R.M.K. COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

R.S.M Nagar, Puduvoyal, Gummidipoondi Taluk, Thiruvallur District, Tamil Nadu- 601206
Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/Accredited by NAAC with AGrade
An ISO 9001:2015 Certified Institution / All the Eligible Programs are accredited by NBA, New Delhi

B.E.- ELECTRONICS AND COMMUNICATION ENGINEERING REGULATIONS–2022

CHOICE BASED CREDIT SYSTEM

I SEMESTER CURRICULUM

Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
SEMESTER –I								
THEORY COURSES WITH LABORATORY COMPONENT								
1	22MA101	Matrices and Calculus	BSC	5	3	0	2	4
2	22PH101	Physics for Electronics Engineering	BSC	5	3	0	2	4
3	22CS101	Problem Solving using C++	ESC	5	3	0	2	4
4	22CS102	Software Development Practices	ESC	5	3	0	2	4
5	22EC101	Digital Principles and System Design	ESC	5	3	0	2	4
6	22HS101	Professional Communication	HSMC	4	2	0	2	3
THEORY COURSES								
7	22GE201	Heritage of Tamils / தமிழர் மரபு	HSMC	1	1	0	0	1
LABORATORY COURSES								
8	22GE111	Product Development Lab - 1	EEC	2	0	0	2	1
MANDATORY COURSES								
9	22CH102	Environmental Sciences and Sustainability (Non Credit)	MC	2	2	0	0	0
10		Induction Program (Non Credit)	MC	3Weeks				
		TOTAL		**34**	**20**	**0**	**14**	**25**

COURSE CODE	MATRICES AND CALCULUS (Theory Course with Laboratory Component) (Common to All I Semester B.E. / B. Tech Programmes)	L	T	P	C
22MA101		3	0	2	4

OBJECTIVES:

The syllabus is designed to:

- explain the concepts of matrix algebra techniques needed for practical applications
- determine the curvature of the curves
- illustrate the simple applications of multivariable calculus and vector calculus
- elaborate the concept and application of multiple integrals

UNIT I   MATRICES   15

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 – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

Theory: 9

Experiments using SCILAB:
1. Introduction to SCILAB through matrices and general syntax.
2. Finding the Eigenvalues and Eigenvectors.
3. Plotting the graph of a quadratic form.

Laboratory: 6

UNIT II   SINGLE VARIABLE CALCULUS   15

Curvature in Cartesian and Polar Co-ordinates – Centre and radius of curvature – Circle of curvature–Evolutes.

Theory: 9

Experiments using SCILAB:
1. Evaluating the radius of curvature.
2. Finding the coordinates of the center of curvature.
3. Tracing of Curves.   Laboratory: 6

UNIT III   MULTIVARIABLE CALCULUS   15

Partial derivatives (excluding Euler's theorem) – 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.

Theory: 9

Experiments using SCILAB:
1. Evaluating the maxima of functions of several variables.
2. Evaluating the minima of functions of several variables.
3. Evaluation of Jacobians.   Laboratory: 6

UNIT IV   MULTIPLE INTEGRALS   15

Double integrals – Change of order of integration – Area enclosed by plane curves – Triple integrals – Volume of solids.   Theory: 9

Experiments using SCILAB:
1. Evaluating area under a curve.
2. Evaluating area using double integral.
3. Evaluation of volume by integrals.   Laboratory: 6

UNIT V   VECTOR CALCULUS   **15**
Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane and Gauss divergence theorem (Statement only) – Simple applications involving cubes and rectangular parallelopipeds.

Theory: 9

Experiments using SCILAB:
1. Evaluating gradient.
2. Evaluating directional derivative.
3. Evaluating divergence and curl.   Laboratory: 6

COURSE OUTCOMES:
After the successful completion of the course, the student will be able to:
CO1: Use the matrix algebra methods to diagonalize the matrix
CO2: Determine the evolute of the curve.
CO3: Apply differential calculus ideas on the function of several variables.
CO4: Evaluate the area and volume by applying the concept of multiple integration .
CO5: Utilize the concept of vector calculus in evaluating integrals.

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, 43rd Edition, 2014.

REFERENCES:
1. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003.
2. P. Sivaramakrishna Das, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.
6. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

COURSE CODE	PHYSICS FOR ELECTRONICS ENGINEERING (Theory Course with Laboratory Component) (For I Semester B.E. – ECE Branch)	L	T	P	C
22PH101		3	0	2	4

OBJECTIVES

The Course will enable the learners to:
- Educate the fundamental important concepts in Physics and to apply the knowledge in solving Scientific and Engineering problems.
- Impart the basic concepts of light propagation in waveguides, conducting materials,
- Semiconducting materials, opto and nanoelectronic devices and photovoltaic technology.

UNIT I   LASER AND FIBRE OPTICS   15

Population of energy levels – Einstein's A and B coefficients derivation - Resonant cavity - Optical amplification (qualitative) - Semiconductor lasers: homojunction and heterojunction- Engineering applications of lasers in data storage (qualitative).

Fibre optics: Principle and propagation of light through optical fibre - V-number - Types of optical fibres (Material, refractive index and mode) - Losses in optical fibre - Fibre optic communication - Fibre optic sensors (pressure and displacement).

(Theory -9)

1. Determination of divergence of laser beam
2. Determination of acceptance angle and numerical aperture of an optical fibre   **(**Laboratory -6)

UNIT II   ELECTRON THEORIES OF MATERIALS   15

Introduction to Classical, Quantum and Zone free electron theories, Classical free electron theory - Expressions for electrical conductivity and thermal conductivity - Wiedemann-Franz law - Success and failures of CFT- Effect of temperature on Fermi function- Density of energy states and average energy of electron at 0 K - Energy bands in solids.

(Theory -9)

1. Determination of thermal conductivity of a bad conductor - Lee's disc method
2. Measurement of the internal resistance using potentiometer   (Laboratory -6)

UNIT III   SEMICONDUCTING MATERIALS   15

Intrinsic Semiconductors – E-k diagram -Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors- Band gap determination-Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductors -Electrical conductivity of intrinsic and extrinsic semiconductors -Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.   (Theory -9)

1. Bandgap determination of intrinsic semiconductor
2. Determination of wavelength of semiconductor laser   (Laboratory -6)

UNIT IV   OPTO AND NANO ELECTRONIC DEVICES   18
Carrier generation and recombination processes in semiconductors (concepts only) –LED-Organic LED- Photodetectors– 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 - Quantum dot lasers.

(Theory -9)

1. Synthesis of nanoparticles by sol-gel method
2. Determination of particle size using laser source
3. Determination of bandgap of an LED   (Laboratory -9)

UNIT V   PHOTOVOLTAICS   12
Photovoltaic effect- Solar Cell-Parameters of Solar Cells -Solar Cell Technology -Effect of Conversion Efficiency-Input Light- Solar Cell Area, Angle of Light Falling on Solar Cell-Solar Cell Operating Temperature, photovoltaic thermal collectors, and organic solar cells-dye sensitized solar cell.   (Theory -9)
1. Solar cell characteristics   (Laboratory -3)

TOTAL: 75 PERIODS

COURSE OUTCOMES
On successful completion of this course, the student will be able to
   CO1: Discuss the basic principles of working of laser and their applications in fibre optic communication
   CO2: Summarize the classical and quantum electron theories and energy band structures
   CO3: Describe the conductivity in intrinsic and extrinsic semiconductors and importance of Hall Effect measurements
   CO4: Associate the properties of nanoscale materials and their applications in quantum computing
   CO5: Explain the concepts of photovoltaic technology and its applications.

TEXT BOOKS:
   1. M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi, 2014.
   2. Kasap, S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
   3. Wahab, M.A. Solid State Physics: Structure and Properties of Materials‖. Narosa Publishing House, 2009.
   4. Nelson, J, The physics of Solar Cells, Imperial College Press, 2003.
   5. Jui Sheng Hsieh, Solar Energy Engineering, Prentice Hall, 2007.

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. A. Marianna, 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.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1.	Semiconductor Laser	6 Nos.
2.	Determination of optical fibre parameters	6 Nos.
3.	Lee's disc apparatus	6 Nos.
4.	Potentiometer	6 Nos.
5.	Bandgap determination set up	6 Nos.
6.	Sol-gel synthesis	2 Nos.
7.	Bandgap of an LED	6 Nos.
8.	Solar cell characteristics	2 Nos.

22CS101	PROBLEM SOLVING USING C++	L	T	P	C
	(Lab Integrated)	3	0	2	4

OBJECTIVES:

- To learn programming fundamentals in C.
- To gain knowledge on pointers and functions.
- To apply the principles of classes and objects
- To develop a C++ application with object oriented concepts.
- To use the functionalities of I/O operations, files build C++ programs using exceptions.

UNIT I	PROGRAMMING FUNDAMENTALS	15

General Problem Solving concepts: Algorithm for problem solving with Sequential Logic Structure, Decisions and Loops.
Overview of C – Data types – Identifiers – Variables – Storage Class Specifiers – Constants – Operators - Expressions – Statements – Arrays and Strings – Single-Dimensional – Two-Dimensional Arrays – Arrays of Strings – Multidimensional Arrays.

UNIT II	POINTERS AND FUNCTIONS	15

Pointers -Variables – Operators – Expressions – Pointers and Arrays – Functions - Scope Rules – Function Arguments – return Statement – Recursion – Structures – Unions – Enumerations.

UNIT III	CLASSES AND OBJECTS	15

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

UNIT IV	OPERATOR OVERLOADING , INHERITANCE AND POLYMORPHISM	15

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 – Pure Virtual Functions – Polymorphism

UNIT V	I/O, FILES AND EXCEPTIONS	15

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.

Lab Exercises

1. Write C/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/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/C++ programs using strings:

a. Checking for palindrome.

b. Count the occurrences of each character in a given word.

4. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members:

EID, Ename, Designation, DOB, DOJ, Basicpay

Note that DOB and DOJ should be implemented using structure within structure.

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

6. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.

7. Program to illustrate default constructor, parameterized constructor and copy constructors

8. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.

9. Write a Program to Demonstrate Friend Function and Friend Class.

10. Program to demonstrate inline functions.

11. Program for Overriding of member functions.

12. Write C++ programs that illustrate how the following forms of inheritance are supported:

a) Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance

13. Program to demonstrate pure virtual function implementation.

14. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

15. Write a Program to Demonstrate the Catching of all Exceptions.

16. Mini project.

TOTAL: 45+30 = 75 PERIODS

OUTCOMES:

At the end of this 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.

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, Tata McGraw-Hill Education, 2008. (Unit 3, 4 & 5)

REFERENCES:

1. Nell Dale, Chip Weems, "Programming and Problem Solving with C++", 5th Edition, Jones and Barklett Publishers, 2010.
2. John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.
3. Yashavant P. Kanetkar, "Let us C++", BPB Publications, 2020
4. ISRD Group, "Introduction to Object-oriented Programming and C++", Tata McGraw-Hill Publishing Company Ltd., 2007.
5. D. S. Malik, "C++ Programming: From Problem Analysis to Program Design", Third Edition, Thomson Course Technology, 2007.
6. https://infyspringboard.onwingspan.com/web/en/app/toc/ lex_auth_01297200240671948837_shared/overview

22CS102	**SOFTWARE DEVELOPMENT PRACTICES** (Theory Course with Laboratory Component)	L	T	P	C
		3	0	2	4

OBJECTIVES:

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

UNIT I	AGILE SOFTWARE DEVELOPMENT AND Git and GitHub	15

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.

UNIT II	HTML	15

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.

UNIT III	CSS	15

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 – Color – Box Shadows – Linear Gradients – Radial Gradients – Multiple Background Images – Image Borders – Animations – Transitions and Transformations – Flexible Box Layout Module – Multicolumn Layout.

UNIT IV	JAVASCRIPT BASICS	15

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.

UNIT V	JAVASCRIPT OBJECTS and database connectivity	15

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

Indicative List of 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 atleast 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.

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

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

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

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

6. Implement Event Handling in the web pages.

7. 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+30 = 75 PERIODS

OUTCOMES:

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

CO1: Apply agile development methods in software development practices.
CO2: Set up and create a GitHub repository.
CO3: Develop static and dynamic webpages using HTML.
CO4: Design interactive personal or professional webpages using CSS.
CO5: Develop web pages using Java script with event-handling mechanism.

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.
3. 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_013094421427470303362099_shared/overview

COURSE CODE	COURSE TITLE	L	T	P	C
22EC101	DIGITAL PRINCIPLES AND SYSTEMS DESIGN	3	0	2	4

OBJECTIVES:
- To acquire the knowledge in Digital fundamentals and its simplification methods.
- To familiarize the design of various combinational digital circuits using logic gates.
- To realize various sequential circuits using flip flops.
- To interpret various clocked sequential circuits.
- To elucidate various semiconductor memories and related technology.
- To build various logic functions using Programmable Logic Devices.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Review of number systems-representation-conversions, Review of Boolean algebra-theorems, sum of product and product of sum simplification, canonical forms, min term and max term, Simplification of Boolean expressions- Karnaugh map, Implementation of Boolean expressions using logic gates and universal gates.

Experiment

1. Implementation of Boolean expression using logic gates

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Design of combinational circuits - Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/De-mux, Parity Generator/Checker

Experiments

2. Design of adders
3. Design of subtractors.
4. Design of binary adder using IC7483
5. Design of Multiplexers & Demultiplexers.
6. Design of Encoders and Decoders.
7. Implementation of a Boolean function using a multiplexer.

UNIT III SEQUENTIAL CIRCUITS 9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Asynchronous and Synchronous Counters Design - Shift registers, Universal Shift Register

Experiments

8. Design and implementation of 3 bit ripple counters.
9. Design and implementation of 3 bit synchronous counter
10. Design and implementation of shift registers.

UNIT IV SYNCHRONOUSSEQUENTIAL CIRCUITS DESIGN 9

Design of clocked sequential circuits - Moore/Mealy models, state minimization, state assignment, circuit implementation

UNIT V MEMORY AND PROGRAMMABLE LOGIC DEVICES 9

Basic memory structure ROM: PROM – EPROM – EEPROM –RAM – Static and dynamic RAM – Programmable Logic Devices: Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL.

TOTAL : 45 Theory + 30 Lab = 75 PERIODS

COURSE OUTCOMES :

On successful completion of this course, the student will be able to

CO1: Implement digital circuits using simplified Boolean functions.

CO2: Realize Combinational circuits for a given function using logic gates.

CO3: Demonstrate the operation of various counters and shift registers using Flip Flops.

CO4: Analyze Synchronous Sequential circuits.

CO5: Summarize the various types of memory devices.

CO6: Design the Combinational circuits using Programmable Logic Devices.

CO7: Perform practical exercises as an individual and / or team member to manage the task in time.

CO8: Express the experimental results with effective presentation and report.

TOTAL:75 PERIODS

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, Pearson, 2018.

2. S.Salivahanan and S.Arivazhagan,Digital Circuits and Design, 5th Edition, Oxford University Press, 2018.

REFERENCES:

1. A.Anandkumar, Fundamental of digital circuits, 4th Edition, PHI Publication,2016.

2. William Kleitz, Digital Electronics-A Practical approach to VHDL, Prentice Hall International Inc, 2012.

3. Charles H.Roth, Jr. andLarry L. Kinney, Fundamentals of Logic Design, 7th Edition, Thomson Learning, 2014.

4. Thomas L. Floyd, Digital Fundamentals, 11th Edition, Pearson Education Inc, 2017.

5.John.M Yarbrough, Digital Logic: Applications and Design, 1st Edition, Cengage India, 2006.

NPTEL LINK: https://nptel.ac.in/courses/108/105/108105132/

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

IC Trainer Kit   -15 Nos

ICs each   - 30 Nos
7400/ 7404 / 7486 / 7408 / 7432 / 7483 / 7473 / 7411/
7474

COURSE CODE	PROFESSIONAL COMMUNICATION (Theory Course with Laboratory Component) (Common to I Semester ECE and II Semester CSE, CSE(CS) and ADSProgrammes)	L	T	P	C
22HS101		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Strengthen basic **reading and writing** skills.
- Comprehend **listening contexts** competently.
- Inculcate **reading habit** and develop **effective reading** skills.
- Improve **active and passive vocabulary**.
- Acquire speech clarity with right pronunciation.
- Develop **vocabulary** of a general kind and enhance**grammatical accuracy.**
- Imbibe Content and Language Integrated Learning (CLIL).

UNIT I   FORMAL AND INFORMAL COMMUNICATION   12

Listening: Short Texts, Short Formal and Informal Conversations
Speaking: Self Introduction, Exchanging Personal Information
Reading: Practice in Skimming, Scanning and Predicting, Reading Comprehension
Writing: Free Writing, Hints Development
Grammar: Parts of Speech,Prepositions.
Vocabulary: Compound Nouns, Technical Words.   (Theory 6)
1. Familiarization of Vowel Sounds-Monophthongs, Diphthongs and Consonant Sounds
2. Listening to Formal Conversations in British and American Accents
3. Guided Writing   (Laboratory 6)

UNIT II   GRAMMAR AND LANGUAGE DEVELOPMENT   12

Listening: Telephonic Conversations.
Speaking: Sharing information of a personal kind - Greetings – Taking leave.
Reading: Short comprehension passages - Pre-reading and Post-reading (multiple choice questions short questions / open and close ended questions)
Writing: Instructions, Recommendations, Checklists
Grammar: Tenses, Framing 'Wh' & 'Yes' or 'No' questions
Vocabulary: Numerical Adjectives, Collocations.   (Theory 6)
1. Communication Etiquettes
 2. Self -Introduction using SWOT Analysis   (Laboratory 6)

UNIT IIIBASIC TECHNICAL WRITING AND STUDY SKILLS   12
Listening: Listening to longer texts and filling up the tables
Speaking: Asking about routine actions and expressing opinions

Reading: Short texts (Cloze Test)
Writing: Formal letters, E-mail writing, Interpretation of Charts and Graphs
Grammar: Cause and Effect expressions, Conditional Clauses
Vocabulary: Often misspelled and confusing words   (Theory 6)
1. Mechanics of Reading Skills
2. News Reading–Cloze Tests   (Laboratory 6)

UNIT IV   GROUP DISCUSSION AND JOB APPLICATIONS   12
Listening: Listening to recorded dialogues of conversations and completing exercises based on them
Speaking: Discussion on Social issues.
Reading: Reading text from magazines
Writing: Purpose Expressions, Letter of Application, Minutes of Meeting.
Grammar: Modal Verbs, Subject-Verb agreement
Vocabulary: Sequence Words   (Theory 6)
1. Group Presentation, Group Discussion: Do's and Don'ts of Group Discussion
2. Discussions on failure and success in interviews of famous personalities
3. Spotting Errors   (Laboratory 6)

UNIT V ART OF REPORTING   12
Listening: Listening to TED talks
Speaking: Debate & Presentations
Reading: Biographies
Writing: Definitions (Single line & Extended), Report Writing (Industrial visit, Accident and Feasibility reports)
Grammar: Reported speech
Vocabulary: Verbal Analogies   (Theory 6)
1. Writing based on listening to academic lectures and discussions
2. Leadership skills, Negotiation skills
3. Mechanics of Report Writing   (Laboratory 6)

LIST OF PROJECTS
1. Create a podcast on a topic that will be interesting to college students
2. Read and Review (Movie/Book/Technical Article)
3. Presentation on Social Issues
4. Submit a report on "Global English: A study"

                                                                   TOTAL: 60 PERIODS

OUTCOMES:
At the end of this course, the students will be able to:
CO1: Comprehend conversations and short talks delivered in English
CO2: Participate efficiently in informal conversations and develop an awareness of theself and
       apply well-defined techniques
CO3: Read articles of a general kind in magazines and newspapers efficiently
CO4: Write short general essays, personal letters and E-mails in English
CO5: Develop vocabulary of a general kind by enriching reading skills

TEXTBOOKS:
1. Kumar, Suresh E, & Sreehari, P. *Communicative English*. Orient Black Swan, 2007.
2. Richards, Jack C. Interchange Students' Book-2 New Delhi: CUP,2015.

REFERENCES:
1. Bailey, Stephen. Academic Writing: *A practical guide for students*. New York: Rutledge,2011.
2. Dhanavel, S P. English and Soft Skills, Volume Two, Orient Black Swan.
3. Elbow, Peter.*Writing Without Teachers*. London: Oxford University Press, 1973.
4. Larsen, Kristine.*Stephen Hawking*: *A Biography*, Greenwood: Publishing Group,2005.
5. Redston, Chris &Gillies Cunningham.Face2Face (Pre- intermediate Students' Book &Workbook) Cambridge University Press, New Delhi: 2005.
6. Lewis, Norman. Word Power Made Easy, Latest Edition:Penguin Random House India: 2015

WEB REFERENCES:
1. Basics of Business Communication:
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012688768083632128308_shared/overview
2. Communicating to Succeed:
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012686653619175424640_shared/overview
3. Business English:
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683227498151936279_shared/overview
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013267708367904768573/overview (lab support)
4. Business Writing:
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012689477601009664433_shared/overview
5. Email Etiquettes:
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013294623865561088817682_shared/overview
6. Email Writing Skills:
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012689543630135296666_shared/overview
7. Time Management:
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012985921210736640721_shared/overview
8. Understanding Body Language:
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012979737651445760246689_shared/overview

ONLINE RESOURCES:
1. https://infyspringboard.onwingspan.com/web/en/page/home

COURSE CODE	HERITAGE OF TAMILS (Theory Course) (Common to II Semester CSE, CSE(CS), ECE and ADS Programmes)	L	T	P	C
22GE201		1	0	0	1

OBJECTIVES:
The course is designed 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, 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

OUTCOMES:

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

CO1: Imbibe the local wisdom and its contribution in the makeup of our general knowledge ofuniverse

CO2: Critically appreciate Tamil literature for its societal ethical principles.

CO3: Explore the essence of heritage and its importance in the present contexts.

CO4: Decipher the relevance of Thirukkural and Sangam literature in contemporary

times.CO5: Analyze, interrogate and redefine the multi-faceted aspects of the heritage of Tamils.

TEXT - CUM - REFERENCE BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL– (inprint)
2. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
5. 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)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, TamilNadu)
8. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE CODE	PRODUCT DEVELOPMENT LAB –1 (Common to all Branches)	L	T	P	C
22GE111		0	0	2	1

The students may be grouped into 3 to 4 and work under a project supervisor. The device/system/component/prototype Idea to be developed by the students and a final presentation to be done by the students about the idea generated at the end of the semester.

OBJECTIVES:
Students completing this course are expected to
- Understand the functionalities and limitation of various machine/equipment
- Demonstrate various operations that can be performed to machines
- Summarize the basic principles of machines to convert their ideas into products

LIST OF EXPERIMENTS
I 1. Study of Manufacturing Processes (Carpentry, Plumbing, Machines and Welding).
   2. Study of fundamental operations of 3D Printer and Scanner with Software.
   3. Study of Smart Machining (CNC and Laser cutting) and Engraving Techniques.
I 1. Study of Fundamental of Circuit Design.
   2. Study of PCB Milling Machine.
   3. Study of Soldering and Desoldering.
II 1. Study of Computer Peripheral Devices (Processing Information Devices)
III 1. Present the Product Idea Presentation - Phase – I

TOTAL: 30 PERIODS

Note:
The students can select the prototype to be made of their choice after learning the above exercises.

OUTCOMES
After successful completion of the course the students will be able to do
CO1 Understand the concept of manufacturing processes.
CO2 Describe the working of the machine element.
CO3 Discuss the various applications of engineering materials
CO4 Summarize the basics of core engineering concepts.
CO5 Describe the process for converting ideas into products

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	Centre lathe	2 Nos
6	Arc welding transformer with cables and holders	2 Nos
7	Plumbing tools	2 Sets
8	Carpentry tools	2 Sets
9	Multimeter	10 Nos
10	Drilling Machine	1 No
11	Solder Stations	5 Sets
12	Desoldering Machine	1 No
13	PCB Milling Machine	1 No
14	Variable Power Supply	1 No
15	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor, etc.	10 Sets
16	Personal Desktop Computers	30 Nos

B.E.- ELECTRONICS AND COMMUNICATION ENGINEERING REGULATIONS–2022

CHOICE BASED CREDIT SYSTEM

II SEMESTER CURRICULUM

SEMESTER –II								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES WITH LABORATORY COMPONENT								
1	22MA201	Transforms and Numerical Methods	BSC	5	3	0	2	4
2	22EC201	Electron Devices and Circuit Theory	ESC	5	3	0	2	4
3	22CH101	Engineering Chemistry	BSC	5	3	0	2	4
4	22CS201	Data Structures	ESC	5	3	0	2	4
5	22CS202	Java Programming	ESC	5	3	0	2	4
THEORY COURSES								
6	22GE301	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	HSMC	1	1	0	0	1
LABORATORY COURSES WITH THEORY COMPONENT								
7	22GE101	Computer aided Engineering Graphics	ESC	3	1	0	2	2
LABORATORY COURSES								
8	22GE211	Product Development Lab - 2	EEC	2	0	0	2	1
AUDIT COURSES								
9		Yoga for Stress Management	AC	1	1	0	0	0
TOTAL				32	18	0	14	24

COURSE CODE	TRANSFORMS AND NUMERICAL METHODS (Theory Course with Laboratory Component) (Common to All II Semester B.E. / B. Tech Programmes)	L	T	P	C
22MA101		3	0	2	4

OBJECTIVES:

The syllabus is designed to:
- introduce the concepts of Laplace transforms and Z-transforms
- illustrate the application of transforms in solving differential and difference equations
- explain the Numerical methods for handling algebraic and transcendental equations
- introduce the numerical techniques for interpolation, differentiation and integration

UNIT I   LAPLACE TRANSFORMS   15

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only).

Theory: 9

Experiments using SCILAB:
1. Finding Laplace transform of a function.
2. Finding inverse Laplace Transforms.
3. Determine the input for given output function of Laplace Transform.   Laboratory: 6

UNIT II   Z – TRANSFORMS   15

Z-transforms – Elementary properties – Inverse Z-transforms – partial fractions method –residues method – Convolution theorem.

Theory: 9

Experiments using SCILAB:
1. Finding Z –transform of a sequence.
2. Finding convolution of two sequences.
3. Plotting the input and output function of Z transform.   Laboratory: 6

UNIT III   SOLUTION OF DIFFERENTIAL AND DIFFERENCE EQUATIONS   15

Solution of linear ordinary differential equation of second order with constant coefficients and first order simultaneous equations with constant coefficients using Laplace transform. Formation of difference equations – Solution of first and second order difference equations with constant coefficients using Z-transform.

Theory: 9

Experiments using SCILAB:
1. Solving second order Ordinary Differential Equation.
2. Finding the Laplace transform and its inverse of a function numerically.
3. Finding the Z-transform numerically

Laboratory: 6

UNIT IV   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   15

Solution of algebraic and transcendental equations by Newton Raphson method - Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel Iterative method– Eigenvalues of a matrix by Power method.   Theory: 9

Experiments using SCILAB:
1. Finding the real roots of algebraic and transcendental equations using Newton Raphson method.
2. Finding the largest Eigenvalue by power method.
3. Solving system of linear equations using Gauss Seidel Method.   Laboratory: 6

UNIT V   NUMERICAL DIFFERENTIATION AND INTEGRATION   15

Finite differences – Forward and Backward differences – Interpolation – Newton's forward and backward interpolation formulae - Lagrange's interpolation for unequal intervals - Numerical Differentiation - Newton's and Lagrange's formulae - Numerical integration using Trapezoidal and Simpson's 1/3 rules – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Theory: 9

Experiments using SCILAB:
1. Finding approximately the missing value using Lagrange interpolation.
2. Evaluating integrals by trapezoidal rule.
3. Evaluating integrals by Simpson's rule.   Laboratory: 6

COURSE OUTCOMES:

After the successful completion of the course, the student will be able to:

CO1: Determine Laplace transform and inverse transform of simple functions

CO2: Determine Z- transform and inverse transform of simple functions.

CO3: Solve ordinary differential equations using Laplace transform and difference equations using
        Z-Transform.

CO4: Compute the solutions of algebraic, transcendental and the system of equations.

CO5: Apply the numerical techniques of interpolation in various intervals and the numerical
        techniques of differentiation and integration for engineering problems.

TEXT BOOKS:
1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:
1. Erwin. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.

2. Jain R.K. and Iyengar S. R. K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.

3. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

4. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.

5. Sastry S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

COURSE CODE	COURSE TITLE	L	T	P	C
22EC201	ELECTRON DEVICES AND CIRCUIT THEORY	3	0	2	4

OBJECTIVES:

- To discuss the behavior of semiconductor diodes in various applications.
- To familiarize the operation of BJT and FET.
- To construct simple 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   SEMICONDUCTOR DIODES   9

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, Zener diode and its applications.

Experiments
1. VI characteristics of PN diode
2. VI characteristics of Zener diode.

UNIT II   TRANSISTORS   9

Bipolar Junction Transistor - NPN -PNP – Operations - Early effect – Current Equations - Input and Output characteristics of CE, CB, CC – Field Effect Transistors - JFET, MOSFET- D-MOSFET, E-MOSFET- Characteristics.

Experiments
3. Input and output characteristics of CE Configuration.
4. Characteristics of JFET.

UNIT III   SPECIAL SEMICONDUCTOR DEVICES AND APPLICATIONS   9

Tunnel diode,Varactor diode, UJT, SCR, DIAC, TRIAC, Power BJT- Power MOSFET- DMOS-VMOS. LED, Photo transistor, Opto Coupler.
Experiments
5. VI characteristics of UJT.
6. VI characteristics of SCR

UNIT IV   BASIC CIRCUIT ANALYSIS   9

Resistive elements - Ohms Law- Kirchhoff's current and voltage laws - series and parallel connection of independent sources - R, L and C, source transformation, Mesh current and Node voltage with AC and DC Analysis - methods of analysis, star delta conversion. Transient response of RL,RC and RLC circuits using Laplace Transform for DC input and AC sinusoidal input.

Experiments

7(a). Verification of Kirchhoff's current law.
7(b). Verification of Kirchhoff's voltage law.

UNIT V   NETWORK THEOREMS   9

Thevenin and Norton Theorems - Superposition Theorem - Maximum power transfer theorem - Reciprocity Theorem - Millman's theorem.

Experiments

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

TOTAL: 45 Theory + 30 Lab = 75 PERIODS

OUTCOMES:

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

CO1: Examine the performance of electronic circuits using PN junction diode and Zener diode.

CO2: Construct electronic circuits using BJT and FET to sketch the input and output characteristics.

CO3: Demonstrate the behavior of special semiconductor devices in various applications.

CO4: Comprehend the impact of voltage and current in electric circuits using Mesh & Nodal methods.

CO5: Relate various network theorems to determine the response of the electric circuits.

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

CO7: Express the experimental results with effective presentation and report.

TEXT BOOKS:

1. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill, 2022.

2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 11thEdition, 2017.

REFERENCES:

1. W.H.Hayt, J.E.Kemmerly&S.M.Durbin, Engineering Circuit Analysis, 9thEdition, McGraw Hill Education, New Delhi, India,2019.

2. Joseph Edminister and MahmoodNahvi, ―Electric Circuits, Schaum'sOutlineSeries, 5th Edition 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,9thEdition, Pearson,2017

5. Donald A Neaman, Semiconductor Physics and Devices, 4thEdition, McGraw Hill, 2017

6. Dr.R.S. Sedha, A Textbook of Applied Electronics, S Chand and company limited, 2019

NPTEL LINK:https://onlinecourses.nptel.ac.in/noc22_ee93/preview
NPTEL LINK:https://onlinecourses.nptel.ac.in/noc20_ee64/preview

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

BC 107, BC 148,2N2646, BFW10	- 25 each
1N4007, Zener diodes	- 25 each
Bread Boards	-15 Nos
CRO (30MHz)	- 10 Nos
Signal Generator /Function Generators (3 MHz)	- 15 Nos
Transistor/FET/SCR/UJT (BJT-NPN-PNP and 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

COURSE CODE	ENGINEERING CHEMISTRY (Theory Course with Laboratory Component) (Common to I Semester CSE, CSE (CS), ADS & II Semester ECE)	L	T	P	C
22CH101		3	0	2	4

OBJECTIVES:
- To understand the water quality criteria and interpret its applications in water purification.
- To gain insights into the basic concepts of electrochemistry and implement its applications in chemical sensors.
- To acquire knowledge on the fundamental principle of energy storage devices and relate it to electric vehicles.
- To identify the different types of smart materials and explore their applications in Engineering and Technology.
- To assimilate the preparation, properties and applications of nanomaterials in various fields.

UNIT I   WATER TECHNOLOGY   15

Sources of water – Impurities - Drinking water quality parameters – Hardness and its types, problems - Municipal water treatment and disinfection (chlorination - break-point chlorination, UV, Ozonation). Boiler troubles - Scales and sludges, Boiler feedwater: Requirements - Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning). External treatment – Ion exchange demineralization - Principle, process and fouling.   Desalination of brackish water: Reverse osmosis – principle -types of membranes, process and fouling.   (Theory-9)

1. Determination of total, temporary and permanent hardness of water by EDTA method.
2. Determination of chloride content of water sample by argentometric method.
3. Determination of alkalinity in water sample.   (Laboratory-6)

UNIT II   ELECTROCHEMISTRY AND SENSORS   15

Introduction-Conductance-factorsaffectingconductance–Electrodes–originof electrode potential – single electrode potential, standard electrode potential – measurement of single electrode potential – over voltage - reference electrodes (standard hydrogen electrode, calomel electrode)-ion selective electrode- glass electrode - Nernst equation (derivation), numerical problems, Electrochemical series and its applications. Chemical sensors – Principle of chemical sensors – Breath analyzer – Gas sensors– CO_2 sensors - Sensor for health care – Glucose sensor.   (Theory-9)

1. Determination of the amount of NaOH using a conductivity meter.
2. Determination of the amount of acids in a mixture using a conductivity meter.
3. Determination of the amount of given hydrochloric acid using a pH meter.   (Laboratory-6)

UNIT III   ENERGY STORAGE DEVICES AND ENERGYSOURCES   15

Batteries – Primary alkaline battery - Secondary battery - Pb-acid battery, Fuel cell- H_2– O_2 fuel cell. Batteries used in E- vehicle: Ni-metal hydride battery, Li-ion Battery, Li-air Battery Nuclear Energy – Nuclear fission, fusion, differences, characteristics – nuclear chain reactions – light water nuclear reactor – breeder reactor.   (Theory-9)

1. Determination of single electrode potential of the given electrode.

2. Estimation of the iron content of the given solution using a potentiometer.

3. Determination of electrochemical cell potential (using different electrodes/ different concentrations of electrolytes) (Laboratory-6)

UNIT IV SMART MATERIALS FOR ENGINEERINGAPPLICATIONS 15

Polymers – Definition – Classification – smart polymeric materials - Preparation, properties and applications of Piezoelectric polymer - Polyvinylidene fluoride (PVDF), Electroactive polymer-Polyaniline (PANI) and Biodegradable polymer - Polylactic acid (PLA). Polymer composites: Definition, Classification – FRP's – Kevlar. Shape Memory Alloys: Introduction, Shape memory effect – Functional properties of Shape Memory Alloys – Types of Shape Memory Alloys - Nitinol (Ni-Ti) alloys - applications. Chromogenic materials: Introduction – Types - applications.

(Theory-9)

1. Determination of the molecular weight of polymer using Ostwald viscometer.

2. Application of polymeric fibers in 3D printing. (Laboratory-6)

UNIT V NANOCHEMISTRY 15

Introduction – synthesis – top-down process (laser ablation, chemical vapor deposition), bottom-up process (precipitation, electrochemical deposition) – properties of nanomaterials – types – nanotubes -carbon nanotubes, applications of CNT - nanocomposites – General applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries. (Theory-9)

1. Determination of concentration of BaSO4 nanoparticles by conductometric titrations.

2. Preparation of ZnO nanocrystal by precipitation method. (Laboratory-6)

TOTAL: 75 PERIODS

COURSE OUTCOMES:

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

CO1: Interpret the water quality parameters and explain the various water treatment methods.

CO2: Construct the electrochemical cells and sensors.

CO3: Compare different energy storage devices and predict their relevance in electric vehicles.

CO4: Classify different types of smart materials, their properties and applications in Engineering and Technology.

CO5: Integrate the concepts of nanochemistry and enumerate its applications in various fields.

TEXTBOOKS:

1. P.C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi,2022.

2. Sivasankar B., "Engineering Chemistry", Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, 2012.

REFERENCES:

1. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", 12th Edition, S. Chand & Company, New Delhi, 2013.
2. V.R. Gowarikar, Polymer Science, 2nd edition, New Age International Publishers,2021.
3. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume -1 & Volume -2, Tata McGraw-Hill Education Pvt. Ltd.,2010.
4. Geoffrey A. Ozin, Andre C. Arsenault and Ludovico Cademartiri, "Nanochemistry: A Chemical Approach to Nanomaterials", 2nd Edition, RSC publishers,2015.
5. Prasanna Chandrasekhar, "Conducting polymers, fundamentals and applications–IncludingCarbonNanotubesandGraphene",SecondEdition,SpringerScience&Business Media, New York,2019.
6. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", 6th edition, Pearson Education Pvt. Ltd.,2019.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1.	Conductivity meter	10 Nos
2.	pH meter	10 Nos
3.	Potentiometer	10 Nos

| 22CS201 | DATA STRUCTURES | L | T | P | C |
| | (Lab Integrated) | 3 | 0 | 2 | 4 |

OBJECTIVES:

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

UNIT I	LINEAR DATA STRUCTURES – LIST	15

Algorithm analysis - running time calculations - Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists - circularly linked lists - doubly-linked lists – applications of lists – Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II	LINEAR DATA STRUCTURES – STACKS, QUEUES	15

Stack ADT – Stack Model - Implementations: Array and Linked list - Applications - Balancing symbols - Evaluating arithmetic expressions - Conversion of Infix to postfix expression- Queue ADT – Queue Model - Implementations: Array and Linked list - applications of queues.

UNIT III	NON LINEAR DATA STRUCTURES – TREES	15

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT– AVL Tree - Priority Queues – Applications of priority queues.

UNIT IV	NON LINEAR DATA STRUCTURES - GRAPHS	15

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Applications of graphs.

UNIT V	SEARCHING, SORTING AND HASHING TECHNIQUES	15

Searching- Linear Search - Binary Search - Sorting - Bubble sort - Selection sort - Insertion sort – Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Lab Exercises

1. Array implementation of List, Stack and Queue ADTs.
2. Linked list implementation of List, Stack and Queue ADTs.
3. Applications of List – Polynomial manipulations
4. Applications of Stack – Infix to postfix conversion and expression evaluation.
5. Implementation of Binary Trees and operations of Binary Trees.
6. Implementation of Binary Search Trees.
7. Implementation of Heaps using Priority Queues.
8. Graph representation and Traversal algorithms.
9. Implement searching and sorting algorithms.

TOTAL: 45 +30 = 75 PERIODS

OUTCOMES:

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

    CO1: Implement abstract data types for list.

    CO2: Solve real world problems using appropriate linear data structures.

    CO3: Apply appropriate tree data structures in problem solving.

    CO4: Implement appropriate Graph representations and solve real-world applications.

    CO5: Implement various searching and sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson Education, 2014.

2. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Silicon paper publications, 2004.

REFERENCES:

1. Rajesh K. Shukla, "Data Structures using C and C++", Wiley India Publications, 2009.

2. Narasimha Karumanchi, "Data Structure and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles", CareerMonk Publications, 2020.

3. Jean-Paul Tremblay and Paul Sorenson, "An Introduction to Data Structures with Application", McGraw-Hill, 2017.

4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in Java", Third Edition, Pearson Education, 2012.

5. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

6. Ellis Horowitz, Sartaj Sahni, Dinesh P Mehta, "Fundamentals of Data Structures in C++", Second Edition, Silicon Press, 2007.

7. https://infyspringboard.onwingspan.com/web/en/app/ toc/lex_auth_0135015781650513921 0584/overview

22CS202	JAVA PROGRAMMING (Theory Course with Laboratory Component)	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To explain object oriented programming concepts and fundamentals of Java
- To apply the principles of packages, interfaces and exceptions
- To develop a Java application with I/O streams, threads and generic programming
- To build applications using strings and collections.
- To apply the JDBC concepts

UNIT I	JAVA FUNDAMENTALS	15

An Overview of Java - Data Types, Variables, and Arrays – Operators - Control Statements – Class Fundamentals – Declaring objects – Methods – Constructors – this keyword - Overloading methods - Overloading constructors - Access Control – Static – Final

UNIT II	INHERITANCE, INTERFACES AND EXCEPTION HANDLING	15

Inheritance: Inheritance basics, Using super, Method Overriding, Using Abstract Classes, Using final with Inheritance - Package and Interfaces: Packages, Packages and member access, Importing Packages, Interfaces, Static Methods in an Interface – Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.

UNIT III	MULTITHREADING, I/O AND GENERIC PROGRAMMING	15

Multithreaded Programming: Creating a Thread, Thread Priorities, Synchronization, Interthread Communication – I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files – Generics: Introduction, Generic class, Bounded Types, Generic Methods, Generic Interfaces, Generic Restrictions.

UNIT IV	STRING HANDLING AND COLLECTIONS	15

Lambda Expressions - String Handling – Collections: The Collection Interfaces, The Collection Classes – Iterator – Map - Regular Expression Processing.

UNIT V	JDBC CONNECTIVITY	15

JDBC – DataSource, Configurations, Connection, Connection Pools, Driver Types, ResultSet, Prepared Statement, Named Parameter, Embedded SQL (Insert, Update, Delete, Join, union etc), ResultSet Navigation, Connection Close and Clean up.

TOTAL: 45+30=75 PERIODS

Indicative List of Experiments:

1. Develop a Java application to generate Electricity bill. You must use one super class called EB Bill and must have two sub classes namely Domestic Bill and Commercial Bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff
   If the type of the EB connection is domestic, calculate the amount to be paid as follows:
   First 100 units - Rs. 1 per unit
   101-200 units - Rs. 2.50 per unit
   201 -500 units - Rs. 4 per unit
   > 501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:
First 100 units - Rs. 2 per unit
101-200 units - Rs. 4.50 per unit
201 -500 units - Rs. 6 per unit
> 501 units - Rs. 7 per unit

2. Arrays Manipulations: (Use Methods for implementing these in a Class)
   a. Find k^{th} smallest element in an unsorted array
   b. Find the sub array with given sum
   c. Matrix manipulations – Addition, Subtraction, Multiplication
   d. Remove duplicate elements in an Array
   e. Accept an integer value N and print the Nth digit in the integer sequence 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and so on till infinity.
   Example: The 11th digit in the sequence 12345678910111213…. is 0.

3. Develop a Java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.

4. Develop a Java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

5. Design a Java interface for ADT Stack. Implement this interface using array and built-in classes. Provide necessary exception handling in both the implementations.

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains the methods print Area () that prints the area of the given shape and Numberofsides() that prints the number of sides of the given shape.

7. Write a Java program to apply built-in and user defined exceptions.

8. String Manipulation:
   a. Reversing a set of words and count the frequency of each letter in the string.
   b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
   c. Remove all the occurrences of string S2 in string S1 and print the remaining.
   d. Find the longest repeating sequence in a string
   e. Print the number of unique string values that can be formed by rearranging the letters in the string S.

9. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

10. Write a Java program to read and copy the content of one file to other by handling all file related exceptions.

11. Collections:
    a. Write a program to perform string operations using ArrayList. Write functions for the following
       i. Append - add at end
       ii. Insert – add at particular index

	iii. Search
	iv. List all string starts with given letter
	b. Find the frequency of words in a given text.
12. Mini Project (using JDBC)	

OUTCOMES:

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

CO1: Understand the object oriented programming concepts and fundamentals of Java.
CO2: Develop Java programs with the packages, interfaces and exceptions.
CO3: Build Java applications with I/O streams, threads andgenerics programming.
CO4: Apply strings and collections in developing applications.
CO5: Implement the concepts of JDBC.

TEXT BOOK:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2019.

REFERENCES:

1. Cay S. Horstmann, Gary Cornell, "Core Java Volume – I Fundamentals", 11th Edition, Prentice Hall, 2019.
2. Paul Deitel, Harvey Deitel, Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
3. Steven Holzner, Java 2 Black book, Dream tech press, 2011.
4. Timothy Budd, Understanding Object-oriented programming with Java, Third Edition, Pearson Education, 2008.
5. https://infyspringboard.onwingspan.com/web/en/app/ toc/lex_29959473947367270000_shared/overview

COURSE CODE	TAMILS AND TECHNOLOGY (Theory Course) (Common to III Semester CSE, CSE(CS), ECE and ADS Programmes)	L	T	P	C
22GE301		1	0	0	1

OBJECTIVES:

The course is designed to

- Recognize the historical significance of weaving and pottery technologies in ancient Tamil civilization.
- Highlight the concepts of design and construction technology during the Sangam age.
- Provide an overview of manufacturing technology and its role in Tamil society.
- Illustrate the agricultural and irrigation techniques employed in ancient Tamil society.
- Promote scientific Tamil and Tamil computing.

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 – Metallurigcal Studies – Iron industry – Iron smelting, steel – Copper and gold-Coins as source of history – Minting of Coins – Beads making-industries Stone beads –Glass beads – Terracotta beads – Shell beads/ bone beats – Archeological evidences – Gem Stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

TOTAL: 15 PERIODS

OUTCOMES:

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

CO1: Analyze the technological advancements of Tamils in weaving and ceramics.

CO2: Explore the architectural superiority of Tamils through inscriptions and structural designs of temples and palaces.

CO3: Examine the manufacturing culture of Tamils before and during Sangam period through various sources.

CO4: Critically appreciate the agricultural and food processing techniques of Tamils.

CO5: Demonstrate adequate information on the Scientific Tamil and Tamil Computing.

TEXT CUM – REFERENCE –BOOKS

1. Social Life of Tamils (Dr.L.L.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
2. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr. S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by International Institute of Tamil Studies.)
5. 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)
6. Studies in the History of India with Special Reference of Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Achaeology & Tamil Nadu text Book and Educational Services Corporation, Tamil Nadu)
8. Journey of civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE CODE	COMPUTER AIDED ENGINEERING GRAPHICS Laboratory Course with Theory Component (Common to I Semester CSE, CSE (CS), ADS and II Semester ECE)	L	T	P	C
22GE101		1	0	2	1

OBJECTIVES:

- To help students understand universal technical drawing standards.
- To provide training on drafting software to draw part models.
- To demonstrate the concepts of orthographic and isometric projections.
- To use drawing skills for communicating concepts, ideas for engineering product design.
- Use pictorial views to visualize and draw the isometric view of the objects

UNIT I   INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWING AND CONIC SECTIONS   9

Introduction to Engineering Drawing - Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Conic curves - Ellipse, Parabola and Hyperbola by Eccentricity method.   (Theory - 3)

Experiments Using CAD Software:

1. Drawing of a title block with necessary text, projection symbol and lettering using drafting software.
2. Drafting of Conic curves - Ellipse, Parabola and Hyperbola   (Laboratory - 6)

UNIT II   ORTHOGRAPHIC PROJECTION   9

Visualization concepts and Orthographic Projection - Layout of views – Orthographic Projection-Conversion of pictorial diagram into orthographic views.   (Theory - 3)

Experiments Using CAD Software:

1. Drawing orthographic view of simple solids like Prism, Pyramids, Cylinder, Cone, etc, and dimensioning.
2. Drawing of orthographic views from the given pictorial diagram.   (Laboratory -6)

UNIT III   PROJECTION OF PLANES   9

Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method.   (Theory - 3)

Experiments Using CAD Software:

1. Drawing of plane Surface inclined to HP.
2. Drawing of plane Surface inclined to VP.   (Laboratory -6)

UNIT IV   PROJECTION OF SOLIDS   9

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to HP by rotating object method.   (Theory - 3)

Experiments Using CAD Software:

1. Drawing of simple solids like prism and pyramids when the axis is inclined to HP.
2. Drawing of simple solids like cylinder and cone when the axis is inclined to HP.

(Laboratory -6)

UNIT V ISOMETRIC DRAWING 9

Principles of isometric view – Isometric view of simple solids – Prism, Pyramid, Cylinder and Cone. (Theory - 3)

Experiments Using CAD Software:

1. Drawing isometric projection of simple solids.
2. Modeling of 2D to 3D objects using drafting software. (Laboratory -6)

TOTAL: 45 PERIODS

OUTCOMES

After successful completion of the course, the students will be able to.

CO1 Explain the various engineering standards required for drafting and explore knowledge in conic sections.

CO2 Draw the orthographic views of 3Dprimitive objects.

CO3 Describe the projection of plane surfaces by the rotating plane method.

CO4 Apply the projection concepts and drafting tools to draw projections of solids.

CO5 Sketch the pictorial views of the objects using CAD tools.

TEXT BOOKS:

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15th Edition, 2019.

REFERENCES:

1. Bhatt N.D. "Engineering Drawing", Charotar Publishing House, 53rd edition ,2019.
2. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition, 2019.
3. Engineering Drawing Practice for Schools and Colleges BIS SP46:2003 (R2008), Published by Bureau of Indian Standards (BIS), 2008.
4. Parthasarathy. N.S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2019.
5. Gopalakrishna. K.R., Engineering Drawing Vol. 1 & 2, Subhas Publications, 27th Edition, 2017.
6. R.S Khurmi and J K Gupta, Textbook of Refrigeration and Air-conditioning (M.E.), S Chand & Co,2006

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1	Computer nodes or systems with suitable graphics facility	30 No
2.	Software for Drafting and Modelling	30 No
3.	Laser Printer or Plotter to print / plot drawings	1 No

COURSE CODE	PRODUCT DEVELOPMENT LAB –2 (Common to all Branches)	L	T	P	C
22GE211		0	0	2	1

The students may be grouped into a batch of strength 3 or 4 to work under a project supervisor. The student batches should study the device/system/component and will do literature review to develop prototype idea. Further at the end of the semester they will make a final presentation to exhibit the conceptual design skills and the process to develop a product.

OBJECTIVES:
Students completing this course are expected to
- Use the innovative design methodology to articulate the product concepts.
- Summarize the requisite Engineering Principles for transforming concepts into products.
- Conduct basic tests to extract the qualitative and quantitative performance factors.

EXERCISES:
1. Study of Basic Engineering Design Concepts.
2. Conduct a literature survey on the implementation of the design concepts.
3. Prepare the design concepts for an identified literature gap.
4. Present the Product Idea Presentation – Phase II.

TOTAL: 30 PERIODS

OUTCOMES:

After successful completion of the course, the students will be able to
CO1 Understand the working and capacity of various engineering systems.
CO2 Infer the outcomes in the product development process.
CO3 Perform basic engineering and material characterization tests.
CO4 Demonstrate the ability to provide conceptual design strategies for a product.
CO5 Implement the Science, Engineering, Technology and Mathematics (STEM) for product design.