GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEBS101	Subject Title	Mathematics I
Category	Basic Science	L-P-T-C	3-0-0-3
Regulation	2025	Semester	01
Prerequisites	Basic knowledge of algebra and elementary calculus.		

Course Objectives: To equip students with the knowledge of

1. To introduce basic concepts of matrices, eigenvalues, and eigenvectors to solve linear systems and understand matrix diagonalization.
2. To develop the skill of solving differential calculus problems, including continuity, derivatives, and partial derivatives.
3. To provide techniques for evaluating definite and indefinite integrals using standard methods and substitutions.
4. To teach methods for solving ordinary differential equations (ODEs) of higher order and simultaneous equations.
5. To introduce Laplace transforms and their application to solving linear ODEs in engineering Problems

Course Content:

[MATRICES] (09 Hours)

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

[DIFFERENTIAL CALCULUS] (09 Hours)

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation – Partial Derivatives.

[INTEGRAL CALCULUS] (09 Hours)

Definite and indefinite integrals – Substitution rule – Techniques of Integration – Integration by parts, Trigonometric Integrals, Trigonometric substitutions, Integration of rational functions by partial fractions.

[ORDINARY DIFFERENTIAL EQUATIONS] (09 Hours)

Higher order linear differential equations with constant coefficients – Method of variation of parameter Cauchy‘s and Legendre‘s linear equations – Simultaneous first order linear equations with constant coefficients.

[LAPLACE TRANSFORM] (09 Hours)

Existence conditions – Transforms of elementary functions – Basic properties (Without proof)

Transforms of derivatives and integrals – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Compute eigen values, eigen vectors, and apply the Cayley-Hamilton theorem to diagonalize matrices and reduce quadratic forms.	L3
CO2	Apply concepts of limits, continuity, and differentiation—including partial derivatives—for solving engineering-related problems.	L3
CO3	Solve complex integrals using substitution, integration by parts, trigonometric identities, and partial fractions.	L4
CO4	Solve higher-order linear ordinary differential equations and systems of first-order linear differential equations.	L3
CO5	Use Laplace transforms and their properties to solve initial value problems in linear ODEs and analyze engineering systems.	L4

Text Books:

1. Grewal. B.S, “Higher Engineering Mathematics”, 42nd Edition, Khanna Publications, Delhi, 2012.
2. Ramana, B.V., “Higher Engineering Mathematics” Tata McGraw Hill Publishing Company, 2008.
3. James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only),2.8, 3.1 to 3.6+,3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5,7.1 - 7.4 and 7.8,14.3].

Reference Books:

1. Dass, H.K., and Er. Rajnish Verma,” Higher Engineering Mathematics”, S. Chand Private Ltd., 2011.
2. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, 2012.
3. Peter V. O’Neil,” Advanced Engineering Mathematics”, 7th Edition, Cengage learning, 2012.
4. Sivarama Krishna Das P. and Rukmangadachari E., “Engineering Mathematics”, Volume I, Second Edition, PEARSON Publishing, 2011.
5. Veerarajan, T.,” Engineering Mathematics (For first year)”, Tata McGraw-Hill Pub. Pvt. Ltd., New Delhi, 2007.

Course Articulation matrix:

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

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

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Department of Electrical and Electronics Engineering

Subject Code	25PTEBS102	Subject Title	Physics for Electrical Engineering
Category	Basic Science	L-P-T-C	3-0-0-3
Regulation	2025	Semester	01
Prerequisites			

Course Objectives:

1. To develop knowledge on basics of conducting materials
2. To understand the basic concept of semi conducting materials
3. To familiarize the student with magnetic materials
4. To understand physics of magnetic and dielectric materials.
5. To apply principles of quantum physics in the engineering field

Course Content:

[CONDUCTING MATERIALS] (09 Hours)

Conductors-Ohm's law-electrical conductivity-relation between current density, drift velocity and mobilityclassical free electron theory: expression for electrical conductivity- success and failures, Fermi-Dirac statistics -Fermi energy- effect of temperature on Fermi function – density of energy states

[SEMICONDUCTING MATERIALS] (09 Hours)

Types of semiconductors-Intrinsic semiconductor – energy band diagram-direct and indirect semiconductorelectron concentration - hole concentration - intrinsic carrier concentration- electrical conductivity of intrinsic semiconductor, extrinsic semiconductor – types (qualitative) - experimental determination of band gap of semiconductor

[MAGNETIC MATERIALS] (09 Hours)

Magnetism in materials – magnetic moment- Bohr magneton - magnetic field and induction – magnetic flux density- magnetization – magnetic permeability – susceptibility – classification of magnetic materials – domain theory of ferromagnetism – hysteresis – soft and hard magnets.

[DIELECTRIC MATERIALS] (09 Hours)

Electric dipole - dipole moment- permittivity – dielectric constant – polarization: types –Langevin Debye equation – frequency dependent polarization– dielectric loss – internal field - Clausius-Mossotti equation – dielectric breakdown mechanism.

[QUANTUM PHYSICS] (09 Hours)

Black body radiation – Wein's displacement law - Rayleigh Jean's law - Planck's radiation law, matter waves – de Broglie hypothesis – wave particle duality – wave function and its physical significance – Schrodinger wave equation: time dependent and independent equation, microscope: types – scanning electron microscope (SEM): principle – construction and working

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Students will be able to learn about fundamentals of conducting materials and their properties	L2
CO2	Students will be able to Understand the basic phenomena of semiconductors and theoretical expression of its carrier concentration	L3
CO3	Students will also acquire knowledge about the fundamentals of magnetic properties of materials	L1
CO4	Students will Understand the dielectric properties of materials, types and its functional knowledge	L2
CO5	Students will also get an exposure to apply principles of quantum physics in the engineering field	L3

Text Books:

1. K. Rajagopal, “Engineering Physics”, PHI, New Delhi, 2011
2 . S. Mani Naidu, “Applied Physics”, Pearson Publisher, India, 2010
3. Uma Mukherji, “Engineering Physics”, Alpha Science International Ltd., Oxford, U.K.
4. K. Rajagopal, “Engineering Physics”, PHI, New Delhi, 2011.
5. P. Mani, “Engineering physics”, Dhanam Publications, 2017
6. S.O. Pillai, Solid state physics, New age international pvt ltd., 9th edition-2022

Reference Books:

1. Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010)
2. Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007).
3. Fundamentals of Physics II, R. Shankar, Yale University Press, New Haven and London (2016).
4. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).
5. Callister’s materials Science and Engineering, R. Balasubramaniam, Wiley India Pvt. Ltd., 2014

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	3	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	3	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	3	-	-

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

***Corre**lation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation*

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEES103	Subject Title	C Programming with Applications
Category	Engineering Sciences	L-P-T-C	3-0-0-3
Regulation	2025	Semester	01
Prerequisites			

Course Objectives:

1. To provide the knowledge of C Programming in context of writing efficient programs.
2. To learn the applications of C Programming for Electrical Engineering.

Course Content:

[BASICS OF C PROGRAMMING] (09 Hours)

Introduction to C – Structure of a C program – Compilation and Linking Processes - Identifiers and Keywords - Basic Data Types - Variables and Constants - Input and Output Functions - Operators and Expressions - Type Conversion and Typecasting - Control Statements – Pre-processor Directives.

[ARRAYS AND STRINGS] (09 Hours)

Arrays - Types of Arrays - Array Traversal – Insertion and Deletion - Sorting – Selection Sort, Merge Sort – Searching – Linear Search and Binary Search - Strings - Reading and Writing Strings - Operations on Strings- Solution to simple mathematical, logical and aptitude problems.

[FUNCTIONS AND STRUCTURES] (09 Hours)

Functions – Built-in Functions – User-Defined Functions – Recursive Function – Storage Classes- Structure - Nested Structures - Arrays of Structures – Union- Solution to system of linear equations, creating functions for given mathematical equations.

[POINTERS] (09 Hours)

Storing data in specific location - Pointers - Declaring Pointer Variables – Null Pointer – Generic Pointer – Call by Reference - Dynamic Memory Allocation – pointer to array – pointer to structure-pointer to function-pointer arithmetic-Relevant simple problems associated to pointers.

[APPLICATIONS TO C PROGRAMMING] (09 Hours)

Array and structure based Implementation- Linked List – Singly Linked Lists- Doubly Linked Lists- Circularly Linked Lists. Sum of series using modular programming-Solving problems using matrices

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Develop a C program to control the sequence of the program and give logical outputs.	L5
CO2	Implement Array, String concepts in C Program and develop C programming for solving simple electrical circuits.	L4
CO3	Implement C program using functions, Structures and Union and develop C programming to find Solution to higher order Networks.	L3

CO4	Implement pointers concepts in C Program and Develop software application using C programming for simulation of electrical circuits -Transient analysis using iterative methods	L3
CO5	Apply code reusability with Lists, stack and queues.	L2

Text Books:

1. E Balagurusamy, "Programming in C", McGraw Hill Education, 2019..
2. Mark Allen Weiss “Data structures and Algorithm Analysis in C”, – 1 January 2020

Reference Books:

1. Yashavant Kanetkar , “Let Us C: Authentic guide to C programming language “,- 19th Edition – 15 December 2022.
2. E Balagurusamy, "Data Structures Using C", McGraw Hill Education, 2013.
3. Reema Thareja, "Data Structures Using C", 2nd edition, Oxford University Press, 2014.

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	3	1	-	-	-	-	-	-	-	3	2
CO2	3	2	3	3	1		-	-	-	-	-	-	3	2
CO3	3	2	3	3	1		-	-	-	-	-	-	3	2
CO4	3	2	3	3	1	-	-	-	-	-	1		3	1
CO5	3	2	3	3	1	-	-	-	-	-	1		3	1

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEPC104	Subject Title	Electric Circuit Analysis
Category	Professional Core	L-P-T-C	3-0-0-3
Regulation	2025	Semester	01
Prerequisites	Laws of Sine and Cosine, Complex Numbers, Solution of Linear simultaneous Equations, Differential and Integral Calculus, Laplace Transforms		

Course Objectives:

1. Analyze electric circuit with the application of fundamental laws to find response and evaluate performance

Course Content:

[BASICS OF CIRCUITS] (09 Hours)

Ohm's Law–Kirchhoff's laws–DC and AC Circuits–Resistors in series and parallel circuits– Mesh current and Node voltage analysis for D.C and A.C. circuits–Phasor Diagram – Power, Power Factor and Energy.

[NETWORK REDUCTION AND NETWORK THEOREMS] (09 Hours)

Network reduction: voltage and current division, source transformation– star delta conversion. Thevenin and Norton Theorem– Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem Simple problems for DC and AC Circuits.

[RESONANCE AND COUPLED CIRCUITS] (09 Hours)

Series and parallel resonance–their frequency response– Quality factor and Bandwidth–Coupled Circuits Self and mutual inductance–Coefficient of coupling– Analysis of coupled circuits-Tuned circuits–Single and double tuned circuits

[CIRCUIT TRANSIENTS] (09 Hours)

Laplace Transformations-Advantages-Laplace transformation of some functions-RL transient- Decay of current in RL Circuits-RC Transient: Decay of Current in RC Circuits-RLC Transient: Over-damped, Critically Damped and Underdamped-AC Transients-RL, RC and RLC Circuits- Natural Frequency and Damping Ratio

[THREE PHASE CIRCUITS] (09 Hours)

Comparison between single phase and poly phase systems-Three phase balanced/ unbalanced sources– analysis of three phase 3-wire and 4-wire circuits with star and delta connection- balanced and unbalanced loads-– phasor diagram of voltages and currents–power and power factor measurements in three phase circuits.

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Explain circuit behaviour using ohm's law and Kirchhoff laws, hence solve the circuits using mesh and nodal analysis	L3
CO2	State various circuit laws and theorems and perform the circuit analysis to prove the theorems.	L3
CO3	Explain the behavior of resonance and magnetically coupled circuits.	L2

CO4	Explain AC circuits using phasor techniques under steady state and transient conditions for any first order and second order systems using R, L, and C Circuits.	L2
CO5	Analyze AC circuits using phasor techniques	L4

Text Books:

1.Arumugam M and Prem Kumar, "Electric Circuit Theory", Khanna Publishers, New Delhi,2006

2. Sudhakar A and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", Tata McGraw Hill, 2015.

REFERENCE Books:

1. Joseph A. Edminister, Mahmood Nahri, Schaum's series, "Electric Circuits", Tata McGraw-Hill, New Delhi, 2014.

2. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, 1996.

3. Ashfaq Husain and Harroon Ashfaq, "Fundamentals of Electrical Engineering", Dhanpath Rai & Sons, New Delhi, 2016

4. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.

5. Charles K.Alexander, Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	-	2	-	2	-	3	-	3	3	3	3
CO2	3	2	2	-	1	-	2	-	3	-	3	3	2	3
CO3	3	2	2	-	2	-	2		3	-	3-	3	2	3
CO4	3	2	2	-	2	-	2	-	3	-	2	3	2	3
CO5	3	2	2	-	3	-	2	-	3	-	2	3	2	3

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

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Department of Electrical and Electronics Engineering

Subject Code	25PTEES105	Subject Title	C Programming Laboratory
Category	Engineering Science	L-P-T-C	3-0-0-3
Regulation	2025	Semester	01
Prerequisites			

Course Objectives:

1. Design solutions to simple engineering problem by applying the basic programming principles of C language.
2. Develop simple C programs to illustrate the applications of different data types such as arrays, pointers, functions.
3. Develop the Data Structure concept like linked list, Stack and Queue operations.

Course Content:

1. Find the largest among the given numbers. Reverse the given number.
2. Arrange the given numbers in an ascending order using Merge and Selection Sort.
3. Perform Matrix addition and multiplication using 2D array.
4. Swapping the number using Call by Value and Call by References.
5. Evaluate the series (Sin(x), Cos(x) and e^x using recursion.
6. Solution of simultaneous equation
7. Creating a function for a given mathematical expression and call the function through function pointer.
8. Solution of logical and aptitude problems
9. Implement the concept of array of structure.
10. Perform the dynamic memory allocation.
11. Write a C Program to implement the Linear and Binary Search.
12. Implementation of Singly linked list**.**

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Apply good programming design methods for program development.	L3
CO2	Write C programs, which involve decision making and arrays and strings.	L4
CO3	Develop programs using functions and pointers.	L5
CO4	Develop programs using structures and unions.	L5
CO5	Write programs that use arrays, linked structures, stacks, queues, trees, and graphs.	L3

.**Reference Books:**

1. E Balagurusamy, “PROGRAMMING IN ANSI C”, 8th edition, Mc Graw Hill, 2019.
.2. Ajit S. Mali (Author), Amol M. Jagtap, “Data Structures using C: A Practical Approach for Beginners”, 1st edition, CRC Press, 2021.
3. *Mark Allen Weiss “Data structures and Algorithm Analysis in C”, – 1 January 2020*

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	1	1	-	-	-	-	-	-	1	-	3	3
CO2	3	2	2	1	-	-	-	-	-	-	1	-	3	3
CO3	3	2	2	1	-	-	-	-	-	-	2	-	2	1
CO4	3	2	2	2	-	-	-	-	-	-	2	-	2	1
CO5	3	2	2	2	-	-	-	-	-	-	2	-	3	1

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

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Department of Electrical and Electronics Engineering

Subject Code	25PTEBS201	Subject Title	Mathematics II
Category	Basic Science	L-P-T-C	3-0-0-3
Regulation	2025	Semester	02
Prerequisites			

Course Objectives:

1. To introduce the concept of interpolation and develop methods for estimating function values at intermediate points.
2. To understand and apply numerical methods for differentiation and integration
3. To analyze periodic functions using Fourier series and apply it in engineering problems
4. To understand and apply Fourier transforms for analyzing non-periodic signals.
5. To study the Z-transform technique and apply it in solving difference equations relevant to discrete systems.

Course Content:

[INTERPOLATION AND APPROXIMATION] (9 Hours)

Interpolation with equal intervals - Newton's forward and backward difference formulae- Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation .

[NUMERICAL DIFFERENTIATION AND INTEGRATION] (9 Hours)

Numerical Differentiation – Newton's interpolation and Lagrange's method- Numerical integration using Trapezoidal, Simpson's 1/3 rule and 3/8 rule.

[FOURIER SERIES] (9 Hours)

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series –Parseval's identity – Harmonic analysis.

[FOURIER TRANSFORMS] (9 Hours)

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties(Without proof) – Transforms of simple functions – Convolution theorem – Parseval's identity.

[Z - TRANSFORMS AND DIFFERENCE EQUATIONS] (9 Hours)

Z- transforms - Elementary properties(Without proof) – Inverse Z - transform (using partial fraction and residues) – Convolution theorem – Solution of difference equations using Z - transform

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Apply interpolation techniques like Newton's and Lagrange's to estimate unknown data points	L3
CO2	Use numerical differentiation and integration methods to solve engineering problems	L3
CO3	Develop Fourier series representations of periodic functions and analyze their behavior.	L4

CO4	Apply Fourier transform techniques to study non-periodic signals in the frequency domain.	L4
CO5	Solve difference equations using Z-transforms and understand their applications in systems.	L5

ext Books:

1. Grewal. B.S., and Grewal. J.S., "Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2007.
2. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2016.
3. Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi, 2017.
4. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd., 1998.

Reference Books:

1. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt Ltd, 9th Edition 2016.
2. Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2018.
3. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, 2016.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2011.
5. Ray Wylie C and Barrett .L.C, "Advanced Engineering Mathematics", 6th Edition, Tata McGraw Hill Education Pvt Ltd, New Delhi, 2012.

Course Articulation matrix:

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

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEPC202	Subject Title	Electron Devices
Category	Professional Core	L-P-T-C	3-0-0-3
Regulation	2025	Semester	02
Prerequisites	Basic Circuit Analysis		

Course Objectives:

Understand the physics and operation of electron devices and obtain appropriate equivalent circuit models

Course Content:

[Carrier Distribution and Properties in Semiconductor] (09 Hours)

Statistical Laws of particles – Maxwell-Boltzmann approximation - intrinsic and extrinsic - Equilibrium distribution – carrier concentration – $n_o p_o$ product- Fermi level (E_F) Position variation with doping and temperature – E_F relevance – Degenerate and non-degenerate - compensated semiconductors – Carrier – drift – diffusion – induced E-field in non-uniform doping – Einstein relation - generation – recombination – continuity equation – quasi Fermi energy.

[PN Junction Diode] (09 Hours)

Structure – Equilibrium conditions – Energy Band Concepts – Zero bias – Forward Bias – Reverse bias – Junction capacitances – one sided and non-uniformly doped junctions – Ideal PN junction current – Deviation from Ideal characteristic – Junction Breakdowns – Switching characteristic – Metal semiconductor junction.

[Bipolar Junction Transistor (BJT)] (09 Hours)

NPN – PNP - BJT Construction - Operation –- Transistor Currents – Gain - Transistor characteristics of CE, CB and CC – Non-ideal effects – Model - Ebers-Moll - Hybrid Pi - Frequency Limitations - Switching Characteristic.

[Field Effect Transistors] (09 Hours)

PN JFET – MESFET – Construction and operation – Pinch off – Saturation – Gate control – Ideal I-V Characteristic – Non-ideal effects – MOSFETs – Construction and characteristics.

[Special and Opto-Electronic Devices] (09 Hours)

Direct gap – Indirect gap Semiconductors - Construction – operation – characteristic – PIN diode – Zener diode Tunnel Diode – LED – Photo diode – Photo transistor – Opto-coupler – Laser Diode - Solar Cell – UJT.

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Apply the. Carrier Distribution and Properties in Semiconductor	L3
CO2	Analyze the working and characteristics of PN junction diode	L4
CO3	Analyze the operation of bipolar junction transistor	L4
CO4	Apply the concepts of Field Effect Transistors	L3
CO5	Illustrate the working of Special and Opto-Electronic Devices and design for the given specifications.	L2

Text books:

1. Donald Neamen and Dhrubes Biswas, "Semiconductor Physics and Devices", New Delhi: McGraw Hill Education (India), 4th Edition, 2012.
2. Donald Neamen, "Electronic Circuits Analysis and Design", Tata McGraw Hill, 3rd Edition, 2007
3. David A. Bell, "Electronic Devices and Circuits", New Delhi: Oxford University Press, 5th Edition, 2008.
4. Robert F.Pierret, "Semiconductor Device Fundamentals", New Delhi: Pearson India Education, 2th Edition, 2016.

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	3	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-	3	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-	3	-
CO4	3	3	1	1	-	-	-	-	-	-	-	-	3	-
CO5	3	3	1	1	-	-	-	-	-	-	-	-	3	-

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEPC203	Subject Title	ELECTROMAGNETIC THEORY
Category	Professional Core/	L-P-T-C	3-0-0-3
Regulation	2025	Semester	02

COURSE OBJECTIVES:

1. To Connect with the concepts of static and dynamic charges and weigh on electro- magnetic field and solve complex problems.

Course Content:

[INTRODUCTION TO ELECTRO MAGNETIC FIELDS] (09 Hours)

Sources and effects of electromagnetic fields – Coordinate systems and its Transformation –Gradient, Divergence and Curl – Gauss Divergence and Stoke's theorem – Coulomb's Law – Gauss Law and its Application.

[ELECTRIC FIELDS] (09 Hours)

Electric field due to point and continuous charges – Electric potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectrics – Electric field in multiple dielectrics –Boundary conditions,– Capacitance and Energy density.

[MAGNETIC FIELDS] (09 Hours)

Biot- Savart's Law and its application – Magnetic field intensity – Ampere's Law and its application – Magnetic flux density in free space, conductor, magnetic materials – Magnetization – Magnetic field in multiple media – Boundary conditions – Magnetic potential – Magnetic force – Torque – Inductance and Energy density.

[ELECTRO MAGNETIC FIELDS] (09 Hours)

Magnetic Circuits – Faraday's laws – Transformer and motional EMF – Forces and Energy in quasistationary Electromagnetic Fields –– Displacement current – Poisson's and Laplace's equations – Maxwell's equations (differential and integral forms) – Relation between field theory and circuit theory.

[ELECTROMAGNETICWAVES] (09 Hours)

Electromagnetic wave equations – Wave parameters: velocity, intrinsic impedance, propagation Constant – Waves in free space, Lossy and lossless dielectrics, conductors – Skin depth – Poynting theorem and Poynting vector.

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Paraphrase three different coordinate systems, Vector Calculus and theorems to solve problems in electric and magnetic fields.	L4
CO2	Categorize Electric fields and appraise energy density in the fields with help of fundamental laws	L3
CO3	Illustrate Magnetic fields and grade the magnetic potentials	L2
CO4	Correlate electric and magnetic fields with help of Faraday's Law and Maxwell's Equations and analyze them	L3
CO5	Integrate the fields and manage electromagnetic Wave propagation, Poynting theorem, Vector and solve problems.	L4

Text Books:

1. MathewN.O.Sadiku,"Elements of Electromagnetics", Oxford University press Inc. India Edition, 6th Edition, 2018.

2. Joseph. A. Edminister, "Theory and Problems of Electromagnetics", 2nd Edition, chaum Series, Tata McGraw Hill, 1993.

3. S.P.Seth,"Elements of Electromagnetic Fields",Dhanpath Rai & Sons, New Delhi, 201.

REFERENCE BOOKS:

1.Ashutosh Pramanik,"Electromagnetism–Theory and Applications",Prentice-Hall of India Private Limited, New Delhi, 2008.

2. *William. H. Hayt, "Engineering Electromagnetics", Tata McGraw Hill, 2011*

3. Kraus and Fleish,"Electromagnetics with Applications",McGraw Hill International Editions, 5thEdition, 1999.

4. *K.A.Gangadhar,P.M.Ramanthan'Electromagnetic Field Theory (including Antennaes and wave propagation)', 16th Edition, Khanna Publications,2008.*

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	-	1	1	-	-	-	-	1	-	-	-
CO2	3	2	3	-	2	1	-	-	-	-	1	-	-	-
CO3	2	1	3	-	3	1	-	-	-	-	1	-	-	-

CO4	1	1	2	3	3	2	-	-	-	-	1	-	-	-
CO5	2	3	3	-	2	2	-	-	-	-	1	-	-	-

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEPC204	Subject Title	Electronic Circuits
Category	Professional Core	L-P-T-C	3-0-0-3
Regulation	2025	Semester	02
Prerequisites			

Course Objectives:

To learn the characteristics, applications of PN junction Diode, Zener diode, UJT, BJT, FET and to design amplifiers, oscillators and pulse circuits

Course Content:

[PN JUNCTION DIODE AND ITS APPLICATIONS] (09 Hours)

Review of PN junction diodes- Rectifiers: HW, FW, Bridge Rectifiers, filters - Zener diode based voltage Regulators - Diode clampers and clippers.

[BJT AND FET] (09 Hours)

Review of BJT and FET – BJT: hybrid model – Analytical expressions – JFET: Pinch off Voltage – small signal model - MOSFET - Drain and Transfer characteristics of JFET and MOSFET. BJT: Need for biasing - Different types of biasing circuits- Small signal analysis.

[AMPLIFIERS] (09 Hours)

Classification of amplifiers – CE, CB and CC amplifiers - frequency response - Class A, B, AB, C and D - RC and transformer coupled power amplifiers - Class B complementary- symmetry, push-pull power Amplifiers Darlington connection..

[FEEDBACK AMPLIFIERS AND OSCILLATORS] (09 Hours)

Differential amplifiers: Common Mode and Differential Mode - CMRR – feedback amplifiers - Voltage / current, series / shunt feedback – condition for oscillation - oscillators – LC, RC, crystal oscillators.

[PULSE CIRCUITS] (09 Hours)

RC wave shaping circuits – Monostable, Astable and Bistable Multivibrators – Schmitt triggers – UJT construction and operation- relaxation oscillators

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Explain the applications of PN junction Diode and Zener diode.	L3
CO2	Explain the characteristics and applications BJTs, and FETs. Compare various biasing methods and circuits for the BJT and MOSFET amplifiers	L2
CO3	Explain the operation of Class A,B,C and D power amplifiers	L3
CO4	Design of feedback amplifiers and oscillators for the given specifications.	L4
CO5	Explain the working of pulse circuits and design for the given specifications.	L2

TEXT BOOKS:

1. Robert Boylestad and Lowis Nashelsky, “Electronic Devices and Circuit Theory”, 10th Edition, Pearson Education, 2009.

2. *David A. Bell, “Electronic Devices and Circuits”, 5th Edition, Prentice Hall India, 2010.*

.**Reference Books:**

1. Floyd T.L,” Electronic Devices”, 7th Edition, Pearson Education, 2009
2. Albert Malvino and David J.Bates, “Electronic Principles”,7 th Edition, Tata Mc-Graw Hill, 2007
3. Jacob Millman, Halkias C.C and Satyabrata Jit, “Electronic Devices and Circuits”, 3rd Edition, Tata Mc-Graw Hill, 2010
4. Rashid, “Microelectronic Circuits”, Thomson Publication, 1999..
5. Singh. B.P and Rekha Singh, “Electronic Devices and Integrated Circuits”, Pearson Education, 2006.
6. TheodreF. Boghert, “Electronic Devices &Circuits”Pearson Education, 6thEdition, 2003.

Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	1	1	1	-	-	-	-	-	-	-	-	-	3
CO2	2	1	1	1	-	-	-	-	-	-	-	3	-	3
CO3	2	2	2	1	1	-	-	-	-	-	1	3	-	3
CO4	2	2	2	1	1	-	-	-	-	-	1	3	-	3
CO5	2	1	2	1	1	-	-	-	-	-	1	3	-	3

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation

GOVERNMENT COLLEGE OF ENGINEERING, BARGUR- 6351

(Autonomous institute affiliated to Anna University, Chennai)

Department of Electrical and Electronics Engineering

Subject Code	25PTEPC205	Subject Title	Electric Circuits and Electron Devices Laboratory
Category	Professional Core	L-P-T-C	3-0-0-3
Regulation	2025	Semester	02
Prerequisites			

Course Objectives:

Course Content:

1. Verification of KVL and KCL
2. Verification of Thevinin's Theorem, Superposition Theorem and Max. Power Transfer Theorem.
3. Determination of Q factor for the given AC circuit
4. Determination of self and mutual inductance of the given coupled circuit
5. Time response of RL, RC and RLC circuit
6. Characteristic determination of Conventional Diode, Zener diode
7. Characteristic determination of given BJT and finding its small signal model in CE or CC or CB mode
8. Determination of Transfer characteristic of the given JFET and MOSFET
9. Determination of CTR of the given opto-coupler
10. Determination of Early Voltage of the given BJT
11. Determination of the circuit model of the given Zener diode.
12. Three phase power measurement using two wattmeter method.

Total Hours: 45

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

CO	Course Outcome	Bloom's Level
CO1	Solve electric circuits using mesh analysis, nodal analysis, and network theorems.	L2
CO2	Design and simulate resonance circuits, filter circuits, and three phase circuits.	L3
CO3	Obtain accurately the characteristics of electronic devices (Diodes, BJT, voltage regulators Independently.)	L4

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Course Articulation matrix:

CO	Program Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	2	2	2	-	-	1	-	1	3	-	3
CO2	3	2	3	2	2	2	-	-	1	-	1	3	-	3
CO3	3	2	3	2	2	2	-	-	1	-	1	3	-	3

Correlation Levels: 3 - Strong, 2 - Medium, 1 - Low, - (dash) - No correlation