R.M.D. ENGINEERING COLLEGE

(An Autonomous Institution)

REGULATIONS 2024

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABI

SEMESTER – I								
S. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1	24MA101	Matrices and Calculus	BSC	4	3	1	0	4
2	24GE102	Heritage of Tamils	HSMC	1	1	0	0	1
THEORY COURSES WITH LABORATORY COMPONENT								
3	24CS101	Programming in C++ (Lab Integrated)	ESC	6	3	0	3	4.5
4	24CS102	Software Development Practices (Lab Integrated)	ESC	6	3	0	3	4.5
5	24PH101	Physics for Electrical and Electronics Engineering (Lab Integrated)	BSC	5	3	0	2	4
6	24EC101	Electronic Devices and Circuit theory (Lab Integrated)	PCC	5	3	0	2	4
MANDATORY COURSES								
7	24MC101	Student Induction Programme (Non Credit)	MC	3 Weeks				
8	24MC103	Programming in C (Non Credit)	MC	40 Hours				
9	24MC102	Environmental Science & Sustainability (Non Credit)	MC	2	2	0	0	0
EMPLOYABILITY ENHANCEMENT COURSES								
10	24HS111	Interpersonal skills, Psychometric Analysis and Career Development	EEC	1	1	0	0	1
11	24GE111	Idea Lab I (Non Credit)	EEC	1	0	0	1	0
TOTAL				**31**	**19**	**1**	**11**	**23**

Course Code	MATRICES AND CALCULUS	L	T	P	C
24MA101		3	1	0	4

OBJECTIVES:

The course will enable the learners to:

- explain the concepts of matrix algebra techniques.
- understand various techniques to solve second and higher order differential equations.
- demonstrate simple applications of functions of several variables and vector calculus.
- comprehend the basic concepts of multiple integrals.
- illustrate elementary ideas of vector calculus.

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation (excluding similarity transformation) – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II DIFFERENTIAL EQUATIONS **12**

Second and 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 linear differential equations with constant coefficients.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **12**

Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables– Lagrange's method of undetermined multipliers.

UNIT IV MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Area enclosed by Cartesian Coordinates (excluding polar coordinates) – Triple integrals (excluding spherical and cylindrical coordinates) – Volume of solids (Cartesian Coordinates only).

UNIT V VECTOR CALCULUS **12**

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and Solenoidal vector fields – Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem (Statement only) - Simple applications involving cubes and rectangular parallelopipeds.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: compute the matrix inverse and their higher powers.

CO2: solve second and higher order differential equations.

CO3: determine the maxima and minima of functions of two variables.

CO4: determine the volume and surface area using multiple integrals.

CO5: evaluate integrals using the concept of vector calculus.

CO6: apply matrix algebra techniques to diagonalize the matrix.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2021.

REFERENCES:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
2. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003.
3. Sivaramakrishna Dass, C. Vijayakumari, "EngineeringMathematics", Pearson Education India, 4th Edition 2019.
4. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
6. NPTEL course on "Engineering Mathematics - I", by Prof. Jitendra Kumar, IIT Kharagpur: https://onlinecourses.nptel.ac.in/noc21_ma58/preview

Course Code	HERITAGE OF TAMILS	L	T	P	C
24GE102		1	0	0	1

OBJECTIVES:

The course will enable the learners to:

- recognize Tamil literature and its significance in Tamil culture.
- introduce the Tamils' rich artistic and cultural legacy.
- familiarize the different types of folk and martial arts that are unique to Tamil Nadu.
- acquaint the concept of Thinai in Tamil literature and culture.
- comprehend the significance of Tamil in developing Indian culture.

UNIT I LANGUAGE AND LITERATURE 3

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

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

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

UNIT III FOLK AND MARTIAL ARTS 3

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

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Citiesand 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

COURSE OUTCOMES:

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

CO1: state the role of Tamil literature in shaping Tamil Cultural roots.

CO2: express the cultural and religious significance of Tamil art and sculptures.

CO3: identify and describe the techniques of folk and martial arts.

CO4: glassify the role of Thinai concept in Tamil culture and literature.

CO5: compare the idea of cultural and intellectual contributions of Tamils.

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. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL –(in print)
5. Social Life of the Tamils - The Classical Period (Dr.S .Singaravelu) (Published by:International Institute of Tamil Studies.
6. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
7. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by:International Institute of Tamil Studies.)
8. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by:
9. Department of Archaeology & Tamil Nadu Text Book and Educational ServicesCorporation, 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 NaduText Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL)

Course Code	PROGRAMMING IN C++ (Theory Course with Laboratory Component)	L	T	P	C
24CS101		3	0	3	4.5

OBJECTIVES:

The Course will enable learners to:

- To learn problem solving and programming fundamentals.
- To gain knowledge on pointers and functions.
- To apply the principles of object orientated programming.
- To understand operator overloading, inheritance and polymorphism.
- To use the functionalities of I/O operations, files build C++ programs usingexceptions.

UNIT I PROGRAMMING FUNDAMENTALS 9+9

Types of computer programming languages - Genesis of C++ - Program Life Cycle - Structure of C++ program - Identifiers - Variables - Keywords - Number System -Binary Number System -Octal Number System- Decimal Number System -Hexadecimal Number System - Data types - Constants - Errors – Operators- Expressions - Type Conversions - Control-Flow Statements - Conditional Statements - Iterative Statements -Unconditional Control Statements - Arrays - One-Dimensional Arrays - Two-DimensionalArrays - Multi -Dimensional Arrays - Strings - String Manipulation Functions - Array of Strings.

List of Exercise/Experiments:

1. Write C++ programs for the following:
    a. Find the sum of individual digits of a positive integer.
    b. Compute the GCD of two numbers.
    c. Find the roots of a number (Newton’s method)
2. Write C++ programs using arrays:
    a. Find the maximum of an array of numbers.
    b. Remove duplicates from an array of numbers.
    c. Print the numbers in an array after removing even numbers.
3. Write C++ programs using strings:
    a. Checking for palindrome.
    b. Count the occurrences of each character in a given word.

UNIT II POINTERS AND FUNCTIONS 9+9

Pointers - Pointer Variables - Pointer Operators & Expressions -Pointers with Arrays - Functions - Scope Rules -Function Arguments -return Statement - Function Variables - Storage Classes - Types of storage classes - Create Header Files - User-Defined Functions - Inline Functions - Function Overloading -Recursion - Namespaces.

List of Exercise/Experiments:

1. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members: EID, Ename, Designation, DOB, DOJ, Basic pay Note that DOB and DOJ should be implemented using structure within structure.

2. Compute internal marks of students for five different subjects using structures and functions.

UNIT III CLASSES AND OBJECTS 9+9

Concepts of Object Oriented Programming – Benefits of OOP – Simple C++ program –

Classes and Objects - Member functions - Nesting of member functions - Private member functions - Memory Allocation for Objects - Static Data Members - Static Member functions - Array of Objects - Objects as function arguments - Returning objects - friend functions – Const Member functions - Constructors – Destructors.

List of Exercise/Experiments:

1. Write a program Illustrating Class Declarations, Definition, and Accessing ClassMembers.
2. Program to illustrate default constructor, parameterized constructor and copy constructors.

Practice Questions & Scenario Based Questions:

1. Imagine you are working as a software engineer at a tech company. Your team is developing a mathematical software library that will be used in various applications across the company. One of the features that your team lead has asked you to implement is a function that calculates the number of trailing zeros in the factorial ofa number.

   The team lead has emphasized the importance of encapsulation in your implementation.

2. Create a C++ class Calculator representing a simple calculator. The class should have the following attributes and methods:

   Attributes: Two operands and an operation (+, -, *, /)

   Methods: Perform the operation and return the result

   Implement constructors to initialize the calculator with default values (0,0) and with specified values. Also, implement a destructor to perform any necessary cleanup.

UNIT IV OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM 9+9

Operator Overloading - Overloading Using Friend functions – Inheritance – Types of inheritance – Virtual Base Class - Abstract Class – Constructors in Derived Classes - member class: nesting of classes.

Pointer to objects – this pointer- Pointer to derived Class - Virtual functions – PureVirtual Functions – Polymorphism.

List of Exercise/Experiments:

1. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.
2. Write a Program to Demonstrate Friend Function and Friend Class.
3. Program to demonstrate inline functions.
4. Program for Overriding of member functions.
5. Write C++ programs that illustrate how the following forms of inheritance aresupported: Single inheritance b) Multiple inheritance c) Multi level inheritance d) Hierarchicalinheritance.

Practice Questions & Scenario Based Questions:

1. Joy is a software developer at a 3D modeling company. The company is developinga new software tool that will be used by architects and engineers to design and analyze 3D models of various structures. One of the features that her project manager has asked is to implement a function that calculates the volume of basic 3Dshapes like cylinders and cuboids. The project manager has emphasized the importance of using function overloading in her implementation..

2. Imagine you are a software developer tasked with creating a utility program for a school that handles student scores. The school wants a simple program where teachers can enter the scores of students for a particular test, and the program will then provide the highest and lowest scores among them. This will help the teachers quickly identify the top performer and the student who might need extra help.

   Your task is to write program that satisfies the above scenario using **inline function**

3. Develop a software system to manage part-time worker students at a university. These students have unique attributes such as their name, student ID, hourly wage, and hours worked per week. Your goal is to create a C++ program that models this system.

4. Ramu is a software developer at a company specializing in developing softwaresolutions for geometric shapes. Recently, a client approached with a request to create a program to calculate the areas of rectangles and triangles.

UNIT V I/O, FILES AND EXCEPTIONS 9+9

C++ Streams – Unformatted I/O - Formatted Console I/O – Opening and Closing File – File modes - File pointers and their manipulations – Templates – Class Templates – Function Templates - Exception handling.

List of Exercise/Experiments:

1. Program to demonstrate pure virtual function implementation.
2. Count the number of account holders whose balance is less than the minimumbalance using sequential access file.
3. Write a Program to Demonstrate the Catching of all Exceptions.

Practice Questions & Scenario Based Questions:

1. Develop a simple library management system. Create a base class Book representing a book in the library. The class should have attributes such as title, author, and ISBN (International Standard Book Number). Implement a virtual functiondisplayDetails() to display information about the book.
2. A software developer working on a banking application. One of the requirements is toanalyze account holders' balances based on a minimum balance threshold. The application should read account information from a sequential access file, where each line represents an account record in the format: account_holder_name, balance.
3. The financial company is developing a new software tool that will be used by financial analysts to perform various calculations. One of the features of that projectis to implement is a function that performs division of two numbers.

   Write a program that takes two integer inputs, numerator and denominator, from the user. Implement error handling to check if the denominator is zero. If the denominator is zero, display the message "Division by zero is not allowed!" using an exception. If the denominator is not zero, calculate the result of the division and display it.
4. Mini project.

TOTAL: 45+45 = 90 PERIODS

OUTCOMES:

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

CO1: Solve problems using basic constructs in C++.

CO2: Implement C++ programs using pointers and functions.

CO3: Apply object-oriented concepts and solve real world problems.

CO4: Develop C++ programs using operator overloading and polymorphism.

CO5: Implement C++ programs using Files and exceptions.

CO6: Develop applications using C++ concepts

TEXT BOOKS:

1. Herbert Schildt, “The Complete Reference C++”, 4th edition, MH, 2015. (Unit 1 & 2)
2. E Balagurusamy,”Object Oriented Programming with C++”, 4th Edition, TataMcGraw-Hill Education, 2008. (Unit 3, 4 & 5)

REFERENCES:

1. Karl Beecher,”Computational Thinking: A beginner's guide to problem-solving and programming”, BCS Learning & Development Ltd, 2017. (Unit 1)
2. Nell Dale, Chip Weems, “Programming and Problem Solving with C++”, 5th Edition,Jones and Barklett Publishers, 2010.
3. John Hubbard, “Schaum's Outline of Programming with C++”, MH, 2016.

4. Yashavant P. Kanetkar, “Let us C++”, BPB Publications, 2020
5. ISRD Group, “Introduction to Object-oriented Programming and C++”, Tata McGraw-Hill Publishing Company Ltd., 2007.
6. D. S. Malik, “C++ Programming: From Problem Analysis to Program Design”, ThirdEdition, Thomson Course Technology, 2007.
https://infyspringboard.onwingspan.com/web/en/app/toc/
lex_auth_01297200240671948837_shared/overview

LIST OF EQUIPMENTS:

1. Standalone desktops with C/C++ compiler (or) Server with C/C++ compiler.

Course Code	SOFTWARE DEVELOPMENT PRACTICES (Theory Course with Laboratory Component)	L	T	P	C
24CS102		3	0	3	4.5

OBJECTIVES:

The Course will enable learners to:

- discuss the essence of agile development methods.
- set up and create a GitHub repository.
- create interactive websites using HTML
- design interactive websites using CSS.
- develop dynamic web page using Java script.

UNIT I AGILE SOFTWARE DEVELOPMENT AND Git and GitHub 9+9

Software Engineering Practices – Waterfall Model - Agility – Agile Process – Extreme Programming - Agile Process Models – Adaptive Software Development – Scrum – Dynamic Systems Development Method – Crystal – Feature Driven Development – Lean Software Development – Agile Modeling – Agile Unified Process – Tool set for Agile Process.

Introduction to Git –Setting up a Git Repository - Recording Changes to the Repository - Viewing the Commit History - Undoing Things - Working with Remotes -Tagging - Git Aliases - Git Branching - Branches in a Nutshell - Basic Branching and Merging - Branch Management - Branching Workflows - Remote Branches - Rebasing.

Introduction to GitHub – Set up and Configuration - Contribution to Projects, Maintaining a Project – Scripting GitHub.

List of Exercise/Experiments:

1. Form a Team, Decide on a project:
    a) Create a repository in GitHub for the team.
    b) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updating.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.

2. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.

3. Form a Team, Decide on a project:
    c) Create a repository in GitHub for the team.
    d) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updation.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.
4. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.

UNIT II HTML **9+9**

Introduction – Web Basics – Multitier Application Architecture – Cline-Side Scripting versus Server-side Scripting – HTML5 – Headings – Linking – Images – Special Characters and Horizontal Rules – Lists – Tables – Forms – Internal Linking – meta Elements – Form input Types – input and datalist Elements – Page-Structure Elements.

List of Exercise/Experiments:

1. Create web pages using the following:
    - Tables and Lists
    - Image map
    - Forms and Form elements
    - Frames

UNIT III CSS **9+9**

Inline Styles – Embedded Style Sheets – Conflicting Styles – Linking External Style Sheets – Positioning Elements – Backgrounds – Element Dimensions – Box Model and Text Flow – Media Types and Media Queries – Drop-Down Menus – Text Shadows – Rounded Corners – Colour – Box Shadows – Linear Gradients – Radial Gradients – Multiple Background Images – Image Borders – Animations – Transitions and Transformations – Flexible Box Layout Module – Multicolumn Layout.

List of Exercise/Experiments:

1. Apply Cascading style sheets for the web pages created.

UNIT IV JAVASCRIPT BASICS 9+9

Introduction to Scripting – Obtaining user input – Memory Concepts – Arithmetic – Decision Making: Equality and Relational Operators – JavaScript Control Statements – Functions – Program Modules – Programmer-defined functions – Scope rules – functions – Recursion – Arrays – Declaring and Allocating Arrays – References and Reference Parameters – Passing Arrays to Functions – Multidimensional arrays.

List of Exercise/Experiments:

1. Form Validation (Date, Email, User name, Password and Number validation) using JavaScript.

UNIT V JAVASCRIPT OBJECTS 9+9

Objects – Math, String, and Date, Boolean and Number, document Object – Using JSON to Represent objects – DOM: Objects and Collections – Event Handling.

List of Exercise/Experiments:

Implement Event Handling in the web pages.

Mini Projects-Develop any one of the following web applications (not limited to one) using above technologies.

a. Online assessment system
b. Ticket reservation system
c. Online shopping
d. Student management system
e. Student result management system
f. Library management
g. Hospital management
h. Attendance management system
i. Examination automation system
j. Web based chat application

TOTAL: 45+45=90 PERIODS

OUTCOMES:

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

CO1: Understand basic software engineering practices effectively.

CO2: Apply version control using Git and GitHub, and manage code repositories proficiently.

CO3: Design web applications using HTML, CSS, and JavaScript.

CO4: Analyze problems and create solutions using CSS for better web page presentation and usability.

CO5: Develop interactive web pages using JavaScript with an event-handling mechanism.

CO6: Apply the technological changes and improve skills continuously.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner„s Approach", McGraw Hill International Edition, Nineth Edition, 2020.

2. Scott Chacon, Ben Straub, "Pro GIT", Apress Publisher, 3rd Edition, 2014.
   Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Pearson, 5th Edition, 2018.

REFERENCES:

1. Roman Pichler, "Agile Product Management with Scrum Creating Products that Customers Love", Pearson Education, 1 st Edition, 2010.
2. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
3. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition, 1999.
4. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
5. Gopalan N.P. and Akilandeswari J., "Web Technology", Second Edition, Prentice Hall of India, 2014.
6. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_ shared/overview
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094421427470336209 9_ shared/overview

LIST OF EQUIPMENTS:

1. Systems with either Netbeans or Eclipse
2. Java/JSP/ISP Webserver/Apache
3. Tomcat / MySQL / Dreamweaver or
4. Equivalent/ Eclipse, WAMP/XAMP

Course Code	PHYSICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING (Theory Course with Laboratory Component)	L	T	P	C
24PH101		3	0	2	4

OBJECTIVES:

The course will enable the learners to:

- understand the classical free electron theory and Fermi distribution function
- differentiate the types of semiconductors and derive their carrier concentration
- relate the theory of laser with its applications in optical devices.
- solve the Schrodinger's wave equation in one dimensional and three dimensional box
- comprehend the behavior of semiconductor diodes in various electron devices and nano electronic devices.

UNIT I CONDUCTING MATERIALS 12

Drude and Lorentz classical free electron theory - Expressions for electrical conductivity and thermal conductivity -Wiedemann-Franz law - Success and failures of classical free electron theory - thermal conductivity of a bad conductor- Lee's disc method -Fermi-Dirac distribution function - Effect of temperature on Fermi-Dirac distribution function- Density of energy states – Total energy and average energy of an electron at 0 K. (Theory-9)

1. Determination of thermal conductivity of a bad conductor- Lee's disc method

(Laboratory-3)

UNIT II SEMICONDUCTING MATERIALS 15

Elemental and Compound semiconductors – Energy-wave vector diagram – Intrinsic semiconductor- carrier concentration in intrinsic semiconductors- Determination of Fermi energy and Bandgap - Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductors – Law of mass action -Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.

(Theory -9)

1. Band gap determination of intrinsic semiconductor
2. Determination of Hall-coefficient of semiconductor

(Laboratory -6)

UNIT III LASER AND OPTICAL DEVICES 18

Laser characteristics - Spatial and Temporal Coherence - Population inversion - Relation between Einstein's A and B coefficients - Components of Laser - Optical amplification (qualitative) -

Semiconductor lasers: Homojunction and Heterojunction- Principle and propagation of light through an optical fiber -Acceptance angle and Numerical aperture, LED, PN photodiodes - PIN photodiode and Avalanche photodiode - -Engineering applications of lasers (qualitative)-.

(Theory -9)

1. Determination of divergence of laser beam
2. Determination of acceptance angle and numerical aperture of an optical fiber
3. Determination of wavelength of semiconductor laser

(Laboratory-9)

UNIT IV QUANTUM PHYSICS **15**

Planck's quantum theory- Black body radiation- Newton's law of Cooling – Heisenberg's Uncertainty principle – Schrodinger's wave equations (time independent and time dependent)- Physical significance of wave function - de Broglie hypothesis -Particle in a one-dimension box – Particle in a three- dimensional box (Qualitative) – Degenerate and Non degenerate energy states Tunneling through a potential barrier.

(Theory -9)

1. Determination of Planck's constant
2. Determination of emissivity – Newton's law of cooling

(Laboratory -6)

UNIT V NANO ELECTRONIC DEVICES **15**

Introduction to Nano materials – synthesis by sol gel method, properties – Moore's law - Electron density in bulk material (qualitative) -Size dependence of Fermi energy- Band gap of nanomaterial - Quantum confinement -Quantum Structures-Density of states in quantum well, quantum wire and quantum dot structures – Application: Quantum dot laser.

(Theory -9)

1. Synthesis of nano-powders by sol-gel method
2. Determination of particle size using laser source

(Laboratory -6)

TOTAL: 75 PERIODS

COURSE OUTCOMES

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

CO1: derive electrical and thermal conductivities using classical free electron theory
CO2: use Fermi Dirac distribution function to determine the density of energy states
CO3: distinguish between the types of semiconductors using the hall effect experiment
CO4: associate the basic principles of working of laser and their applications in opto-electronic Devices
CO5: calculate the energy eigen value and eigen function for a particle in a one- dimensional and three dimensional box using Schrodinger wave equations
CO6: relate the quantum properties of nanoscale materials with their applications

TEXT BOOKS

1. Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi, 2010.
2. M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi, 2014.
3. Kasap, S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
4. Wahab, M.A., Solid State Physics: Structure and Properties of Materials. Narosa Publishing House,2009.
5. William T. Silfvast, Laser Fundamentals, 2nd Edition, Cambridge University press, New York, 2004.

REFERENCES

1. R.K. Gaur and S.L. Gupta, Engineering Physics, Dhanpat Rai Publications (P) Ltd., Eighth Edition., New Delhi, 2001.
2. Hanson, G.W., Fundamentals of Nanoelectronics, Pearson Education, 2009
3. R. A. Serway and J.W. Jewett, Physics for Scientists and Engineers, Ninth Edition. Cengage Learning, 2014.
4. Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems. CRC Press, 2014.
5. Marikani, Materials Science, PHI Learning Private Limited, Eastern Economy Edition, 2017.
6. R. Wolfson, Essential University Physics, Volume 1 and 2 with Mastering Physics, Global Edition,3rd Edition, Pearson 2017.
7. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India, 2012.
8. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc., 1995.

9. Garg, H.P., Treatise on Solar Energy, John Wiley & Sons, 2006.
10. Wilson J.D. and Hernandez C.A., Physics Laboratory Experiments, Houghton Mifflin Company, New York 2005.
11. NPTEL course on "Introduction to LASER" by Prof. M. R. Shenoy, IIT Delhi : https://onlinecourses.nptel.ac.in/noc24_ph45/preview
12. NPTEL course on "Introduction to Semiconductor Devices" by Prof. Naresh Kumar Emani, IIT Hyderabad : https://onlinecourses.nptel.ac.in/noc24_ee99/preview
13. Physics for Electronics Engineering – Laboratory Manual, R.M.D. Engineering College, 2022.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1.	Semiconductor Laser	6 Nos.
2.	Determination of optical fiber parameters	6 Nos.
3.	Lee's disc apparatus	6 Nos.
4.	Emissivity Determination	6 Nos.
5.	Bandgap determination set up	6 Nos.
6.	Sol-gel synthesis of nano powders	6 Nos.
7.	Planck's constant apparatus	6 Nos.
8.	Hall effect set-up	2 Nos.

Course Code		L	T	P	C
24EC101	**ELECTRONIC DEVICES AND CIRCUIT THEORY (Theory course with laboratory component)**	3	0	2	4

COURSE OBJECTIVES:

- To discuss the behavior of semiconductor diodes in various applications.
- To familiarize the operation of BJT and FET.
- To construct electronic circuits using special semiconductor devices.
- To understand the fundamental laws of electric circuits.
- To analyze the response of electric circuits using network theorems.

UNIT I OVERVIEW OF ELECTRONIC DEVICES AND ELECTRICAL CIRCUITS **9+6**

Basic Electronic Components: Resistors, Capacitors, Inductors; Diodes types-PN Junction, Special purpose diodes- Zener Diode, Photodiode, LED, Solar Cell- Characteristics. Basic Electrical Circuits: Ohm's Law, Short and open circuits, Voltage division in series, current division in parallel. Analysis of series and parallel circuits.

List of Experiments:

1. VI Characteristics of PN diode.
2. VI Characteristics of Zener diode.

UNIT II BIPOLAR JUNCTION TRANSISTOR **9+6**

BJT Types - NPN and PNP transistors, Transistor Characteristics: Input and output characteristics, and the concept of operating regions (active, cutoff, saturation) in common base, common emitter and common collector Configurations -Advantages and Disadvantages of BJT.

List of Experiments:

3. .VI Characteristics of BJT in Common Emitter Configuration & also Simulate using PSPICE
4. VI Characteristics of BJT in Common Base Configuration & also Simulate using PSPICE
5. VI Characteristics of BJT in Common Collector Configuration & also Simulate using PSPICE

UNIT III FIELD EFFECT TRANSISTORS 9+6

Theory and Operation of JFET: Structure, types, operation and characteristics of JFET. Advantages and Disadvantages of JFET. Theory and Operation of MOSFET: Structure, types, operation and characteristics of MOSFET (enhancement-mode, depletion-mode). Advantages and Disadvantages of MOSFET.

List of Experiments:

6. Characteristics of JFET & also Simulate using PSPICE or Multisim.
7. Characteristics of MOSFET & also Simulate using PSPICE or Multisim

UNIT IV CIRCUIT THEORY 9+6

Equivalent resistance, Star-Delta conversion; Kirchhoff's Laws: Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL); Mesh Analysis and Node Analysis (AC and DC).

List of Experiments:

8. Verification of Kirchhoff's current law and Kirchhoff's voltage law

UNIT V NETWORK THEOREMS 9+6

Thevenin's and Norton's theorems – Superposition Theorem –Maximum power transfer theorem, Millman's theorem.

List of Experiments:

9. Verification of Thevenin's theorem.
10. Verification of Norton's theorem.

TOTAL: 45 THEORY + 30 LAB = 75 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the operating principles of electronic devices

CO2: Analyze the V-I characteristics of electronic devices.

CO3: Design basic electronic circuits using various electron devices.

CO4: Analyze electric circuits using network theorems.

CO5: Evaluate the Performance of Electrical and Electronic Circuits Using SimulationTools

CO6: Develop simple circuits for real time applications.

TEXTBOOKS:

1. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7thEdition, McGraw Hill, 2022.
2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 11thEdition, 2017.

REFERENCES:

1. W.H.Hayt, J.E.Kemmerly and S.M.Durbin, Engineering Circuit Analysis, 9thEdition, McGraw Hill Education, New Delhi, India, 2019.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum‘s Outline Series, 5thEdition Reprint, Tata McGraw Hill Publishing Company, New Delhi,2016.
3. David A Bell, Electric Circuits and Electronic Devices, Oxford University Press,2010.
4. Thomas L.Floyd, Electronic Devices, 9th Edition, Pearson, 2017.
5. Donald A.Neaman, Semiconductor Physics and Devices, 4th Edition, McGrawHill, 2017.
6. Dr.R.S.Sedha, A Textbook of Applied Electronics, S Chand and company limited, 2019.

NPTEL LINK

1. https://archive.nptel.ac.in/courses/108/108/108108122/2.
2. https://onlinecourses.nptel.ac.in/noc22_ee93/preview

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Bread Boards -15 Nos

CRO (30MHz) - 10 Nos

Signal Generator /Function Generators (3 MHz) - 15 Nos

Transistor/FET/BJT(NPN-PNP) and MOSFET(NMOS/PMOS) - 25 Nos

Dual power supply/ single mode power supply - 15 Nos

Multimeter -15 Nos

Ammeter (0-50) mA -15 Nos

Voltmeter (0-30) V-15 Nos

Standalone desktops PC with SPICE

Course Code	STUDENT INDUCTION PROGRAM (SIP)	L	T	P	C
24MC101		3 Weeks			

OBJECTIVES

The course will enable the learners to:

- Facilitate the adjustment of new students to the new environment, ensuring they feel comfortable and supported.
- Inculcate the institution's ethos and culture in new students, helping them internalize these values.
- Encourage the building of bonds among students and between students and faculty members.
- Expose students to a sense of larger purpose and guide them in their journey of self-exploration.

The various modules or core areas recommended for the 3-week SIP are

Module 1: Universal Human Values I **18**

Welcome and Introductions - Aspirations and Concerns - Self- Management - Health - Relationships - Society - Natural Environment - Sum Up - Self-evaluation and Closure.

Module 2: Physical Health and Related Activities **6**

Special Lecturers: Happy and Healthy lifestyle - Physical Health -Mental Health - Health and Fitness.

Module 3: Familiarization of Department/ Branch and Innovation **8**

Principal Address - Address by Head of Science and Humanities - Addresses by Respective Department HoDs – Campus Tour – CoE introduction – Introduction of Student Activity Cell (SAC).

Module 4: Visit to a Local Area **4**

Virtual tour: Government Museum - Theosophical Society - Fort St. George - Ripon Building - Kalakshetra Foundation - Anna Centenary Library - Marina Beach - St. Thomas Mount - Vivekananda House**.**

Module 5: Lectures by Eminent People **10**

Special Lecturers: Academics – industry – Careers – Art - Self-management.

Module 6: Proficiency Modules **30**

Basic Competencies: C Programming, Foundation in Mathematics, Interpersonal Communication.

Module 7: Literature / Literary Activities **7**

Literary Debate - Creative Writing Workshop - Literature Circle Discussions - Author Study and Presentation.

Module 8: Creative Practices **10**

Activity: Handicrafts (Painting / Drawing / Pottery / Knitting / Jewellery making, etc.)

Module 9: Extra Curricular Activities **10**

Students Activity Cell: Activities from Coding Club – Math Club -- Language Club - Astronomy Club - ECO Club - Photography Club - Tedx Club -Yoga Club.

Valedictory and Closing Ceremony **2**

TOTAL: 105 PERIODS

COURSE OUTCOMES

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

- Achieve a smooth transition where students feel comfortable and confident in their new environment.
- Demonstrate a strong understanding and practice of the institution's ethos and culture within the campus community.
- Build meaningful and supportive relationships with peers and faculty members.
- Develop a clear sense of purpose and engage in self-exploration, leading to a deeper understanding of personal goals and aspirations.

REFERENCE:

https://www.aicte-india.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf

Course Code	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	L	T	P	C
24MC102		2	0	0	0

OBJECTIVES:

The course will enable the learners

- To gain knowledge of the environment and various natural resources.
- To identify the Scientific and Technological solutions to pollution issues and waste management.
- To understand the significance of the conservation of biodiversity.
- To recognize the needs and benefits of sustainability and its management.
- To comprehend the effects of human population on the environment.

UNIT I NATURAL RESOURCES 7

Definition, scope and importance of environment – need for public awareness. Introduction to natural resources - types - forest resources: use and over-exploitation, deforestation and its impacts, food resources: effects of modern agriculture, organic farming, renewable energy sources - solar, wind, geothermal, tidal, OTE and biomass. field activity -tree plantation

UNIT II POLLUTION AND WASTE MANAGEMENT 7

Pollution - definition –causes, effects and control measures of (a) air pollution (b) water pollution (c) soil pollution (d) noise pollution (e) nuclear hazards - nuclear accidents and holocaust - role of an individual in prevention of pollution –case studies.

Waste management- municipal solid wastes, E- waste, plastic waste.

Field study – Solid waste management of the institution

UNIT III BIODIVERSITY AND ITS CONSERVATION 6

Biodiversity: types – values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species, extinct, rare, vulnerable species of India – conservation of biodiversity: in-situ and ex-situ method.

Field study – Biodiversity of the institution

UNIT IV SUSTAINABILITY AND MANAGEMENT 5

Sustainability-concept, needs and challenges- circular economy - sustainable development goals-concept of carbon footprint, environmental impact assessment, clean development mechanism, solutions.

Field study – Alternate energy sources and its impacts

UNIT - V HUMAN POPULATION **5**

Introduction - population growth, variation among nations, population explosion, environment and human health – endemic/epidemic/pandemic – role of information technology in environment and human health.

Case Study – Pandemics of 21st century

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able

CO1: To investigate and use conservational practices to protect natural resources.

CO2: To identify the causes of pollutants and illustrate suitable methods for pollution abatement.

CO3: To analyze the values of biodiversity and its conservational methods.

CO4: To classify suitable sustainable development practices and apply it in day-to-day life.

CO5: To assess the impacts of human population and suggest suitable solutions.

CO6: To develop innovative solutions and strategies to address sustainability challenges.

TEXTBOOKS:

1. Anubha Kaushik and C.P. Kaushik, "Perspectives in environmental studies", New Age International Publishers, 8th edition, 2024.
2. Benny Joseph, Environmental Science and Engineering, McGraw-Hill, 1st edition, 2017.
3. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Pearson Education, 3rd edition, 2014.
4. Erach Bharuch, Textbook of Environmental Studies for Undergraduate Courses, Universities Press(I) Pvt. Ltd., 3rd edition, 2021.

REFERENCES:

1. William P. Cunningham and Mary Ann Cunningham Environmental Science: A Global Concern, McGraw Hill, 14th edition, 2017.
2. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Oxford University Press, 2015.
3. G. Tyler Miller and Scott E. Spoolman, ―Environmental Science, Cengage Learning India Pvt, Ltd., Delhi, 2014.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall, 2012.
5. Bradley. A.S; Adebayo, A.O. and Maria, P. Engineering applications in sustainable design and development, Cengage learning, 2015.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006 and subsequent amendments, 2022

Course Code	INTERPERSONAL SKILLS, PSYCHOMETRIC ANALYSIS AND CAREER DEVELOPMENT	L	T	P	C
24HS111		1	0	0	1

OBJECTIVES

The course will enable the learners to:

- Evaluate and enhance language proficiency by using SMART Vox to assess communication skills and linguistic abilities.
- Explore future technologies, solve real-time problems, and prepare students for campus recruitment.
- Assess and develop work style, cognitive abilities, emotional intelligence, and work competencies
- Explore placements, internships, higher education options, GATE and CAT exams, and career development.
- Understand career milestones, assess personal skills and personality, and develop effective goal-setting strategies for successful career planning

UNIT I LANGUAGE PROFICIENCY EVALUATION 3

Identification of Strengths and Weaknesses - Assessing Language Skills (Diagnostic tests and interactive exercises) - Measuring Language Competence (Proficiency Levels) - Identifying Support Needs - Developing Individual Learning Plans - Enhancing Student Experience (Building Confidence) – Evaluation using SMART Vox

UNIT II CAREER GUIDANCE 3

Future of Engineering- Various aspects of Technology and its Applications - Future of Technologies – Branch Specific emerging technologies - Problems solving through open source - Campus recruitment process.

UNIT III PSYCHOMETRIC EVALUATION 3

Understanding Behavioural work style (Personality)- Testing of numerical, logical, and verbal reasoning skills (Cognitive Abilities / Aptitude) – Measure of emotional intelligence and interpersonal skills – Determination of Culture Preferences in various workplace scenarios – Evaluation of Work Competencies through targeted games and simulations

UNIT IV CAREER PREPARATION 3

Present Scenario of Engineering - Placement Opportunities - Internship Opportunities - Types of Internships- Higher Education opportunities in India and Abroad - Understanding GATE and CAT Exams - Other Opportunities - Career path development plans.

UNIT V CAREER VISION AND PLANNING **3**

Introduction to career milestones - Overview of the Vision Assessment and its benefits - Psychometric evaluation - Numeracy, Literacy, Visual Reasoning, Algorithmic Thinking - Introduction to a goal-setting model - Identification career pathways aligned with personality profiles - Evaluate personal skills and abilities in various areas.

COURSE OUTCOMES **TOTAL: 15 PERIODS**

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

CO1: Assess and improve their English language proficiency using SMART Vox, gaining insights into their communication skills and linguistic competence

CO2: Understand future engineering trends, emerging technologies, importance of solving real-time problems, and the process of campus recruitment.

CO3: Evaluate their behavioral work style, cognitive abilities, emotional intelligence, cultural preferences, and work competencies.

CO4: Understand the current engineering landscape, placement opportunities, and higher education prospects to develop effective career path plans

CO5: Develop a clear and actionable vision for their future career path.

Course Code	IDEA LAB – I	L	T	P	C
24GE111		0	0	1	0

The students may be grouped into 3 to 4. The device/Machine/system/component are studied by the students and a final presentation to be done by the students about the study of various devices or machinery at the end of the semester.

OBJECTIVES:
Students completing this course are expected to

- Understand the functionalities and limitation of various machines/equipment
- Demonstrate various operations that can be performed using various machines

LIST OF EXPERIMENTS

1. Study of fundamental operations of 3D Printer and Scanner with Software.
2. Study of Laser cutting machine.
3. Study of CNC Router machine.
4. Study of Fundamentals of basic circuit design, Soldering and Desoldering.
5. Study of PCB Milling Machine.

TOTAL: 15 PERIODS

OUTCOMES
After successful completion of the course the students will be able to

CO1 Describe the working of the 3D Printer.

CO2 Explain the operation of the CNC router and laser cutting machines.

CO3 Explain the basic parts and PCB fabrication process.

CO4 Develop the ability to handle delicate electronic components carefully, minimizing damage during the soldering process.

CO5 Describe the process for converting ideas into prototypes.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Equipment Name	Quantity
1	CNC Router	1 No
2	3D Printer	1 No
3	3D Scanner	1 No
4	Laser cutting Machine	1 No
5	Multimeter	5 Nos
6	Solder Stations	5 Sets
7	Desoldering Machine	1 No
8	PCB Milling Machine	1 No
9	Variable Power Supply	1 No
10	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor, etc.	5 Sets