Syllabi of
Departmental Courses (DC) Courses
B.Tech I Semester
For batch admitted 2023-24
(Computer Science & Design)
Under Flexible Curriculum

Department of Computer Science and Engineering

INTRODUCTION TO COMPUTER SCIENCE AND DESIGN
(3290121)
(DC)

COURSE OBJECTIVES:

- To understand the basics of computers.
- To familiarize the students with various design techniques.
- To implement design solutions using digital logic, algorithms, computer networks and software development techniques.

Unit I - Biology for Engineers:

Basic Cell Biology: Origin of life, Cell theory, Cell Structure and function, Brief introduction to Bio-engineering, Genetic Engineering, Basics of biosensors its applications, Fundamental concept of Bioinformatics, Applications of Bioinformatics, Artificial Intelligence in Biology, Biometrics system, component of Biometric system.

Unit II - Introduction to Computer:

Introduction, Generation of computers, Classification of Computers, Hardware components, the system bus. Computer memory and its types, memory hierarchy. Computer software - System software, application software. Operating system, its types, and services. Booting.

Unit III - Digital Logic Design:

Von-Neumann Model, Various Subsystems, Binary numbers, Number Base Conversions, Complements, Signed Binary numbers, Binary Codes, Digital Logic Gates, Representation of sign (sign-magnitude, two's complement). Boolean Algebra, expressions, and truth tables.

Unit IV - Computer Network Design:

Introduction: Computer Network, Type s- LAN, MAN & WAN, Data transmission modes-Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission, Networking Devices-Repeaters, Hub, Switch, Bridge, Router, Gateway, and Modem,

Unit V - Software Design:

The evolving role of software, changing nature of software, software myths. Software engineering, Software Development cycle, Models: The waterfall model, incremental models, evolutionary models. Levels of Software design.

RECOMMENDED BOOKS:

- Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J., Delhi, Pearson Education (Singapore) Pte.Ltd., 2001.
- Biology For Engineers by Singal Rajiv, CBS Publishers & Distributors Pvt. Ltd. 2020, 1st. edition.
- Fundamentals of Computer Engineering, E. Balagurusamy, Tata McGraw Hill Education Pvt. Ltd.
- Introduction of Computers: Peter Norton, TMH
- Computer Networks: Andrew Tananbaum, PHI
- Basic Computer Engineering: Silakari and Shukla, Wiley India

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COURSE OUTCOMES:

After completion of the course students would be able to:
CO1: Define the fundamentals of computer systems.
CO2: Outline various components of the computer system.
CO3: Analyse the basics of digital circuit design techniques.
CO4: Select appropriate methods to design algorithms for problem-solving using computers.
CO5: Explain the importance of computer networks.
CO6: Choose suitable development tools to create web-based applications for solving real-world problems.

Department of Computer Science and Engineering

COMPUTER PROGRAMMING

(2290122)

COURSE OBJECTIVES:

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To study the concepts of procedural and object oriented programming.
- To design and implement basic programming solutions using programming constructs.

Unit I

Introduction to Programming, types of computer programming languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, variables, input/output, Operators & Expressions, Precedence of operators.

Unit II

Control Statements and Decision Making: goto statement, if statement, if-else statement, nesting of if statements, The switch statement, while loop, do...while loop, for loop, nesting of for loops, break and continue statement. Function Basics, Function Prototypes, Passing Parameter by value and by reference, Default Arguments, Recursion. Arrays: One dimensional Arrays, Multidimensional Arrays, Passing Arrays to Functions.

Unit III

Strings, Pointers, Structures and File handling:, operations on Strings, Basics of Pointers & Addresses, reference variable, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings. Dynamic memory allocation using new and delete operators. Structures & Union, Pointer to Structure, Self-Referential Structures. File Concepts, Study of Various Files and Streams, operations on files.

Unit IV

Object Oriented Paradigm, Features of OOPS, Comparison of Procedural Oriented Programming with Object Oriented Programming, Abstract Data Types, Specification of Class, Visibility Modes, Defining Member Functions, Scope Resolution Operator, Constructors, its types, and Destructors, Creating of Objects, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Friend Function.

Unit V

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.

RECOMMENDED BOOKS:

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusamy.
- Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES:

After completing this, the students will be able to:

CO1: identify situations where computational methods and computers would be useful.

CO2: develop algorithms and flowchart for a given problem.

CO3: understand the concepts of procedural programming.

CO4: explain the concepts of object oriented programming and its significance in the real world.

CO5: analyze the problems and choose suitable programming techniques to develop solutions.

CO6: develop computer programs to solve real world problems.

List of Experiment

Computer Programming(3290122)

1. Write a Program to Check Whether a Number is Even or Odd
2. Write a Program to Check Leap Year
3. Write a Program to find the sum of the first n natural numbers
4. Write a Program to convert string from lower case to upper case
5. Write a program to find the sum of array elements
6. Write a program to print String using Pointer
7. Write a program to swap two numbers using pointers
8. Write a Program to read the first line from a file
9. Write a Program to write a sentence on a file
10. Write a Program Binary to decimal conversion

List of Skill Based Mini-projects

Computer Programming(3290122)

1. Design a program to implement Tic tac toe game
2. Design a program to implement basic operation of Leave Management System
3. Generate a Student report card system using a C program.
4. Design a program which can generate a Calendar for any year.
5. Design a program which demonstrates the operations performed by an ATM Machine.
6. Design a program to create a Number System Conversion system.
7. Design a program to implement basic operation of Department Store Management System
8. Design a program to implement basic operation of Library Management System
9. Design a program to implement basic operation of Bus Reservation System
10. Design a program to implement Periodic Table.
11. Design a program to implement Digital clock

Please Note: Each project has to be submitted by a group of 3 to 4 students, and each group will beassigned only one project.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR - 474005

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Department of Computer Science and Engineering

3290122- COMPUTER PROGRAMMING

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To design and implement programming solutions for problem solving.

Unit I

Introduction to Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C Programming: Data Types, Constants, Keywords, Operators & Expressions, Precedence of operators and input/output functions.

Unit II

Control Statements and Decision Making: The goto statement, The if statement, The if- else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break and continue statement.

Unit III

Arrays, Strings & Pointers: One dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, Pointer to Pointer, Pointer to Array, Array of Pointers, Types of pointers, Pointer to Strings.

Unit IV

Functions & Structures: Function Basics, Function Prototypes, Passing Parameter by value and by reference, Passing string to function, Passing array to function, Function returning address, Recursion, Structures & Union, Pointer to Structure, Self-Referential Structures, Dynamic memory allocation by malloc/calloc function, Storage Classes.

Unit V

File Handling: Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Command Line Arguments.

RECOMMENDED BOOKS

- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
- Paul Deitel and Harvey M. Deitel , How to Program, Pearson Publication.
- Yashavant Kanetkar , Let Us C, BPB publication.
- E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill.
- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: identify situations where computational methods and computers would be useful.

CO2: describe the basic principles of procedural programming.

CO3: develop algorithms and flowchart for a given problem.

CO4: analyze the problems and choose suitable programming techniques to develop solutions.

CO5: design, implement, debug and test programs.

CO6: design computer programs to solve real world problems.

LINEAR ALGEBRA (3250100)

COURSE OBJECTIVES:

- To understand the concept of Matrices and their applications
- To understand the various aspect of algebraic structures ‘
- To explore vector space
- To perceive knowledge of linear transformation and their application

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Unit I

Matrix, Rank of Matrix, Echelon form, Normal form of a matrix, Solution of the simultaneous equation by elementary transformation, Consistency of equation, Eigenvalues and Eigenvectors, Normalized eigenvector, Cayley Hamilton theorem, and its application to finding the inverse of a matrix.

Unit II

Introduction of Groups and their properties, Sub-groups, Coset, Lagrange ‘s theorem for the finite group, Normal sub-group, Cyclic group, Ring and its properties, Field, Finite field, Integral domain, and its properties.

Unit III

Vector spaces over the field and its properties, sub-spaces, linear dependent vectors, and linearly independent vectors, a linear span of a set of vectors, basis, and dimension of a vector space, sum, and direct sum.

Unit IV

Linear transformation, Kernel and range space of linear transformation, Nullity and Rank, Singular and Non- Singular transformation, Matrix representation of a linear transformation, change of basis and similarity.

Unit V

Inner product spaces, Properties of inner product space, Norm space, Schwarz ‘s inequality, Triangular inequality, Parallelogram Law, Orthogonality, Generalized theorem of Pythagoras.

RECOMMENDED BOOKS:

- S. Lipschutz and M. Lipson, Linear Algebra (4th Edition), Schaum‘s Outline series, Mc- Graw

Hill. (2009).
- S. Boyd and L. Vandenberghe, Introduction to Applied Linear Algebra Vectors, Matrices, and Least Squares, University Printing House, Cambridge CB2 8BS, United Kingdom One Liberty Plaza, 20th Floor, New York, NY 10006, USA, (2018).
- E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
- R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd, 5th Edition (2016).

COURSE OUTCOMES:

After completion of the course students would be able to:

CO1: Determine the solution of Matrix
CO2: Find the analytical solution of algebraic structures
CO3: Express the vector space
CO4: Acquire the knowledge of Linear transformation.
CO5: Illustrate the concept of Inner product spaces

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR - 474005

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Basic Electrical & Electronics Engineering

3100022

Course Objectives:

- To impart the basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer and its terminology.
- To make familiarize the students about the working of rotating electrical machine, various electronic circuits and its importance.

Unit I - D.C. Circuits Analysis:

Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit II –Single-phase AC Circuits:

Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.

Unit III- Magnetic Circuits:

Basic definitions, AC excitation in magnetic circuits, self-inductance and mutual inductance, Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Flux,MMF and their relation, analysis of magnetic circuits.

Unit IV- Single-phase Transformer &Rotating Electrical Machines:

Single phase transformer, Basic concepts, construction and working principal, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.

Unit V - Digital Electronics, **Devices & Circuits:**

Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates- symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations

Recommended Books:

1. Basic Electrical and Electronics Engineering, D.P. Kothari & I.J. Nagrath-Tata McGraw Hill
2. Basic Electrical and Electronics Engineering, V N Mittle & Arvind Mittal -Tata McGraw Hill
3. Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
4. Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
5. Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall.
6. Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH
7. Integrated Electronics- Millmann & Halkias
8. Electronics Devices & circuits- Sanjeev Gupta, Dhanpat Rai Publication
9. Basic Electrical and Electronics Engineering, D.C Kulshreshtha-Tata McGraw Hill

Course Outcomes

After the completion of the course, the student will be able to –

CO 1. **Solve** dc & ac circuits by applying fundamental laws & theorems
CO 2. **Compare** the behavior of electrical and magnetic circuits for given input
CO 3. **Explain** the working principle, construction, applications of rotating electrical machines
CO 4. **Explain** the working principle, constructional details, losses & applications of single phase transformer.
CO 5. **Select** the logic gates for various applications in digital electronic circuits.
CO 6. **Explain** the characteristics of the Diode and Transistor.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR - 474005

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Basic Electrical & Electronics Engineering Lab (3100022)

LIST OF EXPERIMENT

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem
3. To determine the resistance & inductance of a choke coil.
4. To determine active & reactive power in a single-phase A.C circuit.
5. To determine the voltage ratio & current ratio of a single-phase transformer.
6. To determine the polarity of a single-phase transformer.
7. To perform open circuit & short circuit tests on a single-phase transformer.
8. To study multimeters & measure various electrical quantities
9. To study of constructional details of the DC machine.
10. To determine the V-I characteristics of the diode in forward bias & reverse bias conditions.

Course Outcomes:

After the completion of the lab, the student will be able to -

CO 1. **Verify** circuit theorems.
CO 2. **Perform** tests on transformer for determination of losses, efficiency & polarity.
CO 3. **Acquire** teamwork skills for working effectively in groups
CO 4. **Prepare** an organized technical report on experiments conducted in the laboratory.

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Skill-Based Mini Project

Basic Electrical & Electronics Engineering (3100022)

1. Enlist the different electrical loads available in your home and prepare their rating chart.
2. Design the residential house wiring using fuse, switch, and indicator, lamp and energy meter. Also apply the Thevenin's theorem for finding the current in a particular branch of the circuit.
3. If one FTL (Fluorescent Tube Light) is replaced by LED bulb.
   A. Calculate the Monthly electrical energy saving?
   B. Calculate the monthly savings in electricity bill?
   Note: LUX level of FTL and LED bulbs must be the same (follow BEE Guide lines). Consider electricity bill charges from MP VidyutVitran company website.
4. What is the use of condenser in a ceiling fan? Draw a wiring diagram for the testing of motor winding.
5. Find the different ways/ Methodologies/ Guidelines, by which energy can be conserved in domestic applications?
6. Design a working model for controlling one lamp by two 2-way switch.
7. Visit the electrical machine lab and enlist different types of AC and DC motors along with their ratings. Also mention their industrial applications.
8. Visit the panel room and identify the different safety practices followed by electrical engineer.
9. Enlist different measuring instruments available in electrical workshop lab. Also prepare a comparison chart for Analog and digital measuring instruments.

Department of Computer Science and Engineering

DIGITAL ELECTRONICS (3290123)

COURSE OBJECTIVES

- To perform the analysis and design of various digital electronic circuits.
- To learn various number systems, boolean algebra and logic gates.
- To understand the concept of counters, latches and flip-flops.

Unit-I

Introduction to Digital Electronics, Needs and Significance, Different Number Systems: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic, Binary Codes: BCD, ASCII Codes.

Unit-II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications, Prime Implicants, and Essential Prime Implicants definition.

Unit-III

Combinational Circuits, Half Adder, Half Subtractor, Full Adder, and Full Subtractor, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers, Demultiplexer.

Unit-IV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

Unit-V

Introduction to Memory, Memory Decoding, Error Detection and Correction, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices, RTL and DTL Circuits, TTL, ECL, MOS, CMOS, Application Specific Integrated Circuits.

RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
- Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain the computer architecture for defining basic component and functional unit.

CO2. recall different number system and solve the basic arithmetic operations.

CO3. develop the understanding of combinational circuits.

CO4. analyze the basic concept of sequential circuits.

CO5. compare various memories.

CO6. solve the boolean functions using logic gates.

List of Experiments
(3290123)

1. To study and verify the truth table of various logic gates.
2. To realize Half Adder and Full Adder by using Basic logic gates
3. To realize Adder and Subtractor by using Basic logic gates
4. To design and set up 4:1 Multiplexer (MUX) using only NAND gates.
5. To design and set up 1:4 Demultiplexer (DE-MUX) using only NAND gates.
6. To realize One & Two Bit Comparator and study of 7485 magnitude comparator
7. To study and verify Truth Table of RS Flip Flop
8. To study and verify Truth Table of D type Flip Flop.
9. To study and verify Truth Table of JK type Flip Flop.
10. To study and verify Truth Table of T Flip Flop.
11. To study and verify Truth Table of JK Master Slave Flip Flop

Skill Based Project(3290123)

- Design a 4-bit comparator
- Design a parity checker
- Design a 4-bit Ripple counter
- Design a Synchronous counter
- Design a Ring Counter
- Design a left-shift counter
- Design a right-shift counter

Please Note: Each project has to be submitted by a group of 2 to 4 students (Depending upon the project), and each group will be assigned only one project.

Engineering Chemistry (3000002)

(Natural Sciences & Skills)

COURSE OBJECTIVES:

- Enable the students to become familiar with the concepts of Modern Engineering Chemistry Develop an understanding of complex topics in correlation to Chemical analysis and applications. So that they could be applied to engineering and applications. Help students develop an understanding of the reactions and analysis-related problems in day-to-day life/ industry/engineering field.

Unit I - Chemistry of Water Analysis

Source and impurities, alkalinity, pH, hardness of water, the interrelationship between alkalinity and hardness, degree of hardness, Standards of water for drinking purposes, Methods of water softening: lime- soda process, zeolite, and ion exchange resin process. Scale formation: causes, effects, and prevention. Caustic embitterment, priming, foaming, boiler corrosion, and deaeration. Simple numerical problems on water softening based on the lime soda process and water analysis

Unit II - Chemistry of Engineering Material

Lubricants-Introduction, functions of lubricants, types, and classification of lubricants, solid lubricants, semi-solid lubricants, liquid lubricants, synthetic lubricants, lubricating emulsions, biodegradable lubricants, mechanism of lubrication, physical & chemical properties, testing of lubricants, types of greases, application of lubricants and silicones, selection of lubricants.

Cement: introduction & raw materials, gypsum cement, Types of cement, Methods of manufacturing cement: Wet process, Dry process, Semi-dry process. Chemistry of setting & Hardening of cement, Types of Portland cement, and its derivatives.

Refractory. Introduction, classification of refractories, and properties of refractories with reference to Refractoriness, RUL, Porosity, Thermal Spalling

Unit III - Chemicals of industrial importance

Fuels- Definition & Classification of fuels and their comparison. Calorific values, Determination of calorific value by Bomb calorimeter. Proximate and ultimate analysis of coal and their significance, Varieties of fuel oils, their properties and uses, knocking, anti-knocking compounds (octane &cetane number), simple numerical problems based on fuels.

Unit IV - Polymers of Engineering importance

Introduction, types and classification of polymers, Types of polymerization: addition or chain polymerization, condensation polymerization and their mechanism,

Classification of plastic, important thermoplastic resins Nylon 66, Teflon, Polystyrene & important thermosetting resins Phenolic resin, Amino resin. Moulding of plastics.Natural & synthetic rubbers, Vulcanization, styrene rubber, polyurethanes, silicon rubber, reclaimed rubber, Introduction to polymer composites, Engineering Plastics, Polymer in medicine and surgery and conducting polymers

Unit V - Standard Methods of Chemical Analysis

Introduction to Chromatography- Classification of Chromatography Methods, Principle of Chromatographic Mechanisms, Terminology Used in Chromatography, Chromatographic Performance, Isolation of Separated Components (Elution), Column, Thin layer and paper Chromatography. Principle, Instrumentation and application of Gas Chromatography.

Introduction to Spectroscopy-Ultra-Violet, and Visible Spectroscopy, Theory of ultraviolet visible spectroscopy, Types of electronic transitions, Chromophore, Auxochrome, Absorption and intensity shifts, The Absorption law. Instrumentation and Applications of ultraviolet-visible spectroscopy. Introduction of IR Spectroscopy.

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RECOMMENDED BOOKS:

- Engineering Chemistry- P.C.Jain and Monika Jain, Dhanpat Rai *Publishing* Co (P) Ltd, 2013
- Engineering Chemistry - B.K. Sharma, Krishna Publication, 2015
- A Text Book of Engineering Chemistry - S. S. Dara & A.K. Singh, S. Chand Publication, 2015.
- Applied Chemistry - Theory and Practice, O.P. Viramani, A.K. Narula, New Age Pub, 2008.
- Polymer Science – Ghosh, Tata McGraw Hill.2010
- Chemistry for Environmental Engineering - Sawyer, McCarty and Parkin – McGraw Hill, International.2003
- Industrial Chemistry - B.K. Sharma, GOEL Publishing house 2011

COURSE OUTCOMES:

After completion of the course students would be able to:

CO1: Integrate the importance of water treatment for domestic and Industrial purposes

CO2: Acquire knowledge of the types, properties, and applications of advanced Engineering materials like lubricants, fuels.

CO3: Appreciate the knowledge of the types, properties, and application of advanced polymer materials, cement, refractories.

CO4: Perform simple and complex calculations through problem-solving methods.

CO5: Summarize the concept of chromatography and spectroscopy for various engineering applications related to day to day life.

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List of Experiments

Subject Name: Engineering Chemistry laboratory
Subject code 3000002 (Under Flexible Scheme-2019-20)
B.Tech. (First / Second semester) with effect from 01.07.2022

NOTE: At least 10 of the following experiments must be performed during the session.

Experiment No.	Aim of experiment
1	Determination of Total hardness by Complexometric titration.
2	Determination of temporary and permanent hardness by Complexometric titration.
3	Determination of alkalinity of given water sample by neutralization Titration. (a) OH^- & CO_3^{2-} (b) CO_3^{2-} & $HCO3^-$
4	Determination of percentage of Fe in Iron alloy solution by redox titration.
5	Determination of percentage of Cr in Chromium alloy solution by back titration.
6	Determination of Cu in Copper alloys solution by Iodometric Titration.
7	Determination of Viscosity of given oil sample by Redwood viscometer No.1
8	Determination of Flash & fire points of given oil sample by Pensky Martin close cup Apparatus.
9	Determination of Flash & fire point of given oil sample by Cleveland's open cup Apparatus.
10	Determination of Moisture content, volatile matter content, Ash content and fixed Carbon of a given sample of coal by proximate analysis.
11	Separation of the colour pigment of spinach leaf by paper chromatography**.**
12	Preparation of phenol formaldehyde resin by condensation polymerization.
13	Preparation of urea formaldehyde resin by condensation polymerization.

Course outcomes

Lab CO	After attending the lab in Engineering Chemistry (100101) the student will be able to:
CO1	**Develop** experimental skills required for the application of chemistry in engineering.
CO2	**Operate** different chemicals and instruments specified in the course safely and efficiently.
CO3	**Analyze** water samples, lubricants, fuel, alloys, and ores for different properties
CO4	**Function** as a member of a problem-solving team

Skill-Based Mini Project

Guidelines for delivering the Project:

Students will have to deliver a 10 Minute presentation preferably on PowerPoint.

1. **The student can choose a topic of their choice but the same should be from the syllabi.**
2. **The students will have to communicate the same to the teacher in advance before delivering the same, and getting the topic approved. The teacher can change, modify, and suggest one instead.**
3. **The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.**
4. **Student will also have to submit a written report based on that.**
5. **The said activity has to be completed before the teaching ends.**
6. **He will be judged on basis of Presentation rubrics.**