



# R.M.K. ENGINEERING COLLEGE

(An Autonomous Institution)

R.S.M Nagar, Kavaraipettai, Gummidipoondi Taluk, Thiruvallur District, Tamil Nadu- 601206

Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/Accredited by NAAC with A+ Grade

An ISO 9001:2015 Certified Institution / All the Eligible UG Programs are Accredited by NBA, New Delhi



## B.TECH- COMPUTER SCIENCE AND BUSINESS SYSTEMS

REGULATIONS – 2022

CHOICE BASED CREDIT SYSTEM

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics and computer science for the applications relevant to various business requirements.
2. To enrich graduates with the core competencies necessary for solving the business requirements of an enterprise.
3. To enable graduates to think logically, pursue lifelong learning and will have the capacity to understand technical issues related to computing and business systems and to design optimal solutions.
4. To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills to solve real world problems and meet the diversified needs of industry, academia and research.
5. To practice the profession with ethics, integrity, leadership and social responsibility with a good understanding of the changing societal needs.

### PROGRAM OUTCOMES (POs)

**After the successful completion of the program, the graduates will be able to:**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and

modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

**After the successful completion of the program, the graduates will be able to:**

1. Apply the core aspects of computer science and business system principles such as software design & development and data engineering for developing software products.
2. Identify and utilize the strengths of cutting edge technologies and strong analytical skills to develop quality software in scientific and business applications for the betterment of society and Industry.
3. Decide on suitable career path immediately after graduating or after pursuing higher degree that would place them in an esteemed organization or create one of their own.

### **MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES**

A broad relation between the programme objective and the outcomes is given in the following table

<b>PROGRAMME EDUCATIONAL</b>	<b>PROGRAMME OUTCOMES</b>
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<b>OBJECTIVES</b>	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	1	1								
2	3	3	3	3	2	1	2	1			2	2
3			3	3	3	2	2	1	1	1	2	3
4			3	3	3	2	3	2	1	1	2	3
5				3		2	2	3	3	2	2	2

### **MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES**

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

<b>PROGRAMME SPECIFIC OBJECTIVES</b>	<b>PROGRAMME OUTCOMES</b>											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	3	3	2	1	2	1			2	2
2			3	3	3	2	3	2	1	1	2	3
3				3		2	2	3	3	2	2	2

Contribution

1: Reasonable

2: Significant

3: Strong



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## B.TECH- COMPUTER SCIENCE AND BUSINESS SYSTEMS

REGULATIONS – 2022

CHOICE BASED CREDIT SYSTEM

I - VIII SEMESTER CURRICULUM AND SYLLABI

SEMESTER – I								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
<b>THEORY COURSES</b>								
1	22MA102	Discrete Mathematics	BSC	4	3	1	0	4
2	22MA103	Introduction to Statistics, Probability and Calculus	BSC	3	3	0	0	3
<b>THEORY COURSES WITH LABORATORY COMPONENT</b>								
3	22CS101	Problem Solving using C++	ESC	5	3	0	2	4
4	22CS102	Software Development Practices	ESC	5	3	0	2	4
5	22EE102	Principles of Electrical Engineering	ESC	4	2	0	2	3
6	22PH104	Fundamentals of Physics	BSC	5	3	0	2	4
<b>LABORATORY COURSE</b>								
7	22ME111	Product Development Lab - 1	EEC	2	0	0	2	1
<b>MANDATORY COURSE</b>								
8		Induction Program (Non Credit)	MC	3 Weeks				
<b>TOTAL</b>				<b>28</b>	<b>17</b>	<b>1</b>	<b>10</b>	<b>23</b>

SEMESTER – II								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
<b>THEORY COURSE</b>								
1	22MA202	Linear Algebra	BSC	3	3	0	0	3
<b>THEORY COURSES WITH LABORATORY COMPONENT</b>								
2	22MA203	Statistical Methods	BSC	5	3	0	2	4
3	22CB201	Data Structures and Algorithms	ESC	5	3	0	2	4
4	22CS202	Java Programming	ESC	5	3	0	2	4
5	22EC202	Principles of Electronics Engineering	ESC	4	2	0	2	3
6	22HS101	Professional Communication	HSMC	4	2	0	2	3
<b>LABORATORY COURSE</b>								
7	22ME211	Product Development Lab - 2	EEC	2	0	0	2	1
<b>MANDATORY COURSE</b>								
8	22CH104	Environmental Sciences and Sustainability (Non Credit)	MC	2	2	0	0	0
<b>AUDIT COURSE</b>								
9		Yoga for Stress Management	AC	1	1	0	0	0
<b>TOTAL</b>				<b>31</b>	<b>19</b>	<b>0</b>	<b>12</b>	<b>22</b>

SEMESTER –III								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
<b>THEORY COURSES</b>								
1		Universal Human Values II	HSMC	3	3	0	0	3
2	22CB301	Computer Organization & Architecture	PCC	3	3	0	0	3
3	22CB302	Fundamentals of Economics	PCC	2	2	0	0	2
<b>THEORY COURSES WITH LABORATORY COMPONENT</b>								
4	22CB303	Formal Language and Automata Theory	PCC	5	3	0	2	4
5	22MA304	Computational Statistics	BSC	5	3	0	2	4
6	22CB304	Database Management Systems	PCC	5	3	0	2	4
<b>LABORATORY COURSE</b>								
7	22ME311	Product Development Lab - 3	EEC	2	0	0	2	1
<b>EMPLOYABILITY ENHANCEMENT COURSES</b>								
8		Aptitude and Coding Skills I	EEC	2	0	0	2	1
9		Internship/Seminar*	EEC	2	0	0	2	1
<b>AUDIT COURSE</b>								
10		Value Education (Non Credit)	AC	2	2	0	0	0
<b>TOTAL</b>				<b>29</b>	<b>19</b>	<b>0</b>	<b>10</b>	<b>22</b>

SEMESTER –IV								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
<b>THEORY COURSES</b>								
1	22CB401	Introduction to Innovation, IP Management and Entrepreneurship	PCC	3	3	0	0	3
2	22CB402	Marketing Research and Marketing Management	PCC	2	2	0	0	2
<b>THEORY COURSES WITH LABORATORY COMPONENT</b>								
3	22CB403	Operating Systems	PCC	5	3	0	2	4
4	22CB404	Design And Analysis of Algorithms	PCC	5	3	0	2	4
5	22CB405	Software Design with UML	PCC	5	3	0	2	4
6	22CB406	Operations Research	PCC	5	3	0	2	4
<b>LABORATORY COURSE</b>								
7	22ME411	Product Development Lab - 4	EEC	2	0	0	2	1
<b>EMPLOYABILITY ENHANCEMENT COURSES</b>								
8		Aptitude and Coding Skills II	EEC	2	0	0	2	1
9		Mini Project	EEC	2	0	0	2	1
<b>MANDATORY COURSE</b>								
10		Indian Constitution (Non Credit)	MC	2	2	0	0	0
<b>TOTAL</b>				<b>31</b>	<b>19</b>	<b>0</b>	<b>12</b>	<b>23</b>

<b>22MA102</b>	<b>DISCRETE MATHEMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

OBJECTIVES:

The Syllabus designed to:

- Check the validity of arguments by using basic connective and valid rules of inference
- Impart knowledge of the basics of counting and solving recurrence relations.
- Apply Boolean algebra, basic properties, and Karnaugh's maps.
- Explain functions, relations, and group theory.
- Know the nomenclature of graphs, isomorphism of graphs, paths, and cycles circuits
- Enumerate the concept of trees, tree traversals, information storage, and retrieval.

#### **UNIT I LOGIC**

**12**

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

#### **UNIT II BOOLEAN ALGEBRA**

**12**

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

#### **UNIT III ABSTRACT ALGEBRA**

**12**

Set, relation, group, ring, field.

#### **UNIT IV COMBINATORICS**

**12**

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

#### **UNIT V GRAPH THEORY**

**12**

Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula,

dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

TOTAL: 60 PERIODS

**COURSE OUTCOMES:**

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

- CO1: examine the validity of the arguments.
- CO2: utilize the significance of Boolean algebra in computer science and engineering.
- CO3: identify algebraic techniques to formulate and solve group theoretic problems.
- CO4: demonstrate various proof techniques and application of principles.
- CO5: apply graph theory techniques to solve real life problems.

**TEXTBOOKS:**

1. J.P. Trembly & Manohar, “Discrete Mathematical Structures with applications to computer science”, 1<sup>s</sup> Edition, McGraw Hill Education,2017.
2. N. Herstein, “Topics in Algebra”, 2<sup>nd</sup> Edition, John Wiley and Sons, 1975
3. M. Morris Mano, “Digital Logic & Computer Design”, 1<sup>st</sup> Edition, Pearson, 2004.
4. J.A. Bondy and U.S.R. Murty, “Graph Theory with Applications”, 5<sup>th</sup> Edition, Macmillan Press, London, 1982.

**REFERENCES:**

1. Gilbert Strang, “Introduction to linear algebra”, 4<sup>th</sup> Edition, Wellesley-Cambridge Press, 2009.
2. R.A. Brualdi, “Introductory Combinatorics”, 1<sup>st</sup> Edition, North-Holland, New York, 1977.
3. N. Deo, “Graph Theory with Applications to Engineering and Computer Science”, 1<sup>st</sup> Edition, Prentice Hall, Englewood Cliffs, 2016.

<b>22MA103</b>	<b>INTRODUCTION TO STATISTICS, PROBABILITY &amp; CALCULUS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

The syllabus is designed to:

- Acquaint the students with the fundamental concept of statistics, probability and distributions.
- Impart the knowledge on basic concepts of differential calculus and integral calculus.

**UNIT I INTRODUCTION TO STATISTICS 9**

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



2. I.R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers", 9<sup>th</sup> Edition, PHI, 2017.
3. A.M. Mood, F.A. Graybill and, D.C. Boos, "Introduction to the Theory of Statistics", 3<sup>rd</sup> Edition McGraw Hill Education, 1973.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7<sup>th</sup> Edition, Thomson Learning, 2011.
5. M. D. Greenberg, "Advanced Engineering Mathematics", 2<sup>nd</sup> Edition, Pearson Education, 2002.

<b>22CS101</b>	<b>PROBLEM SOLVING USING C++ (Common to All Branches)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**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 using exceptions.

**UNIT I      PROBLEM SOLVING AND PROGRAMMING FUNDAMENTALS      15**

Computational thinking for Problem solving – Algorithmic thinking for Problem solving - Building Blocks - Problem Solving and Decomposition - Dealing with Error – Evaluation.

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.

**List of Exercise/Experiments:**

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.

**UNIT II      POINTERS AND FUNCTIONS      15**

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

**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, Basicpay

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**

**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.

#### **List of Exercise/Experiments:**

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

### **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.

#### **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 are supported:
  - a) Single inheritance
  - b) Multiple inheritance
  - c) Multi level inheritance
  - d) Hierarchical inheritance.

### **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.

#### **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 minimum balance using sequential access file.
3. Write a Program to Demonstrate the Catching of all Exceptions.
4. Mini project.

**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.
2. E Balagurusamy,"Object Oriented Programming with C++", 4th Edition, Tata McGraw-Hill Education, 2008.

**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++", 5<sup>th</sup> 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", Third Edition, Thomson Course Technology, 2007.
7. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01297200240671948837\\_shared/overview](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.

<b>22CS102</b>	<b>SOFTWARE DEVELOPMENT PRACTICES (Common to All Branches)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES:**

**The Course will enable learners to:**

- 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.

### 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 update.
    - 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

15

Introduction – Web Basics – Multitier Application Architecture – Client-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



**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, Ninth 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](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview)
7. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0130944214274703362099\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944214274703362099_shared/overview)

**LIST OF EQUIPMENTS:**

Systems with either Netbeans or Eclipse

Java/JSP/ISP Webserver/Apache

Tomcat / MySQL / Dreamweaver or

Equivalent/ Eclipse, WAMP/XAMP

<b>22EE102</b>	<b>PRINCIPLES OF ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

**COURSE OBJECTIVES:**

The Course will enable learners to:

- Study the basic concepts of electrical engineering.
- Study the basic DC and AC networks used in electrical circuits.
- Demonstrate the concepts of electrical statics and electro-mechanics.
- Acquaint the knowledge about the measurement of electrical quantities.
- Demonstrate the concepts of electrical wiring and safety.

**UNIT I INTRODUCTION**

**12**

Basics of electric circuits- terminology and symbols - passive and active elements, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis.

(Theory – 6)

1. Familiarization of electrical Elements and sources related to electrical circuits
2. Verification of Kirchhoff's laws

(Laboratory– 6)

## **UNIT II DC CIRCUITS**

**12**

Current-voltage relations of the electric network by mathematical equations to analyze the network - Thevenin's theorem, Norton's theorem, maximum power transfer theorem, super position theorem, simplifications of networks using series-parallel, star/delta transformation

(Theory – 6)

1. Verification of Thevenin's and Norton's Theorem
2. Verification of Maximum Power Transfer Theorem

(Laboratory – 6)

## **UNIT III AC CIRCUITS**

**12**

AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit,R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor,3 phase balanced AC circuits (Y- $\Delta$  & Y-Y).

(Theory – 6)

1. Simulation of R-L-C series circuits and time response of RC circuit
2. Verification of relation in between voltage and current in three phase balanced star and deltaconnected loads

(Laboratory – 6)

## **UNIT IV ELECTRO-MECHANICS**

**12**

Electricity and magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, magnetic circuit, single phase transformer, principle of operation, EMF equation, voltageratio,current ratio, KVA rating, efficiency and regulation, electromechanical energyconversion.

(Theory – 6)

1. Load test on single phase transformer
2. Study of magnetic field along a current carrying conductor

(Laboratory – 6)

## **UNIT V MEASUREMENTS AND SENSORS**

**12**

Introduction to measuring devices/sensors and transducers - piezoelectric and thermocouple, elementary methods for the measurement ofelectrical quantities in DC and AC systems - currentandsingle-phase power,electricalwiring: basic layout of the distribution system, types of wiringsystem and wiring accessories, necessity of earthing, Types of earthing, safety devicesand system.

(Theory – 6)

1. Measurement of power in a given DC Circuit.
2. Measurement of power in a given AC Circuit.

(Laboratory – 6)

**TOTAL PERIODS 60 PERIODS**

**COURSE OUTCOMES:**

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

CO1: Summarize the behavior electrical circuits

CO2: Solve the DC circuits using network theorems

CO3: Interpret the concepts of AC circuits

CO4: Discuss the electrostatic and magnetic fields with circuit laws and analyze the performance of transformers

CO5: Explain the various sensors and demonstrate electric wiring

**TEXT BOOKS:**

1. A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, Electric Machinery, sixth edition, Tata McGraw Hill, 2012.
2. B. L. Theraja, A Textbook of Electrical Technology, (vol. I), Chand and Company Ltd., New Delhi, 2010.
3. V. K. Mehta, Basic Electrical Engineering, S. Chand and Company Ltd., New Delhi, 2006.
4. I.J. Nagrath and Kothari, Theory and Problems of Basic Electrical Engineering, second edition, Prentice Hall of India Pvt. Ltd, 2005.

<b>22PH104</b>	<b>FUNDAMENTALS OF PHYSICS</b> <b>[Theory Course with Laboratory Component]</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES**

The course will enable the learners to:

- Impart the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.
- Illustrate the fundamentals of oscillatory systems and the analogy of mechanical and electrical systems.
- Explain various light concepts like interference, diffraction and polarization.
- Impart knowledge related to the importance of EM waves and quantum mechanics
- Introduce concepts of crystallography, band structure and thermodynamics
- Give idea of basic lasing action, various types of lasers and fiber optics

**UNIT I WAVES AND OSCILLATIONS**

**12**

Oscillation: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring-mass system. Resonance-definition,damped harmonic oscillator – heavy, critical and light damping, energy

decay in adamped harmonic oscillator, quality factor, forced oscillation and resonance inmechanical and electrical oscillators.

(Theory-12)

## **UNIT II OPTICS**

**15**

Interference-principle of superposition-Young's experiment: Theory of interferencefringes-types of interference-Fresnel's prism-Newton's ring, Diffraction-Two kinds ofdiffraction-Difference between interference and diffraction. Fraunhofer diffraction atsingle slit-plane diffraction grating, Temporal and Spatial Coherence. Polarization oflight: Polarization - Concept of production of polarized beam of light from two SHMacting at right angle; plane, elliptical and circularly polarized light, Brewster's law,double refraction.

(Theory-12)

1. Determination of wave length of light by Newton's Ring method

(Laboratory -3)

## **UNIT III ELECTROMAGNETISM AND QUANTUM MECHANICS** **18**

Basic Idea of Electromagnetism: Continuity equation for current densities, Maxwell'sequation in vacuum and non-conducting medium. Quantum Mechanics: Introduction-Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg'sUncertainty principle, time independent and time dependent Schrödinger's waveequation, Physical significance of wave function, Particle in a one-dimensional potential box.

(Theory -9)

1. Determination of Plank constant
2. Magnetic field along the axis of current carrying coil – Stewart and Gee
- 3.Determination of Stefan's Constant

(Laboratory -9)

## **UNIT IV CRYSTALLOGRAPHY AND THERMODYNAMICS** **15**

Crystallography: Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, atomic packing factor for SC, BCC, FCC and HCP structures, X-raydiffraction. Semiconductor Physics: Conductor, Semiconductor and Insulator; Originof Band Theory, Basic concept of Band theory. Thermodynamics: Zeroth law ofthermodynamics, first law of thermodynamics, brief discussion on application of 1<sup>st</sup>law, second law of thermodynamics and concept of Engine, entropy, change inentropy in reversible and irreversible processes.

(Theory -12)

1. Determination of Hall coefficient of semi-conductor

(Laboratory -3)

## **UNIT V LASER AND FIBER OPTICS** **15**

Laser and Fiber optics: Einstein's theory of matter radiation interaction and A

and Bcoefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO<sub>2</sub> and Neodymium YAG (Neodymium-doped Yttrium Aluminum Garnet); Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering, Fiber optics and applications, types of optical fibers.

(Theory -9)

1. Determination of wave length of light by Laser diffraction method
2. Determination of laser and optical fiber parameters

(Laboratory -6)

**TOTAL: 75 PERIODS**

## **OUTCOMES**

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

- CO1: Obtain solution of the oscillator using differential equation.
- CO2: Analyze the intensity variation of light due to Polarization and interference
- CO3: Explain fundamentals of electromagnetism and quantum mechanics and apply it in engineering problems
- CO4: Find solution to thermal and electrical problems faced in computer devices.
- CO5: Analyze working principle of lasers and to summarize its applications

## **TEXT BOOKS:**

1. **A Beiser**, Concepts of Modern Physics, (Fifth Edition), McGraw Hill International.
2. **Ajoy Ghatak**, Optics, 5th Ed., Tata McGraw Hill, 2012
3. **Sears and Zemansky** -University Physics- (Addison-Wesley)
4. **Jenkins and White**, Fundamentals of Optics,(Third Edition), McGraw-Hill.
5. **M.N. Avadhanulu and P.G. Kshirsagar**, "A text book of Engineering Physics", S. Chand and Company, New Delhi, 2014.
6. **R.K. Gaur and S.L. Gupta**, "Engineering Physics", DhanpatRai Publications (P) Ltd., Eighth Edition, New Delhi, 2001.

## **REFERENCES:**

1. **Halliday, Resnick and Walker**, Fundamentals of Physics, 9th Ed., John Wiley & Sons (2011).
2. **Richard P. Feynman**, The Feynman Lectures on Physics - Vol. I, II and III: The New Millennium Edition (2012).
3. **Neil W Ashcroft and N David Mermin**, "Solid State Physics", Harcourt College Publishers, 1976
4. **S. O. Pillai**, "Solid state physics", New Age International, 2015.
5. **M A Wahab**, "Solid State Physics", 3rd Edition, Narosa Publishing House Pvt.

Ltd., 2015

6. **Garcia,N. and Damask,A.** “Physics for Computer Science Students” Springer-Verlag,2012.
7. **Rogers, B., Adams,J and Pennathur, S.,** “Nanotechnology: Understanding Small System”, CRC Press, 2014.
8. **Wilson J.D. and Hernandez C.A.,** Physics Laboratory Experiments, Houghton Mifflin Company, New York 2005.
9. **Department of Physics,** Physics laboratory manual, R.M.K. Group of Institutions, 2021.

### LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1.	Newton's Ring apparatus	6 Nos.
2.	Plank constant apparatus	6 Nos.
3.	Magnetic field along the axis of current carrying coil – Stewart and Gee	6 Nos.
4.	Semiconductor Laser	6 Nos.
5.	Determination of optical fibre parameters	6 Nos.
6.	Hall effect set-up	2 Nos.

22ME111	<b>PRODUCT DEVELOPMENT LAB -1</b> (Common to all Branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

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.
- II 1. Study of Fundamental of Circuit Design.

2. Study of PCB Milling Machine.
3. Study of Soldering and Desoldering.

III 1. Study of Computer Peripheral Devices (Processing Information Devices)

IV 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

**REFERENCES:**

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press.2011.
2. D. J. Griffiths, Introduction to Electrodynamics, fourth edition, Pearson, 2019.
3. William H. Hayt& Jack E. Kemmerly, Engineering Circuit Analysis, McGraw Hill Book CompanyInc, 2018.
4. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh,Prentice Hall (India) Pvt. Ltd, 2007.

**SEMESTER - II**

<b>22MA202</b>	<b>LINEAR ALGEBRA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

The syllabus is designed to

- Introduce the concepts of matrices and determinants.
- Impart the knowledge of vectors, linear combinations, vector space and linear transformations.
- Implement the concept of linear combinations in image processing and Machine learning.

**UNIT I MATRICES AND DETERMINANTS****9**

Introduction to Matrices and Determinants – Solution of Linear Equations – Cramer's rule – Inverse of a Matrix.

**UNIT II VECTORS AND LINEAR COMBINATIONS****9**

Vectors and linear combinations – Rank of a matrix – Gaussian elimination – LU Decomposition– Solving Systems of Linear Equations using LU Decomposition method.

**UNIT III VECTOR SPACE****9**

Vector space – Dimension – Basis – Orthogonality – Projections – Gram-Schmidt orthogonalization and QR decomposition.

**UNIT IV LINEAR TRANSFORMATIONS** **9**

Linear transformations – Eigen values and Eigen vectors – Positive definite matrices – Hermitian and unitary matrices.

## UNIT V APPLICATIONS OF MATRICES 9

Singular value decomposition and Principal component analysis—Introduction to their applications in Image Processing and Machine Learning.

**TOTAL: 45 PERIODS**

### COURSE OUTCOMES:

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

CO1: solve the system of linear equations using Cramer's rule.

CO2: solve the system of equations using LU Decomposition method.

CO3: compute QR decomposition for a given matrix.

CO4: represent the linear transformations in matrix and to find Eigenvalues and Eigenvectors.

CO5: apply the concept of linear combinations in image processing and Machine learning.

### TEXT BOOKS:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43<sup>rd</sup> Edition, New Delhi 2014.
2. A. H. Friedberg, A. J. Insel and L. Spence, "Linear Algebra", Prentice Hall of India, 4<sup>th</sup> Edition New Delhi, 2004.

### REFERENCE BOOKS:

1. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7<sup>th</sup> Edition.
2. Michael. D. Greenberg, "Advanced Engineering Mathematics", Pearson, 2<sup>nd</sup> Edition.
3. Gilbert Strang, "Introduction to linear algebra", Wellesley-Cambridge Press, 5<sup>th</sup> Edition.
4. P. N. Wartikar & J.N. Wartikar, "Applied Mathematics", Volume I & II, Pune Vidyarthi GrihaPrakashan, 7<sup>th</sup> Edition, 1994.
5. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Pearson Education International, 3<sup>rd</sup> Edition.

<b>22MA203</b>	<b>STATISTICAL METHODS + LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### OBJECTIVES:

The Syllabus designed to

- Explain the fundamental concepts of random sampling and Test of hypothesis.
- Develop an understanding of the principles of estimation theory.



TOTAL: 15 PERIODS

DataSource:

- [www.rbi.org.in](http://www.rbi.org.in)

### **COURSE OUTCOMES:**

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

CO1: find the standard error and sample mean of the sampling distributions.

CO2: identify and evaluate the unbiased estimators.

CO3: compute correlation and regression curve.

CO4: apply testing of hypotheses to real-life problems.

CO5: analyze the ARIMA model and apply it to real-life situations.

### **TEXTBOOKS:**

1. I.R.Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers", Prentice Hall India Learning Private Limited, 4th Edition, 2012.
2. A.Goon, M.Gupta and B.Das Gupta, "Fundamentals of Statistics", Volume I & II, World Press.
3. Chris Chatfield, "The Analysis of Time Series: An Introduction", Chapman & Hall/CRC, 6th Edition, 2004.

### **REFERENCES:**

1. D.C. Montgomery and E.Peck, "Introduction to Linear Regression Analysis", Wiley-Inter science.
2. A.M. Mood, F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill.
3. N. Draper and H. Smith, "Applied Regression Analysis", Wiley-Inter science.
4. R. Garrett Golemund, "Hands-on Programming with R", O'Reilly.
5. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Professional, 2nd Edition.

22CB201	<b>DATA STRUCTURES AND ALGORITHM (Theory Course with Laboratory Component)</b>	L	T	P	C
		3	0	2	4

**COURSE OBJECTIVES:**

The Course will enable learners to:

- Explore algorithm performance analysis.
- Learn linear data structures like lists, stacks, and queues.
- Understand and apply tree data structures.
- Understand and apply graph and file structures.
- Able to incorporate various searching and sorting techniques in real time scenarios.

**UNIT I INTRODUCTION TO ALGORITHM & DATA ORGANISATION 15**

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

**UNIT II LINEAR DATA STRUCTURE 15**

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

**List of Exercise/Experiments:**

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.

**UNIT III NON LINEAR DATA STRUCTURES 15**

Trees (Binary Tree, Binary Search Tree, AVL Tree, B & B+ Tree), Operations and Applications of Non-Linear Data Structures

**List of Exercise/Experiments:**

3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.

**UNIT IV GRAPHS AND FILES 15**

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms. File: Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes.

**List of Exercise/Experiments:**

5. Breadth First Search
6. Depth First Search

**UNIT V SEARCHING AND SORTING 5**

Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort,

Heapsort, Introduction to Hashing

**List of Exercise/Experiments:**

7. Merge Sort
8. Quick Sort

**TOTAL: 75 PERIODS**

**COURSE OUTCOMES:**

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

- CO1: Analyse the various data structure concepts.
- CO2: Apply the different linear data structures to problem solutions.
- CO3: Apply the tree non-linear data structures to problem solutions.
- CO4: Apply the graph and file non-linear data structures to problem solutions
- CO5: Critically analyse the various sorting algorithms.

**TEXT BOOKS:**

1. Fundamentals of Data Structures, E. Horowitz, S. Sahni, S. A-Freed, Universities Press, 2018.
2. Data Structures and Algorithms, A. V. Aho, J. E. Hopperoft, J. D. Ullman, Pearson, 2021.

**REFERENCES:**

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth, 2016.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press, 2018.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), (Thirty First Edition), Pat Morin, UBC Press, 2019.

<b>22CS202</b>	<b>JAVA PROGRAMMING</b> <b>(Common to CSE, CSD, EEE, ECE, ME, IT, ADS and CSBS)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES:**

**The Course will enable learners to:**

- 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.

**List of Exercise/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<sup>th</sup> 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 N<sup>th</sup> 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.

**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.

**List of Exercise/Experiments:**

1. 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.
2. Design a Java interface for ADT Stack. Implement this interface using array and built-in classes. Provide necessary exception handling in both the implementations.

3. 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.
4. Write a Java program to apply built-in and user defined 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.

**List of Exercise/Experiments:**

1. Write a Java program that correctly implements producer consumer problem using the concept of inters thread communication.
2. Write a Java program to read and copy the content of one file to other by handling all file related exceptions.

**UNIT IV STRING HANDLING AND COLLECTIONS 15**

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

**List of Exercise/Experiments:**

1. 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.
2. 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.

**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.

**List of Exercise/Experiments:**

1. Mini Project (using JDBC)

**TOTAL: 75 PERIODS**

**OUTCOMES:**

**Upon completion of the 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 and generics programming.

**CO4:** Apply strings and collections in developing applications.

**CO5:** Implement the concepts of JDBC.

**TEXT BOOK:**

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

**REFERENCES:**

1. Cay S. Horstmann, Gary Cornell, "Core Java Volume – I Fundamentals", 11<sup>th</sup> 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](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29959473947367270000_shared/overview)

**LIST OF EQUIPMENTS:**

1. Systems with either Netbeans or Eclipse, JDK 1.7 and above, Linux and MySQL

22EC202	PRINCIPLES OF ELECTRONICS ENGINEERING	L	T	P	C
		2	0	2	3

**OBJECTIVES:**

The Course will enable learners to:

- Study the operation of semi conductor diodes and their characteristics
- Acquire knowledge about the operation and characteristics of BJT under various configurations
- Introduce the structure and terminal characteristics of FET and MOSFET
- Understand the concepts of feedback and operational amplifiers with its applications
- Gain knowledge about digital logic circuits.

## **UNIT I SEMI CONDUCTOR DIODES AND CIRCUITS**

**6**

Semiconductors: Introduction to Semiconductors: intrinsic & extrinsic, P&N-type semiconductors. Diodes and Diode Circuits: Formation of P-N junction, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown and its reverse characteristics. Rectifier circuits: half wave, full wave.

## **UNIT II BIPOLAR JUNCTION TRANSISTORS**

**6**

Formation of PNP / NPN junctions and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, current amplification factors for CB and CE modes.

## **UNIT III FIELD EFFECT TRANSISTORS**

**6**

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type.

## **UNIT IV FEEDBACK AMPLIFIER AND OPERATIONAL AMPLIFIERS**

**6**

Concept (Block diagram), positive and negative feedback, loop gain, open loop gain, feedback factors, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits: operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation.

## **UNIT V DIGITAL ELECTRONICS FUNDAMENTALS**

**6**

Difference between analog and digital signals, Logic ICs, half and full adder /subtract or, multiplexers, demultiplexers.

**TOTAL:30 PERIODS**

### **LIST OF EXPERIMENTS:**

**TOTAL:30 PERIODS**

1. Semi conductor Diodes and application,
  - a. Characteristics of PN junction diode
  - b. Zener diode characteristics
2. Transistor circuits
  - a. Common Emitter Input Output characteristics
3. JFET, oscillators and amplifiers.
  - a. FET characteristics
4. Opamp based experiments (Analysis using Simulation Spice)
  - a. Opamp as inverting amplifier, non-inverting amplifier
5. Digital experiments
  - a. Simplification, realization of Boole an expressions using logicgates / Universalgates.
  - b. Realization of Half/Full adders and Half/Full Subtractors using logicgates.
  - c. Construction of Multiplexer and Demultiplexer circuits using logicgates.

**TOTAL: 60 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 to sketch the input and output characteristics.
- CO3: Examine the terminal characteristics of FET and MOSFET
- CO4 : Acquire the knowledge on feedback amplifiers and operational amplifiers.
- CO5: Design of simple Digital Logic 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.

**TEXTBOOKS:**

1. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar , Microelectronic Circuits: Theory And Applications, 7th Edition, Oxford University Press ,2017
2. Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, 2nd Edition, McGraw Hill Education, 2017
3. M. Morris Mano, Digital Logic & Computer Design, 1st Edition, Pearson, 2016.

**REFERENCES:**

1. Robert L. Boylestad, Louis Nashelsky Electronic Devices and Circuit Theory, 11th Edition, Pearson, 2017.
2. Ben Streetman, Sanjay Banerjee, Solid State Electronic Devices, 6th Edition, Pearson, 2015.
3. Albert Paul Malvino, Electronic Principle, 8th Edition, McGraw Hill, 2015.
4. D. Schilling, C. Belove, T. Apelewicz, R. Saccardi Electronics Circuits: Discrete & Integrated, 3rd Edition, McGraw Hill, 2002.
5. Jacob Millman, Arvin Grabel, Microelectronics, 2nd Edition, McGraw Hill, 2017.
6. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, Electronics Devices & Circuits, 4th Edition, McGraw Hill, 2017.

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

NPTEL LINK: [https://onlinecourses.nptel.ac.in/noc21\\_ee07/preview](https://onlinecourses.nptel.ac.in/noc21_ee07/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 (BJT-NPN-PNP and NMOS/PMOS)	- 50 Nos
Dual power supply/ single mode power supply	- 15 Nos
IC Trainer Kit	-15 Nos
Seven segment display	-15 Nos
Digital LCR Meter	- 2 Nos
Multimeter	-15 Nos
IC tester	-2Nos
Standalone desktop PCs	- 15 Nos.

SPICE Circuit Simulation Software: (any public domain or commercial software)

ICs each 50 Nos

7400/ 7402 / 7404 / 7486 / 7408 / 7432 / 7483 / 74150 / 74151 / 74147 / 7445 / 7476/7491/ 555 / 7494 / 7447 / 74180 / 7485 / 7473 74138 / 7411 / 7474/Op-Amps uA741 /LM555

22HS101	<b>PROFESSIONAL COMMUNICATION</b> <b>(Theory Course with Laboratory Component)</b>	L	T	P	C
		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 shortquestions / 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 III BASIC 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)

3. Writing based on listening to academic lectures and discussions
4. Leadership skills, Negotiation skills
5. 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 the self 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.
5. **Larsen, Kristine.** *Stephen Hawking: A Biography*, Greenwood: Publishing Group, 2005.
6. **Redston, Chris & Gillies Cunningham.** *Face2Face (Pre-intermediate Students' Book & Workbook)* Cambridge University Press, New Delhi: 2005.
7. **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](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](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/en/app/toc/lex_auth_012683227498151936279_shared/overview)

[https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_013267708367904768573/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\\_01268947760100966433\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01268947760100966433_shared/overview)

**5. Email Etiquettes**

[https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01329462386556108817682\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329462386556108817682_shared/overview)

**6. Email Writing Skills**

[https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_01268954363013529666\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01268954363013529666_shared/overview)

**7. Time Management**

[https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_012985921210736640721\\_shared/overview](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\\_01297973765144576024689\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01297973765144576024689_shared/overview)

**ONLINE RESOURCES:**

1. <https://infyspringboard.onwingspan.com/web/en/page/home>

<b>22ME211</b>	<b>PRODUCT DEVELOPMENT LAB –2</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

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.

22CH104	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	L	T	P	C
		2	0	0	MC

#### OBJECTIVES:

- 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 – Carbon footprint of the institution**

### **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 21<sup>st</sup> century**

**TOTAL: 30 PERIODS**

#### **COURSE OUTCOMES:**

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

CO1: Investigate and use conservational practices to protect natural resources.

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

CO3: Adapt the values of biodiversity and its conservation methods.

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

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

#### **TEXTBOOKS:**

1. Anubha Kaushik and C.P. Kaushik, “Perspectives in environmental studies”, New Age International Publishers, 2<sup>nd</sup> edition, 2021.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2017.
3. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 3<sup>rd</sup> edition, Pearson Education, 2014.

4. Erach Bharuch, Textbook of Environmental Studies for Undergraduate Courses, Third Edition, Universities Press(I) Pvt. Ltd., Hyderabad, 2021.

**REFERENCES:**

1. William P.Cunningham & Mary Ann Cunningham Environmental Science: A Global Concern, McGraw Hill, 14<sup>th</sup> 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., 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