Devicesǁ, Fourth Edition, Tata Mc Graw Hill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, —Electronic Devices and circuits, Third Edition, Tata McGraw- Hill, 2008.

REFERENCE BOOKS:

1. Robert Boylestad and Louis Nashelsky, —Electron Devices and Circuit Theory Pearson Prentice Hall, 10th edition, July 2008.
2. R.S.Sedha, — A Text Book of Applied Electronics Chand Publications, 2006.
3. Yang, —Fundamentals of Semiconductor devices, McGraw Hill International Edition.

WEB REFERENCES:

1. https://www.digimat.in/nptel/courses/video/108101091/L01.html

CO-PO MAPPING

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

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 %**

23ES1201	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To know the basic programming constructs and control structures in python
- To use python data structures – Lists, Tuples and Dictionary
- To define Python functions and use Strings
- To learn about input/output with files in Python.
- To understand python packages and GUI concepts

UNIT - I INTRODUCTION TO PYTHON PROGRAMMING AND CONTROL STRUCTURES 9

Introduction to Python, Demo of Interactive and script mode, Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions, Type Casting. Illustrative problems: find minimum in a list, guess an integer number in a range, Towers of Hanoi.

Control Structures: Selective statements – if, if-else, nested if, if – elif ladder statements ; Iterative statements - while, for, range functions, nested loops, else in loops, break, continue and pass statements. Illustrative programs: exchange the values of two variables,circulate the values of n variables, distance between two points.

UNIT - II FUNCTIONS AND STRINGS 9

Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion and Lambda functions.Illustrative programs:power of a number,sorting,Fibonacci series using lambda.

Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions, Regular expression: Matching the patterns, Search and replace. Illustrative programs:check whether the string is symmetrical,reverse a string,length of a string.

UNIT - III COLLECTIONS 9

List: Create, Access, Slicing, Negative Indices, List Methods, and comprehensions

Tuples: Create, Indexing and Slicing, Operations on tuples.

Dictionary: Create, add, and replace values, operations on dictionaries.

Sets: Create and operations on set.

Illustrative programs: Interchange first and last element in a list,maximum and minimum N elements in a tuple, sort dictionary by key or value, size of a set.

UNIT - IV FILES AND EXCEPTION HANDLING 9

Files: Open, Read, Write, Append and Close. Tell and seek methods. Illustrative programs: word count, copy file. Command line arguments, Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined Exceptions, Defining Clean-Up actions. Illustrative programs: prompt the user to input an integer and raises a ValueError exception if the input is not a valid integer, open a file and handles a FileNotFoundError exception if the file does not exist, prompt the user to input two numbers and raises a TypeError exception if the inputs are not numerical, executes an operation on a list and handles an IndexError exception if the index is out of range.

UNIT - V **PACKAGES & GUI** **9**

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. Illustrative programs:create a pandas series using numpy, make a pandas dataframe with 2D list.

GUI Programming: Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples. Python programming with IDE. Illustrative programs: create a GUI mark sheet, calendar, file explorer using Tkinter.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

- **CO1** Develop and execute simple Python programs using conditionals and loops for solving problems.
- **CO2** Express proficiency in the handling of strings and functions
- **CO3** Represent compound data using Python lists, tuples, dictionaries, sets, etc.,
- **CO4** Read and write data from/to files and handle exceptions in Python programs
- **CO5** Implement python packages in data analysis and design GUI
- **CO6** Examine various problem solving concepts in python to develop real time applications.

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. ReemaThareja,”Problem Solving and Programming with Python’’, 2nd edition, Oxford University Press, New Delhi, 2019.
3. Alan D. Moore, Python GUI Programming with Tkinter, Design and Build Functional and User-friendly GUI Applications, Packt Publishing, 2021.

REFERENCE BOOKS:

1. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
2. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018
3. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.

ONLINE COURSES / RESOURCES:

1. https://docs.python.org/3/tutorial/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.javatpoint.com/python-tutorial
5. https://nptel.ac.in/courses/

CO-PO MAPPING

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

23HS1201	COMMUNICATIVE AND APTITUDE SKILLS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

- To develop linguistic and strategic competence in workplace context and to enhance language proficiency and thereby the employability of budding engineers and technologists.
- To improve the relevant language skills necessary for professional communication.
- To help learners to develop their listening skills, which will, enable them to listen to lectures and comprehend them by asking questions; seeking clarification and developing their speaking skills and to speak fluently in real contexts.
- To improve the verbal ability skill and communicative skill of the students.
- To enhance the analytical and problem solving skills of the students.
- To prepare them for various public and private sector exams & placement drives.

UNIT - I INTERPERSONAL COMMUNICATION 6

Listening: Listening to Telephone Etiquettes and Conversations. **Speaking**: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks. **Reading**: Reading the Interview of an Achiever and Completing Exercises (Skimming, Scanning and Predicting). **Writing**: Writing a Short Biography of an Achiever Based on Given Hints, **Grammar**: Comparative Adjective, Numerical Expressions and Sentence pattern. **Vocabulary Development**: Idioms and Phrases

UNIT - II TECHNICAL COMMUNICATION 6

Listening: Listening to Talks/Lectures Both General and Technical and Summarizing the Main Points. **Speaking**: Participating in Debates, TED Talks. **Reading**: Reading Technical Essays/ Articles and Answering Comprehension Questions. **Writing**: Summary Writing, Minutes of the meeting. **Grammar**: Prepositional Phrases and Relative Clauses. **Vocabulary Development:** Abbreviations and Acronyms.

UNIT - III PROCESS DESCRIPTION 6

Listening: Listening to a Process Description and Drawing a Flowchart. **Speaking**: Participating in Group Discussions, Giving Instructions, Presentation. **Reading**: Reading Instruction Manuals **Writing**: Process Descriptions – Writing Instructions **Grammar**: Use of Imperatives, Tenses, Impersonal Passive Voice and Phrasal verbs **Vocabulary Development**: Misspelt words. Homophones and Homonyms.

UNIT - IV REPORT WRITING 6

Listening: Listening to a Presentation and Completing Gap-Filling Exercises. **Speaking**: Making Formal Presentations, **Reading**: Reading and Interpreting Charts/Tables and diagrams. **Writing**: Interpreting Charts/Tables and Diagrams, Writing a Report. **Grammar**: Reported Speech; Interrogatives- Question Tags and Articles – omission of articles **Vocabulary Development**: Technical Jargon

UNIT - V **INTERVIEW SKILLS** **6**

Listening: Listening to a Job Interview and Completing Gap-Filling Exercises **Speaking**: Mock Interview, Telephone Interviews & Etiquette, and Group Discussion .**Reading:** Reading a Job Interview, SOP, Company Profile and Completing Comprehension Exercises **Writing**: Job Applications and Resume. **Grammar**: Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement. **Aptitude Skills: Ratio and Proportion** – Ratio, Proportion, Simple equations, Problems on Ages. **Percentages** - Percentages increase/decrease, Simple and Compound interest. **Number system -** Factors, Multiples - HCF and LCM. **Permutation** - Combination and Probability

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Board of Editors. English for Engineers and Technologists Volume 2 Orient Black Swan Limited, 2020
2. Richards, C. Jack. Interchange, New Delhi: CUP, 2017
3. Aggarwal R.S, Quantitative Aptitude for Competitive Examinations 3rd (Ed.) New Delhi: S.Chand Publishing, 2017.

REFERENCE BOOKS:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
3. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
4. Sharma Arun, Quantitative Aptitude, 7th (Ed.). Noida: McGraw Hill Education Pvt. Ltd., 2016.

WEB REFERENCES:

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabularyexams/word-formation.
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018.
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.html.
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/
5. https://www.math-only-math.com/practice-test-on-ratio-and-proportion.html
6. https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php

ONLINE COURSES / RESOURCES:

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions
5. https://www.classcentral.com/course/quantitative-methods-4340
6. https://www.classcentral.com/subject/qualitative-research

LIST OF EXPERIMENTS

1. Speaking- sharing personal information- self introduction
2. Speaking- Group Discussion, Small talk or Peb Talk
3. Speaking- Presentation- Formal and Informal
4. Speaking- Mock Interview
5. Speaking- FAQ's on Job Interview
6. Speaking – JAM
7. Speaking- Debate and Story Narration
8. Writing: Error Detection- Spotting and reasoning the errors from the passages in competitive exams.
9. Writing: Letter of recommendation
10. Writing: Elements of a good essay
11. Writing: Types of essays. Descriptive – Narrative-Issue based.

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

- **CO1** Recognise the need for life skills; apply them to different situations, the basic communication practices in different types of communication.
- **CO2** Gain confidence to communicate effectively in various situations to acquire employability skills.
- **CO3** Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
- **CO4** Communicate effectively & appropriately in real life situation and enhance student's problem solving skill.
- **CO5** Prepare for various public and private sector exams & placement drives.
- **CO6** Enhance students' problem solving skills.

REFERENCE BOOKS:

1. Kumar, Suresh. E., Engineering English, Orient lackswan:Hyderabad,2015.
2. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
5. Sharma Arun, Quantitative Aptitude, 7th (Ed.). Noida: McGraw Hill Education Pvt. Ltd.,2016.

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

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 %**

23ES1204	BASIC ELECTRICAL CIRCUITS AND ENGINEERING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVE:

- To learn the basic concepts and behaviour of DC and AC circuits.
- To understand various methods of circuit/ network analysis using network theorems.
- To impart knowledge in types, construction and working of Electrical machines
- To introduce the functional elements and working of measuring instruments
- To understand the concepts of Solar PV system &Hybrid Electric Vehicle.

UNIT - I BASIC CIRCUITS ANALYSIS 9

Basic Components of electric Circuits, Ohms Law, Kirchoff's Law, Resistors in Series and Parallel, Voltage and current division, Nodal analysis, Mesh analysis.

UNIT - II NETWORK THEOREMS AND TWO PORT NETWORK 9

Thevenin's and Norton's Theorems – Superposition Theorem – Maximum power transfer theorem – Two port Parameter: Z,Y and h parameters

UNIT - III ELECTRICAL MACHINES 9

Principles and operation, characteristics of DC Motors, DC Generators, Single Phase Transformer, single phase induction Motor.

UNIT - IV MEASUREMENTS & INSTRUMENTATION 9

Functional elements of an instrument, Standards and calibration, Operating Principle , types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT,DSO- Block diagram- Data acquisition

UNIT - V SOLAR PV SYSTEM AND ELECTRIC VEHICLE 9

Solar PV system- Introduction-Comparison with Electrical and Hybrid Electrical vehicle-Construction and working of PHEV-Block diagram and components-Charging mechanisms-Advantages of PHEVs- Solar and Battery powered Electric Vehicle

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis",McGraw Hill education, 9th Edition, 2018.
2. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
3. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, First edition 2017.
4. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & 49 Instrumentation', DhanpatRai and Co, New Delhi, 2015

REFERENCE BOOKS:

1. Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, Fourth Edition, McGraw Hill Education, 2019.
2. Joseph Edminister and MahmoodNahvi, —Electric Circuits, Schaum‘s Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016
3. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
4. Mehrdad Ehsani, Yimin Gao, Sebastian E. Gay, Ali Emadi, 'Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design', CRC Press, 2004.
5. Chakrabarti A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai& Sons, New Delhi, 1999.

WEB REFERENCES:

1. https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/
2. https://library.automationdirect.com/basic-electrical-theory/

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee90/preview
2. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

LIST OF EXPERIMENTS

1. Electrical House Wiring:
   (i)Residential house wiring using switches, fuse, indicator, lamp and energy meter.
   (ii)Fluorescent lamp wiring.
   (iii)Stair case wiring
   (iv)Study of Home Appliances- wiring and assembly
   (v)Study of Protective Devices
2. Measurement of electrical quantities – voltage, current, power, &power factor in RLC circuit.
3. (i)Study of Electronic components and equipment’s – Resistor color coding
   (ii)Soldering practice – Components Devices and Circuits – Using general purpose PCB.
4. Experimental verification of Kirchhoff’s current and voltage law
5. Simulation and Experimental verification of Thevenin’s and Norton's theorem
6. Simulation and Experimental verification of Superposition theorem
7. PCB design using Suitable Software.

SOFTWARE REQUIRED: MATLAB, Fusion 360

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Apply the basic concepts of circuit analysis such as Kirchoff's laws, mesh current and node voltage method for analysis of DC and AC circuits.

CO2 Apply network theorems to analyse AC and DC circuits

CO3 Explain the Construction and working of DC machines.

CO4 Understand the construction and working principle of Ac Machines

CO5 Explain the types and operating principles of measuring instruments

CO6 Illustrate the concepts related in the solar PV system and Hybrid Electric Vehicles

CO-PO MAPPING

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

23EC1211	CIRCUITS AND DEVICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To learn the characteristics of basic electronic devices.
- To learn the characteristics of transistors and SCR
- To design RL, RC and RLC circuits
- To understand Thevenin & Norton theorem KVL & KCL, and Super Position Theorems.
- To demonstrate the characteristics of semiconductor devices using a simulation software.

LIST OF EXPERIMENTS

1. Characteristics of PN Junction Diode
2. Characteristics of Zener diode & Zener diode Load Regulation
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Observe Transistor as an Electronic Switch
8. V-I Characteristics of UJT
9. Characteristics of LDR, Photo Diode and Photo Transistor
10. Characteristics of TRIAC and DIAC
11. Characteristics of LED

Demonstration: Characteristics of semiconductor devices like PN diode, Zener diode, BJT, FET, and SCR using a simulation tool.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Understand the characteristics of electronic devices.

CO2 Understand the behaviour of the transistors, UJT and SCR.

CO3 Design and analyse the characteristics of RL, RC and RLC circuits.

CO4 Analyze the characteristics of LED, LDR, Photo Diode and Photo Transistor.

CO5 Analyze the characteristics of TRIAC and DIAC.

CO6 Demonstration of simulated semiconductor devices and compare the characteristics.

REFERENCE BOOKS:

1. H. Hayt, Jr. Jack E. Kemmerly and steven M. Durbin, “Engineering Circuit Analysis”, McGraw Hill Science Engineering, Eighth Edition, 11th Reprint ,2016.
2. Donald A Neaman, “Semiconductor Physics and Devices”, Tata McGrawHill Inc. 2012.
3. Robert Boylestad and Louis Nashelsky, -Electron Devices and Circuit Theory Pearson prentice Hall,10th edition, July 2008.

CO-PO MAPPING

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

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

23ES1211	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To write, test, and debug simple Python programs
- To implement Python programs with conditions and loops
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples, dictionaries.
- To learn to implement string functions and file operations
- To understand python packages and GUI development.

LIST OF EXPERIMENTS

1. Basic Python Programs
2. Write programs to demonstrate different number data types in python
3. Develop python programs to demonstrate various conditional statements
4. Implement user defined functions using python
5. Develop python scripts to demonstrate built-in functions
6. Develop python programs to perform various string operations like slicing, indexing & formatting
7. Develop python programs to perform operations on List & Tuple
8. Demonstrate the concept of Dictionary with python programs
9. Develop python programs to perform operations on Sets.
10. Develop python codes to perform matrix addition, subtraction and transpose of the given matrix
11. Develop python codes to demonstrate the concept of function composition and anonymous functions.
12. Demonstrate python codes to print try, except and finally block statements
13. Implement python programs to perform file operations
14. Write a python code to raise and handle various built in exceptions.
15. Implement python programs using packages numpy and pandas
16. UI development using tkinter

Mini Project :Suggested Topics(but not limited to)

- Dice roll simulator
- Guess the number game
- Random password generator

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Develop and execute simple Python programs

CO2 Implement programs in Python using conditionals and loops for solving problems.

CO3 Deploy functions to decompose a Python program.

CO4 Develop programs using string operations.

CO5 Utilize Python packages in data analysis

CO6 Create GUI for python applications

WEB REFERENCES:

1. https://www.programiz.com/python-programming/examples
2. https://www.geeksforgeeks.org/python-programming-examples/
3. https://beginnersbook.com/2018/02/python-programs/
4. https://www.javatpoint.com/python-programs
5. https://www.w3schools.com/python/python_examples.asp

CO-PO MAPPING

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

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

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.

REFERENCE 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/

CO-PO MAPPING

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

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

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 - Archaeological evidences - Gem stone types described in Silappathikaram.

UNIT - IV AGRICULTUREAND 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

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

UNIT - I **நெசவு மற்றும் பானைத்தொழில்நுட்பம்** **3**

சங்க காலத்தில் நெசவுத்தொழில் - பானைத்தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

UNIT - II **வடிவமைப்பு மற்றும் கட்டிடத்தொழில்நுட்பம்** **3**

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு – சங்ககாலத்தில் கட்டுமானப்பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச்சிற்பங்களும், கோவில்களும் – சோழர்காலத்துப்பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் – நாயக்கர் காலக்கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாடு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசோனிக்கட்டிடக்கலை.

UNIT - III **உற்பத்தி தொழில்நுட்பம்** **3**

கப்பல் கட்டும்கலை - உலோகவியல் - இரும்புத்தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடிமணிகள் - சுடுமண்மணிகள் - சங்குமணிகள் - எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

UNIT - IV **வேளாண்மை மற்றும் நீர் பாசனத்தொழில்நுட்பம்** **3**

அணை, ஏரி, குளங்கள், மதகு – சோழர் காலக்குமிழித்தூம் பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச்சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு - மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார்சமூகம்.

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

அறிவியல்தமிழின் வளர்ச்சி - கணினித்தமிழ் – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ்மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக்கல்விக்கழகம் – தமிழ்மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத்திட்டம்.

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 வெளியீடு)
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– (inprint)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute 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 Civilization 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) (Published by: The Author)
11. Porunai Civilization(Jointly Published by: Department of Archaeology &Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by:RMRL)

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 %**

SEMESTER – III

23MA1302	LINEAR ALGEBRA AND NUMERICAL ANALYSIS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

- To understand the concepts of vector space and Sub space.
- To understand the concepts of linear Transformations and diagonalization.
- To apply the concept of inner product spaces in orthogonalization.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.

UNIT - I VECTOR SPACES 9+3

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT - II LINEAR TRANSFORMATION AND DIAGONALIZATION 9+3

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of a linear transformation – Eigen values and eigenvectors – Diagonalizability.

UNIT - III INNER PRODUCT SPACES 9+3

Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

UNIT - IV SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations: Fixed point theorem (without proof)– Newton Raphson method - Solution of linear system of equations : Gauss elimination and Gauss Jordan method - Iterative methods of Gauss Jacobi and Gauss Seidel method – Eigen values of a matrix by Power method.

UNIT - V INTERPOLATION AND APPROXIMATION 9+3

Interpolation with unequal intervals: Lagrange's interpolation – Newton’s divided difference interpolation - Interpolation with equal intervals: Newton’s forward and backward difference formulae- Numerical Differentiation using interpolation formulae.

TOTAL: 60 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Understand the concepts of vector space.

CO2 Demonstrate the matrix techniques in solving the linear transformations.

CO3 Construct orthonormal basis by the concepts of normalization.

CO4 Apply the concept of inner product spaces in orthogonalization.

CO5 Understand the basic concepts and techniques of solving algebraic and transcendental equations.

CO6 Apply the numerical techniques of interpolation and approximations in various intervals in real life situations.

TEXT BOOKS:

1. Friedberg, A.H., Insel, A.J. and Spence, L., —Linear Algebra, Prentice Hall of India, New Delhi, 2015.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers,10th Edition, New Delhi, 2015.
3. Kumaresan, S., —Linear Algebra – A Geometric Approach, Prentice – Hall of India, New Delhi, Reprint, 2010.
4. Kandasamy, P., Thilagavathy, K.,andGunavathy,S., 'Numerical Methods', Chand and Co.,2016.

REFERENCE BOOKS:

1. Kolman, B. Hill, D.R., —Introductory Linear Algebrall, Pearson Education, New Delhi,First Reprint, 2013.
2. Lay, D.C., —Linear Algebra and its Applicationsll, 5th Edition, Pearson Education, 2015.
3. Burden, R.L. and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
4. Sundarapandian, V. —Numerical Linear Algebrall, Prentice Hall of India, New Delhi, 2008.

WEB REFERENCES:

1. https://nptel.ac.in/courses/111/107/111107063/
2. https://nptel.ac.in/courses/111/107/111107105/

CO-PO MAPPING

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

23EC1301	SIGNALS AND SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the basic properties of signals and systems.
- To practice Fourier and Laplace transforms for continuous time signals.
- To explain an LTI continuous time system in time and frequency domain.
- To illustrate discrete time signals from the Fourier and Z domains.
- To analyze LTI discrete time systems in time domain and frequency domain.

UNIT - I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Standard signals: Step, Ramp, Pulse, Impulse, Real and complex exponentials, and Sinusoids - Classification of signals: Continuous time (CT) and Discrete Time (DT) signals, Periodic &Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems: CT systems and DT systems, Static & Dynamic, Causal & Non-causal, Linear & Nonlinear, Time variant & Time invariant, Stable & Unstable.

UNIT - II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier Series of standard periodic signals: Sine, Cosine, Sawtooth and Square wave - Analysis of Continuous Time Signals: Fourier Transform, Properties of FT, Inverse FT, Laplace Transform, Unilateral LT and Bilateral LT, Properties of Unilateral LT - Inverse LT. Case study: Application of FS and FT- Filter, Modulation.

UNIT - III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Impulse response - convolution integral – Graphical method - Properties of convolution integral-Overall impulse response for interconnected systems - Fourier and Laplace transforms in analysis of CT systems - Solving of Differential Equation.

UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband signal sampling - notion of aliasing with examples, Analysis of Discrete Time Signals: Discrete Time Fourier Transform (DTFT), Properties of DTFT, Inverse DTFT-Analysis of Discrete Time Signals: Z Transform, Properties of Z Transform, Inverse Z Transform.

UNIT - V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Impulse response - Convolution sum - Graphical method - Properties of Discrete Convolution - Overall impulse response for interconnected systems - Solving of Difference equations - Solution of Difference equation using DTFT- Solution of difference equation using Z-transform.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Understand the basics of signals and its classifications

CO2 Explain the basic systems and its classifications

CO3 Apply Fourier and Laplace transforms for continuous time signals

CO4 Use the Fourier and Laplace Transform for the analysis of CT- LTI systems

CO5 Analyze the Characteristics of DT signals using DTFT and Z- Transform

CO6 Investigate the DT- LTI systems using Fourier and Z- Transform

TEXT BOOKS:

1. Signals & Systems, Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, 2nd Ed., Pearson Education, 2013.
2. B.P.Lathi,“Principles of Linear Systems and Signals”,Second Edition,Oxford,2009.

REFERENCE BOOKS:

1. S. Haykin and B. Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2003.
2. R.E. Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3. Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.

WEB REFERENCES:

1. http://www.nptelvideos.in/2012/12/signals-and-system.html
2. https://freevideolectures.com/course/3177/signals-and-systems

ONLINE COURSES / RESOURCES:

1. https://www.edx.org/course/signals-and-systems-part-1
2. https://www.edx.org/course/signals-and-systems-part-2

CO-PO MAPPING

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

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 %**

23EC1302	ELECTRONIC CIRCUITS I	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To study Biasing concepts of Bipolar Junction Transistor
- To analyse the construction and operation of Field Effect Transistor
- To discuss the small scale and hybrid models of BJT and FET
- To derive and determine frequency response of BJT amplifiers
- To understand the concepts of short and narrow channel effects in MOSFET

UNIT - I BIASING OF BIPOLAR JUNCTION TRANSISTORS 9

BJT– Need for biasing – DC load line and Bias point – Various biasing methods of BJT – Bias circuit design – Thermal stability – Stability factors – Bias compensation techniques using Diode, thermistor and sensistor.

UNIT - II JFET AND MOSFET 9

Construction and operation of JFET and MOSFET – MOSFET as an amplifier and as a switch – Biasing in MOS Amplifier Circuits – Noise performances of JFET and MOSFET – Parasitic capacitance effect of MOSFET – FET voltage variable resistor and active load.

UNIT - III BJT AND FET AMPLIFIERS 9

Analysis of CE, CC and CB amplifiers using small scale and hybrid π equivalent circuits – Early effect of small scale signal analysis – Darlington amplifier – Cascade and cascode configurations – MOSFET small signal model – Analysis of CS, CG and Source follower.

UNIT - IV FREQUENCY RESPONSE OF BJT AMPLIFIER 9

Low and High Frequency response of transistor amplifiers – Miller effect – Short circuit current gain – cut off frequency – fα, fβ and unity gain bandwidth.

UNIT - V SHORT AND NARROW CHANNEL EFFECTS IN MOSFETS 9

Velocity saturation from horizontal field – Mobility degradation from the vertical field – Weak Inversion in MOS Transistors – Transistor frequency in weak inversion – Narrow & Short Channel Effects in MOSFETs.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

- **CO1** Understand the biasing concepts of transistors
- **CO2** Remember the working principles of FET
- **CO3** Analyse the performance of small signal equivalent circuits
- **CO4** Identify the operations of cascade and cascode configurations
- **CO5** Evaluate high and low frequency response of amplifiers
- **CO6** Classify the operation of short and narrow channels in MOSFET

TEXT BOOKS:

1. S Salivahanan and N Suresh Kumar, Electronic Devices and Circuits, 5th Edition, Mc Graw Hill Education (India) Private Ltd., 2022.

2. Donald .A. Neamen, Electronic Circuit Analysis and Design – 2nd Edition, Tata Mc Graw Hill, 2009.

REFERENCE BOOKS:

1. Robert Boylestad and Louis Nashelsky, Electron Devices and Circuit Theory, Printice Hall Publications, 11th Edition , 2015.
2. Millman and Halkias, Electronic devices and circuits, 2nd Edition, McGraw Hill Publication, 2007.
3. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
4. David A.Bell, Electronic Devices and Circuits, Oxford Higher Education Press, 5th Edition, 2010.
5. S.M.Kang & Y.Leblibici, CMOS Digital Integrated Circuits-Analysis & Design, 3rd Edition, Tata Mc Graw Hill, 2011.

WEB REFERENCES:

1. https://link.springer.com/chapter/10.1007/0-387-37766-2_14.
2. https://www.sciencedirect.com/topics/physics-and-astronomy/junction-transistor1.

ONLINE COURSES / RESOURCES:

1. https://www.coursera.org/learn/transistor-field-effect-transistor-bipolar-junction-transistor
2. https://rkthenua.in/electronics-engineering/
3. https://ekeeda.com/degree-courses/electrical-engineering/electronic-devices-and-circuits
4. https://www.udemy.com/course/moseft-transistor-the-complete-course-for-beginners/
5. https://pdfkeys.com/download/2537297-Electronic-Circuits-Ii-By-S-Ramalatha.pdf
6. https://www.ee.iitm.ac.in/videolectures/doku.php?id=ec3102_2012a:start

CO-PO MAPPING

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

23EC1303	DIGITAL ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To define the fundamentals in logical minimization methods
- To explain the concept of combinational circuits using logic gates.
- To design Synchronous Sequential Circuits
- To design Asynchronous Sequential Circuits
- To analyze and examine the concepts of Programmable Logic Devices and Digital Integrated Circuits

UNIT - I BOOLEAN ALGEBRA AND MINIMIZATION METHODS OF LOGIC CIRCUITS 9

Introduction to Binary Addition and Subtraction, different type of codes, boolean theorems and postulates, logic gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Quine - McCluskey method of minimization.

UNIT - II DESIGN OF COMBINATIONAL CIRCUITS 9

Design of Half and Full Adders, Half and Full Subtractors, binary Parallel Adder, carry look ahead adder. Code Converter, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT - III ANALYSIS AND DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops: SR, JK, T, D, Master/Slave FF, operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits, design of Moore and Mealy models, state minimization, state assignment, and circuit implementation. Design of Counters, Ripple Counters, Ring Counters, Shift registers.

UNIT - IV ANALYSIS AND DESIGN OF ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Analysis and Design of Asynchronous sequential circuits - State reduction, race free assignments, Hazards, Essential Hazards. Design of Hazard free circuits, cycles and races.

UNIT - V PROGRAMMABLE LOGIC DEVICES AND DIGITAL INTEGRATED CIRCUITS 9

Programmable Logic Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Implementation of combinational logic circuits using PLA and PAL, Sequential Programming Logic Device. Architecture of Field Programmable Gate Array, Complex Programmable Logic Device,Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, Logic families and their characteristics: TTL and CMOS

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Define the Boolean theorems and laws for logic circuit simplifications

CO2 Infer the combinational circuits using logic gates

CO3 Apply the knowledge of designing the synchronous sequential circuits

CO4 Apply the knowledge of designing the asynchronous sequential circuits

CO5 Analyze the various Programming Logic Devices

CO6 Examine the Digital Integrated Circuits in the design of logic gates

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, 6th Edition, Pearson, 2018.
2. Charles H.Roth. "Fundamentals of Logic Design", 7th Edition, Thomson Learning, 2014.

REFERENCE BOOKS:

1. Thomas L.Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2018.
2. Leach, Malvino and Saha “Digital Principles and Applications”, McGraw Hill Education, 8th Edition, 2014.
3. Ronald J. Tocci, Neal S. Widmer and Gregory L. Moss, “Digital Systems: Principles and Applications”, 12th Edition, Pearson Education, 2017.
4. Soumitra Kumar Mandal, "Digital Electronics", Mc Graw Hill Education Private Limited, 2016.
5. Dr. P. Kannan, M. Saraswathi, “Digital Electronics”, Sree Kamalamani Publication, 2nd Edition, 2017.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee10/preview

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3	2									
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 %**

23EC1304	CONTROL SYSTEMS ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To define the fundamentals of various mathematical models of physical systems.
- To explain the concept of various time domain parameters.
- To design various frequency response plots and its system.
- To design different compensation techniques required for the systems.
- To analyse and examine the concepts of various system stability criterions and state variable analysis methods.

UNIT - I MATHEMATICAL MODEL OF PHYSICAL SYSTEMS 9

Basic components of a control system - Feedback and its effect - Types of feedback control systems - Modelling of Physical systems: Electrical and Mechanical transfer function models - free body diagram - Analogous Systems - Armature controlled and Field controlled DC motor - Block diagram reduction - Signal flow graphs

UNIT - II TIME RESPONSE ANALYSIS 9

Time response: Time domain specifications – Types of test input – I and II order system response - effect on an additional zero and an additional pole - Steady-State error - Static error coefficients - Error analysis for different types of systems - Effects of PI, PD, PID control systems

UNIT - III FREQUENCY RESPONSE ANALYSIS 9

Closed loop frequency response - Performance specification in frequency domain - Frequency response of standard second order system - Bode Plot - Polar Plot - Nyquist plots – Effect of Lag, Lead and Lag-Lead compensation on frequency response using Bode Plots

UNIT - IV STABILITY ANALYSIS 9

Concepts of stability – Bounded-Input Bounded-Output stability (BIBO) - Routh Hurwitz criterion - Relative stability - Root locus concept - Guidelines for sketching root locus - Nyquist stability criterion

UNIT - V ANALYSIS OF STATE VARIABLE METHODS 9

State variable representation - Conversion of state variable models to transfer functions - Conversion of transfer functions to state variable models - Solution of state equations - Concepts of Controllability and Observability - Stability of linear systems - Equivalence between transfer function and state variable representations

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Define the various mathematical models of physical systems.

CO2 Interpret the various system using time domain specifications.

CO3 Infer the various system using frequency domain specifications.

CO4 Apply the knowledge of different compensation techniques required for the systems.

CO5 Analyze the concepts of stability of the system using RH and Nyquist methods.

CO6 Examine the concepts of various state variable analysis methods.

TEXT BOOKS:

1. J. Nagrath and M. Gopal, “Control System Engineering”, New Age International Publishers, 6th Edition, January 2017.
2. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012.

REFERENCE BOOKS:

1. A. Nagoor Kani, “Control System Engineering”, CBS Publication and Distributors, 2020.
2. Richard C. Dorf, Robert H. Bishop, “Modern Control System”, Pearson, 13th Edition, 2016.
3. Benjamin.C.Kuo, “Automatic Control Systems”, Prentice Hall of India, 9th Edition, 2010.
4. S.K.Bhattacharya, “Control System Engineering”, Pearson, 3rd Edition, 2013.
5. K.Ogata, “Modern Control Engineering”, PHI, 5th Edition, 2012.

WEB REFERENCES:

1. https://ctms.engin.umich.edu/CTMS/index.php?example=Introduction&section=SystemModeling
2. https://reference.wolfram.com/language/guide/ControlSystems.html

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/107106081/
2. https://www.coursera.org/learn/modeling-feedback-systems
3. https://www.udemy.com/topic/control-systems

CO-PO MAPPING

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

23EC1311	ELECTRONIC CIRCUITS AND SIMULATION LABORATORY I	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE

- To analyse the biasing amplifier circuits.
- To learn the frequency response of BJT and CS Amplifiers.
- To demonstrate h-parameters with transistor configurations.
- To determine feedback amplifiers and oscillators.
- To illustrate the frequency response of cascade and cascode amplifiers.
- To recognize the characteristics of CE and CS amplifiers using PSPICE.

LIST OF EXPERIMENTS

1. Fixed bias common emitter amplifier circuit.
2. Frequency response of Common base amplifier circuit.
3. Common collector amplifier with voltage divider bias.
4. Measurement of h-parameters of transistor in
   a) Common base configuration
   b) Common emitter configuration
   c) Common collector configuration
5. Frequency response of FET CS amplifier.
6. MOSFET CS amplifier and buffer circuit.
7. Frequency response of cascade amplifier.
8. Frequency response of cascode amplifier.
9. CMRR measurement of differential amplifier.
10. Voltage gain and bandwidth of narrow band amplifier.
11. Voltage gain and bandwidth of wide band amplifier.
12. **SIMULATION USING PSPICE**
    a) Common emitter amplifier
    b) Common source amplifier

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

- **CO1** Analyse the characteristics of amplifiers.
- **CO2** Classify the parameters of amplifier circuits.
- **CO3** Illustrate the operation of cascade and cascode amplifiers.
- **CO4** Identify the characteristics of differential amplifier.
- **CO5** Determine the voltage gain and bandwidth of narrow and wide band amplifiers.
- **CO6** Recognize amplifiers using PSPICE Tool.

WEB REFERENCES

1. https://www.circuitlab.com/
2. https://wiki.analog.com/university/labs/circuits
3. https://www.falstad.com/circuit/
4. https://www.sciencedirect.com/topics/physics-and-astronomy/junction-transistor1.

5. https://www.javatpoint.com/c-programs
6. https://digilent.com/reference/test-and-measurement/guides/complementary-labs/lab1/start

CO-PO MAPPING

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

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

23EC1312	CONTROL SYSTEMS ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE

- To identify different toolboxes and understand the basics operations used in MATLAB.
- To infer the transfer function and the output responses of control system.
- To compute the steady state errors of the given system.
- To analyze the time and frequency response the given system.
- To evaluate the output responses of different controllers.

LIST OF EXPERIMENTS

1. To study the basic of MATLAB and introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Determine the transfer function for given closed loop system in block diagram representation.
4. Determine the time response of the closed and open loop system.
5. Plot the pole-zero configuration in s-plane for the given transfer function.
6. Plot unit step response of given transfer function and determine delay time, rise time, peak time and peak overshoot.
7. Determine the steady state errors of a given transfer function.
8. Determine the time response of given system subjected to any arbitrary input.
9. Plot bode plot for the given transfer function. Also determine the relative stability by measuring gain and phase margins.
10. Plot polar plot for the given transfer function. Also determine the relative stability by measuring gain and phase margins.
11. Plot root locus of given transfer function, locate closed loop poles for different values of k.
12. For the given transfer function, obtain the response of the system using P, PI, PD and PID controllers.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Understand the basics of control systems tools used in MATLAB.
CO2 Identify the responses of open loop and closed loop system.
CO3 Simulate the given system to determine the steady state errors.
CO4 Analyze the response of the system using arbitrary inputs.
CO5 Analyze the system stability using frequency response of the system.
CO6 Choose the suitable controller based on the system response.

WEB REFERENCES

1. https://www.mathworks.com/matlabcentral/fileexchange/73716-implementation-of-control-system-experiments-in-matlab?s_tid=FX_rc2_behav
2. https://www.worldscientific.com/worldscibooks/10.1142/9260#t=aboutBook.
3. https://ctms.engin.umich.edu/CTMS/index.php?aux=Home.

CO-PO MAPPING

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

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

23ES1312	CODING 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 Python as implementation Tool.
- To introduce various Collection Data types and Exception handling using Python.

LIST OF EXPERIMENTS

1. Data Types, Variables, Operators.
2. Expressions, Precedence of Operators.
3. Conditional Statements.
4. Built-in Functions including Range, len, input, map and split.
5. Looping, For and While.
6. User Defined Functions.
7. List.
8. Tuple.
9. Dictionary.
10. Recursion and Lambda Functions.
11. String Handling.
12. Regular Expressions.
13. Packages.
14. Exception Handling.
15. GUI using TKinter.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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 Python language and learn to apply basic control structures in Python.

CO3 Demonstrate the applications of Collection data types in Python.

CO4 Visualize the capabilities of String and Regular expressions.

CO5 Understand the basic principles of Exception Handling.

CO6 Design and Develop GUIs.

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. Reema Thareja,”Problem Solving and Programming with Python"", 2nd edition,Oxford University Press, New Delhi, 2019.
3. Alan D. Moore, Python GUI Programming with Tkinter, Design and Build Functional and User-friendly GUI Applications, Packt Publishing, 2021.

REFERENCE BOOKS:

1. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.
2. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.

ONLINE COURSES / RESOURCES:

1. https://docs.python.org/3/tutorial/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.javatpoint.com/python-tutorial
5. https://nptel.ac.in/courses/

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

SEMESTER – IV

23MA1402	PROBABILITY AND RANDOM PROCESSES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

- To provide necessary basic concepts in probability and some standard distributions applicable to engineering.
- To understand concepts of two dimensional random variables phenomenon.
- To understand the basic concepts of random processes which are widely used in Communication fields.
- To understand the concept of correlation and spectral densities.
- To understand the significance of linear systems with random inputs.

UNIT - I RANDOM VARIABLES 9+3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT - II TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (Without Proof).

UNIT - III RANDOM PROCESSES 9+3

Classification – Stationary process – Markov process - Markov chain - Poisson process.

UNIT - IV CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT - V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Understand the basic concepts of one dimensional random variables and apply in engineering applications.

CO2 Utilise standard distributions to solve the real-world problems.

CO3 Recognise the fundamental ideas behind two-dimensional random variables and use them in engineering applications.

CO4 Apply the concept random processes in engineering disciplines.

CO5 Develop skills in solving problems on power spectral density function relevant to the various branches of engineering.

CO6 Analyse the response of random inputs to linear time invariant systems.

TEXT BOOKS:

1. Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007.
2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.
3. Veerarajan.T.,"Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill, 3rd Edition,2016.

REFERENCE BOOKS:

1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3. Miller. S.L. and Childers. D.G., —Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
4. Stark. H. and Woods. J.W., —Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 3rd Edition, 2002.
5. Yates. R.D. and Goodman. D.J., —Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

CO-PO MAPPING

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

23CS1403	PRINCIPLES OF DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the different types of data structures and its operations for real-time programming applications
- To understand Linear Data Structures such as arrays, stacks, queues and linked lists and their applications in problem solving
- To learn about Non Linear Data Structures - Graph and its implementations.
- To learn about Non Linear Data Structures – Trees and its traversals.
- To know the different techniques for solving problems like sorting and searching.

UNIT - I BASIC CONCEPTS OF DATA STRUCTURES 9

Introduction to Data Structures - Abstract data types - Basic Analysis of Algorithms – Notations, Efficiency of algorithms, Notion of time and space complexity.

UNIT - II LINEAR DATA STRUCTURES 9

Array-Operations on Arrays–Insertion and Deletion-Applications on Arrays. Abstract Data Types (ADTs), List ADT, Array Based Implementation - Stacks and Queues, Linked List - Linked list-based implementation of Stacks and Queues– Applications of Stacks and Queues.

UNIT - III NON LINEAR DATA STRUCTURES – TREES 9

Trees-General Trees-Tree Terminologies-Tree representation - Binary Trees, Tree Traversals, Tree Operations - Binary Search Tree, Expression Trees - Applications of trees.

UNIT - IV NON LINEAR DATA STRUCTURES – GRAPH 9

Graphs - Representation of Graph – Types of graphs – Breadth first traversal – Depth first traversal – Applications - Minimum Spanning Tree : Prim's and Kruskal's Algorithm – Single Source Shortest Path: Dijkstra’s Algorithm.

UNIT - V SORTING AND SEARCHING TECHNIQUES 9

Sorting: Merge Sort - Quick Sort – Insertion Sort – Selection Sort - Searching: Linear Search – Binary Search.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Define the fundamentals of data structures and their applications essential for programming/problem solving..

CO2 Understand the performance of the implementations of basic linear data structures.

CO3 Implement different types of Trees and apply them to the problem solutions

CO4 Understand Graph structure and various operations on graphs and their applicability.

CO5 Analyze the various Sorting and Searching algorithms.

CO6 Adapt the different data structures to various computing problems.

TEXT BOOKS:

1. Chandan Banerjee and Atanu Das, Data Structures and Algorithms in C and Python,Universities Press, 2023.
2. Reema Thareja, "Data Structures Using C", 2nd Edition, OXFORD University Press, New Delhi, 2018.

REFERENCE BOOKS:

1. Jean-Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", 2nd Edition, McGraw Hill, 2013.
2. Langsam, Augenstein and Tanenbaum, "Data Structures Using C and C++", 2nd Edition, Pearson Education, 2015.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 1st Edition, Pearson, 2002.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 4th Edition, 2014.Yates.
5. R. Kruse, C. L. Tondo and B. Leung, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2006.

WEB REFERENCES:

1. https://www.programiz.com/dsa
2. https://www.w3schools.in/data-structures/tutorials/
3. https://www.javatpoint.com/data-structure-tutorial
4. https://www.geeksforgeeks.org/data-structures/
5. https://en.wikibooks.org/wiki/Data_Structures
6. https://www.simplilearn.com/tutorials/data-structure-tutorial

ONLINE COURSES / RESOURCES:

1. https://www.codechef.com/certification/data-structures-and-algorithms/prepare.
2. https://www.coursera.org/learn/data-structures
3. https://nptel.ac.in/courses/106102064
4. https://www.edx.org/learn/data-structures
5. https://www.udemy.com/topic/data-structures/

CO-PO MAPPING

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

23EC1401	COMMUNICATION THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To introduce concepts of various Amplitude Modulation techniques and their spectral characteristics.
- To interpret Frequency Modulation and Phase Modulation techniques and their spectral characteristics.
- To apply concepts of Noise and analyze the effect of Noise in Communication Systems.
- To evaluate different types of Source Coding Techniques.
- To propose Applications pertaining to Communication Theory.

UNIT - I AMPLITUDE MODULATION 9

Amplitude Modulation – DSBSC, DSBFC, SSB, VSB - Modulation index, Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter Method, Phase Shift Method, VSB Generation – Filter Method, Demodulation, Envelope Detector – Comparison of different AM techniques.

UNIT - II ANGLE MODULATION 9

Phase and Frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth, FM modulation – Direct and Indirect methods, FM Demodulation, Detector – FM to AM conversion, FM Discriminator, PLL as FM Demodulator – Comparison of different FM techniques.

UNIT - III NOISE CHARACTERIZATION 9

Noise sources – Noise Figure, Noise Temperature and Noise Bandwidth – Noise in Cascaded Systems, Representation of Narrowband Noise – In-phase and Quadrature, Envelope and Phase – Noise performance analysis in AM and FM systems – Threshold effect, Pre-emphasis and Deemphasis for FM.

UNIT - IV INFORMATION THEORY 9

Discrete Memoryless Source, Information, Entropy, Source Coding theorem, Shannon – Fano Coding, Huffman Coding – Codewords, Average Codeword Length, Efficiency, Redundancy, Code Variance – Shannon Hartley Theorem, Mutual Information.

UNIT - V APPLICATIONS IN COMMUNICATION THEORY 9

AM Radio Broadcasting, FM Radio Broadcasting, Repeaters for Communication Signal Transmission, Channel Capacity in Communication Channel, Frequency Division Multiplexing of Communication signals.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1 Define AM communication systems and its allied types.
CO2 Classify Angle modulated communication systems and Infer Frequency Modulation and Phase modulation.
CO3 Analyze Noise in Cascaded Systems.
CO4 Evaluate Noise performance in AM and FM systems.

CO5 Design Source Coding techniques to improve coding efficiency.
CO6 Develop Applications using concepts of Communication Theory.

TEXT BOOKS:

1. Simon Haykin, “Communication Systems”, 4th Edition,Wiley Student Edition, Wiley India (P.) Ltd.,Reprinted 2012.
2. J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, 2nd Edition, Pearson Education, 2014.

REFERENCE BOOKS:

1. Wayner Tomasi, Electronic Communications Systems, Fundamentals through advanced, 5th Edition, Pearson Education, 2019.
2. Dr. Sanjay Sharma, “Communication Systems (Analog and Digital)”, 7th Edition, S.K. Kataria & Sons, 2017.
3. Dennis Roddy, John Coolen, “Electronic Communications”, 4th Edition Pearson Education, 2014.
4. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2010.

WEB REFERENCES:

1. https://www.electronics-notes.com/articles/radio/modulation/amplitude-modulation-am.php
2. https://www.javatpoint.com/angle-modulation
3. https://www.agilebroadcast.com.au/types-of-radio-broadcasting

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/106106097
2. https://nptel.ac.in/courses/117102059
3. https://www.classcentral.com/course/swayam-principles-of-communication-systems-i-7963
4. https://courseware.cutm.ac.in/courses/analog-communication-systems

CO-PO MAPPING

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

23EC1402	ELECTRONICS CIRCUITS II	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To define the fundamentals of Amplifiers and Oscillators constructed with discrete components.
- To understand the concept of feedback amplifiers and oscillators principles.
- To design of Oscillator Circuits
- To design of Tuned Amplifiers and Multivibrators.
- To analyze and observe the concepts of Power Amplifiers and DC Converters.

UNIT - I FEEDBACK AMPLIFIERS AND STABILITY 9

Feedback Concepts, Gain with feedback, Effect of feedback on gain stability, Distortion, Bandwidth, Input and Output Impedances; Topologies of feedback amplifiers, Analysis of series-series, shunt- shunt and shunt-series feedback amplifiers, Stability problem, Gain and Phase-margins, Frequency compensation.

UNIT - II OSCILLATORS 9

Barkhausen criterion for oscillation, Phase shift, Wien bridge, Hartley & Colpitts's oscillators, Clapp Oscillator, Ring oscillators and Crystal oscillators, Armstrong and Franklin Oscillators.

UNIT - III TUNED AMPLIFIERS 9

Coil losses, Unloaded and loaded Q of tank circuits, Small signal tuned amplifiers, Analysis of capacitor coupled single tuned amplifier, Double tuned amplifier, Effect of cascading single tuned and double tuned amplifiers on bandwidth, Stagger tuned amplifiers, Stability of tuned amplifiers, Neutralization, Hazeltine neutralization method, Neutralization using coils & Rice neutralization.

UNIT - IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RC & RL Integrator and Differentiator circuits, Diode clampers and clippers, Diode comparators, Multivibrators, Astable multivibrator, Monostable multivibrator, Bistable multivibrator, Schmitt Trigger, UJT Oscillator, Characteristics and applications of 555 Timer.

UNIT - V POWER AMPLIFIERS AND DC CONVERTERS 9

Buck,Boost analysis and design, Power amplifiers, Class A, Class B, Class AB, Class C, Power MOSFET, Temperature Effect, Class AB Power amplifier using MOSFET, DC/DC convertors, Buck, Boost, Buck,Boost analysis and design.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Define the effect of negative feedback on amplifiers parameters, and analyze the various types of feedback amplifiers and their stability analysis.

CO2 Design of RC and LC oscillators by deriving their frequency of oscillation.

CO3 Analyze the frequency response of small signal tuned amplifiers and learn their stabilization techniques.

CO4 Analyze and design of various multivibrators circuits.

CO5 Explain the response of wave shaping circuits for various types of input signals.

CO6 Analyze the efficiency of various power amplifiers and learn operation of DC, DC converters.

TEXT BOOKS:

1. Sedra and Smith, —Micro Electronic Circuits‖; Seventh Edition, Oxford University Press, 2014.
2. Jacob Millman,Microelectronics‘, McGraw Hill, 2nd Edition, Reprinted, 2017.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nasheresky, —Electronic Devices and Circuit Theory, 11th Edition, Pearson Education / PHI, 2013
2. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010.
3. David A. Bell, —Electronic Devices and Circuitsc‖, Fifth Edition, Oxford University, Press, 2008.
4. Millman J. and Taub H., —Pulse Digital and Switching Waveforms‖, TMH, 2000

WEB REFERENCES:

1. http:// www.introni.it/pdf/Millman-Taub- Pulse and Digital Switching Waveforms 1965.pdf
2. https://www.google.co.in/books/edition/Pulse_and_Digital_Circuits/5v5ct06-kbwC?hl=en&gbpv=0
3. https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/pages/syllabus/

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee55/preview
2. https://archive.nptel.ac.in/courses/108/102/108102095/
3. https://www.electronics-tutorials.ws/sequential/seq_3.html
4. https://semiconductorclub.com/downloads/theory-and-design-of-electronic-circuits/

CO-PO MAPPING

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

23EC1403	ANALOG INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To Introduce the basics of operational amplifiers.
- To learn the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers.
- To introduce the theory and applications of PLL.
- To learn the theory of ADC and DAC.
- To introduce, study and analyze some special function ICs.

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Introduction of operational amplifier, Ideal Operational Amplifier, General operational amplifier stages, Internal circuit diagram of IC 741 - DC performance characteristics – Input bias current, Input offset current, Input offset voltage, Total output offset voltage, Thermal drift, AC performance characteristics – Frequency response, stability, frequency compensation, slew rate, Open and closed loop configurations, Introduction of Advanced operational amplifiers - JFET Operational Amplifiers – LF155 and TL082, CMOS Operational amplifier – MC14573, BiMOS Operational amplifier – CA3140.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, Operational Transconductance Amplifier (OTA), Adder, Subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, Low-pass, high-pass and wide band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, Analog multiplier Monolithic ICs-AD633 and its applications-Voltage divider, Squarer, square rooter, frequency doubler and phase angle detector, Operation of the basic PLL, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronisation.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type, Nyquist rate A/D converter - Two step A/D Converter, Pipelined A/D converter.

UNIT V SPECIAL FUNCTION ICs 9

Function generator IC8038, Timer IC 555- Modes of Operation, IC Voltage regulators – Three terminal fixed voltage regulators-IC78XX,IC 79XX, adjustable voltage regulators-IC LM317, ICLM337 - IC 723 general purpose regulator, Audio Power amplifier LM380, Isolation Amplifier ISO100 and Optocoupler IC TLP112, MOC3009,TLP141G,TLP521.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Infer the basics of operational amplifier.
CO2 Demonstrate linear and nonlinear applications of op-amps.
CO3 Illustrate the functions of analog multiplier.
CO4 Illustrate the functions of Phase Locked Loop (PLL).
CO5 Compare the working principles of data conversion methods (ADCs & DACs).
CO6 Analyze some special function ICs.

TEXT BOOKS

1. D.Roy Choudhry, ShailJain,"Linear Integrated Circuits", New Age International Pvt. Ltd., 2000. Circuits", 4 th Edition, Tata McGraw-Hill, 2017.
2. Millman J. and Taub H., "Pulse, Digital and Switching waveforms", 3rd Edition, TMH, 2017.
3. D.Roy Choudhry, ShailJain,"Linear Integrated Circuits", New Age International Pvt. Ltd., 2000. Circuits", 4 th Edition, Tata McGraw-Hill, 2017.

REFERENCE BOOKS

1. Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.
2. Tony Chan Carusone, David Johns, Kenneth William Martin, Analog Integrated Circuit Design, John Wiley and Sons,2012.
3. B.S.Sonde, "System design using Integrated Circuits", 2nd Edition, New Age Pub, 2001.
4. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2005.
5. Ramakant A.Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Prentice Hall /Pearson Education, 2001.
6. William D.Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 2004.

WEB REFERENCES

1. https://www.analog.com/media/en/training-seminars/design-handbooks/basic-linear-design/chapter1.pdf
2. http://fa.ee.sut.ac.ir/Downloads/AcademicStaff/24/Courses/73/%5BGray___Meyer%5D_Analysis_and_Design_of_Analog_Integrated_Circuits_5th_ed.pdf

CO-PO MAPPING

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

23EC1404	ELECTROMAGNETIC FIELDS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To study the concepts of vector algebra and electric fields.
- To understand the applications of static electric fields.
- To attain the information of magnetic fields and its applications.
- To analyse the concept of Maxwell's equations and time varying fields.
- To evaluate the behavior of time varying field and wave propagation.

UNIT - I STATIC ELECTRIC FIELD 9

Review of vector algebra, Coordinate Systems, Vector Identities, Operators and Theorems, Point Charges, Charge Distributions, Coulomb's Law, Gauss's Law and its Applications, Electric field Intensity, Electrical field due to Point charges, Line, Surface and Volume Charge Distributions, Absolute Electric Potential, Potential Difference and its Calculation of for different configurations.

UNIT - II STATIC ELECTRIC FIELD AND ITS APPLICATIONS 9

Electric dipole, Electrostatic Energy and Energy Density, Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

UNIT - III STEADY MAGNETIC FIELD 9

Fields and Currents, Forces on Charged Particles and Current Elements, Scalar and Vector Magnetic Potential, Magnetostatic Boundary Conditions, Inductance of Solenoid, Toroid, Transmission Line and Parallel Transmission Lines.

UNIT - IV MAXWELL's EQUATIONS AND TIME-VARYING FIELDS 9

Faraday's Law, Transformer and motional EMF, Maxwell's Equations, Boundary conditions in Electromagnetic Field, Time Varying Potentials.

UNIT - V ELECTROMAGNETIC WAVES 9

Solution for Free Space Conditions, Uniform Plane Wave Propagation, Wave Equation for Conducting and Dielectric medium, Reflection of Waves at interface between Conductors and Dielectrics for Normal Incidence, Skin Depth, Power Flow and Poynting Vector, Standing Waves.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Outline the proficiency in vector algebra, coordinate systems and enumerate the fundamental laws to analyze static electric fields.

CO2 Articulate the concepts of Static Electric Fields in various applications.

CO3 Apply the concept of Steady Magnetic Fields and associated principles.

CO4 Analyze Faraday's Law and Maxwell's Equations to determine the significance of time varying fields.

CO5 Evaluate and understand the behaviour of Electromagnetic Wave Propagation.

CO6 Solve wave equations for conducting and dielectric mediums and understand the reflection of waves.

TEXT BOOKS:

1. M. N. O. Sadiku, Principles of Electromagnetics, Oxford University Press, New Delhi , Sixth Edition 2015.
2. W. H. Hayt Jr. and J. A. Buck, Engineering Electromagnetics, McGraw Hill, New York , 2014.

REFERENCE BOOKS:

1. D.K. Cheng, Field and Wave Electromagnetics, Pearson Education, Singapore , 2003.
2. Edward C. Jordan and Keith G. Balmain, Electromagnetic Waves and Radiating Systems, Prentice Hall inc., Second Edition, 2010.
3. A. Pramanik, Electromagnetism, Vol. 1 (Theory), PHI, New Delhi , 2014.

WEB REFERENCES:

1. https://onlinelibrary.wiley.com/doi/epdf/10.1002/9780470124581.fmatter
2. https://empossible.net/academics/emp3302/

ONLINE COURSES / RESOURCES:

1. https://www.udemy.com/course/electromagnetic-field-theory-transmission-lines/
2. https://www.classcentral.com/course/swayam-electromagnetic-theory-5223.
3. https://ocw.mit.edu/courses/8-311-electromagnetic-theory-spring-2004/
4. https://onlinecourses.nptel.ac.in/noc21_ee83/

CO-PO MAPPING

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

23EC1411	ELECTRONICS CIRCUITS AND SIMULATION LABORATORY II	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To understand the hands-on experience in designing electronic circuits
- To apply the simulation software used in circuit design
- To analyse the fundamental principles of amplifier circuits
- To design the differentiate feedback amplifiers and oscillators.
- To infer the operation of various multivibrators

LIST OF EXPERIMENTS

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt Feedback Amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers

SIMULATION USING PSPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. RC and RL Differentiator & Integrator Circuits
4. Double and Stagger tuned Amplifiers
5. Bistable Multivibrator
6. Schmitt Trigger circuit with Predictable hysteresis
7. Analysis of power amplifier
8. Study the characteristics of 555 Timer
9. A Stable Multivibrator using 555 Timer

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Understand and analyze the various types of feedback amplifiers

CO2 Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators

CO3 Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.

CO4 Analyze the waveform change of diode clipping and clamping circuits when the bias is applied.

CO5 Design and Simulate the A Stable Multivibrator using SPICE Tool.

CO6 Analyze the characteristics of 555 Timer using SPICE Tool.

TEXT BOOKS:

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory",11th Edition, Pearson Education, 2013.

REFERENCE BOOKS:

1. David A. Bell, —Electronic Devices and Circuitscll, Fifth Edition, Oxford University, Press, 2008.

WEB REFERENCES:

1. https://www.circuitlab.com/
2. https://www.electroschematics.com

CO-PO MAPPING

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

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

23EC1412	ANALOG AND DIGITAL CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To design amplifiers and Data converters using op-amps.
- To design and analyse different types of filters using OPAMP and its frequency response.
- To design DC power supply using Monolithic ICs
- To Understand and implement the concepts of combinational circuits
- To Understand and implement the concepts of sequential circuits

LIST OF EXPERIMENTS

1. Design and implementation of Inverting, Non inverting and differential amplifiers.
2. Design and implementation of Integrator and Differentiator.
3. Design and implementation of Active low-pass, High-pass and band-pass filters.
4. Implementation of R-2R Ladder Type D- A Converter using Op-amp.
5. Design and Implementation of Astable and Monostable multivibrators using NE555 Timer
6. Implementation of DC power supply using LM317 and LM723.
7. Study of logic gates and verify its truth table
8. Design and implementation of 4 bit binary Adder/ Subtractor
9. Design and implementation of Multiplexer and De-multiplexer using logic gates
10. Design and implementation of encoder and decoder using logic gates
11. Design and implementation of synchronous and asynchronous counter
12. Design and implementation of 3-bit synchronous up/down counter
13. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Realize the Amplifiers and Data converters using operational amplifiers
CO2 Construct the various filters using OPAMP
CO3 Implement DC power supply using ICs
CO4 Understand the operation of basic gates
CO5 Implement the combinational circuits
CO6 Implement the sequential circuits

WEB REFERENCES:

1. https://classes.engineering.wustl.edu/jee2330/Exp09.pdf
2. https://www.ti.com/sc/docs/apps/msp/journal/aug2000/aug_07.pdf
3. https://www.homemade-circuits.com/ic-723-voltage-regulator-working-application-circuit/
4. https://link.springer.com/chapter/10.1007/978-3-642-03697-2_8
5. https://da-iitb.vlabs.ac.in/
6. https://vlab.amrita.edu/index.php?sub=59&brch=165&sim=903&cnt=6

CO-PO MAPPING

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

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

23CS1412	PRINCIPLES OF DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- Knowledge of basic Data Structures and their implementations.
- Skills to apply appropriate Data Structures in problem solving.
- Strength and weakness of different Data Structures.
- Importance of Data Structures in context of writing efficient programs.

LIST OF EXPERIMENTS

1. Write a program to implement the Stack operations.
2. Write a program to implement the Queue operations.
3. Write a program to implement the operations on Singly Linked List.
4. Write a program to implement the operations on Doubly Linked List.
5. Write a program to implement the operations on Circular Linked List.
6. Write a Program to perform the given operations on Trees.
   a) Insertion
   b) Deletion
   c) Searching
7. Write a Program to implement the following Tree Traversals Methods
   a) Pre-order
   b) In-order
   c) Post-order
8. Write a program to implement the following Graph Traversal Methods
   a) Breadth First Search
   b) Depth First Search
9. Write a program to implement Minimum Spanning Tree using the following algorithms
   a) Prim's Algorithm
   b) Kruskal's Algorithm
10. Write a Program to implement Single Source Shortest Path algorithm using Dijkstra's algorithm.
11. Write a program to sort the given list of elements using Quick Sort and Merge Sort.
12. Write a program to search an element in the given list of elements using Linear Search and Binary Search.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Understand the concept of Stacks and Queues and its application

CO2 Explain the concept of Queues and its application.

CO3 Study about different types of Tree along with their operations and applications.

CO4 Solve problem involving Graphs and its applicability.

CO5 Design efficient algorithms for Sorting.

CO6 Implement efficient algorithms for Searching.

WEB REFERENCES:

1. https://www.hackerrank.com/domains/data-structures
2. https://www.geeksforgeeks.org/data-structures/
3. https://www.codechef.com/learn/topic/data-structures-and-algorithms
4. https://www.javatpoint.com/data-structure-tutorial
5. https://www.programiz.com/dsa.
6. http://www.java2s.com/example/java/data-structure/

CO-PO MAPPING

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

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

23ES1412	CODING PRACTICES II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVE:

- To understand the concepts of Arrays,ListADT.
- To learn linear data structures–stacks and queues ADTs.
- To understand and apply Tree data structures.
- To analyze sorting and searching algorithms.
- To understand and apply Graph structures.

LIST OF EXPERIMENTS

1. Arrays
   a. Initialization of an array
   b. One dimensional array declaration
   c. Two dimensional array declaration
   d. Merge two sorted arrays
   e. Merge sub arrays
   f. Kth largest element in array
   g. Pascal's triangle.

2. ListADT
   a. Print linked list
   b. Linked list to array
   c. Print reverse linked list
   d. Kth element in list
   e. Add an element at kth position in linked list
   f. Remove an element at kth position in linked list
   g. Merge two linked sorted list and remove duplicates from sorted List

3. Queue ADT
   a. Implement queue using arrays.
   b. Implement queue using linked list
   c. Implement queue using stacks
   d. Balanced parentheses.

4. StackADT
   a. Implement stack using arrays
   b. Implement stack using linked list
   c. Implement stack using queues.

5. Problems on Postfix anf Infix expressions.

6. BinaryTreeTraversal

7. Binary Search Tree

8. Linear search algorithm & Binary search algorithm.

9. Sorting algorithms
   a. Selection Sort
   b. Insertion Sort
   c. Merge Sort
   d. Quick sort

10. Graph Traversal algorithms
    a. BFS
    b. DFS
    c. Topological Sorting
11. Minimum Spanning tree
    a. Kruskal Algorithm
    b. Prim's Algorithm

TOTAL: 30 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Implement arrays in data structures.
CO2 Solve real world problems using appropriate linear list data structures.
CO3 Apply appropriate tree data structures in problem solving.
CO4 Implement various searching algorithms.
CO5 Implement various sorting algorithms.
CO6 Implement appropriate Graph representations and solve real-world applications.

SOFTWARE REQUIREMENTS:

1. Anaconda Python Distribution/ TURBO C.

TEXT BOOKS:

1. G. A. Vijayalakshmi Pai," A Textbook of Data Structures and Algorithms, Volume 1", Wiley-ISTE,January 2023.
2. G. A. Vijayalakshmi Pai,"A Textbook of Data Structures and Algorithms, Volume 2: Mastering Nonlinear Data Structures", Wiley-ISTE,February2023.
3. Dr.HarshBhasin,"Data Structures with Python",BPBPublications,Delhi,March2023.
4. John Canning,Alan Broder,RobertLafore,``Data Structures & Algorithms in Python", Addison-Wesley Professional, October 2022.
5. DanielLiang,"IntroductionToPythonProgrammingAndDataStructures",Global Edition 3rd Edition ,Pearson Publications ,November 2022.

REFERENCE BOOKS:

1. Dr.Basant Agarwal,"Hands-On Data Structures and Algorithms with Python",3rd Edition, Packt Publishing,July 2022.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", Career Monkk Publications, August 2016.
3. Michael H.Goldwasser,MichaelT.Goodrich,and Roberto Tamassia," Data Structures and Algorithms in Python",Wiley Publications 2013.

ONLINE COURSES/RESOURCES:

1. https://www.codechef.com/practice.
2. https://www.javatpoint.com/data-structure-tutorial.
3. https://www.simplilearn.com/tutorials/python-tutorial/data-structures.
4. https://nptel.ac.in/Courses/.

Internal Assessment		End Semester Examination
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