

23BS1101
LINEAR ALGEBRA & CALCULUS
COMMON TO ALL BRANCHES

(AI&DS/AI&ML/CE/CSE/ECE/EEE/EIE/IT/ME)

Course Category:	Basic Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0- 0
Prerequisites:	Fundamentals of Matrices, Fundamentals of Calculus, Integration, Differentiation.	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Solve the system of homogeneous and non-homogeneous linear equations
CO2	Examine the nature of a quadratic form by transforming into a canonical form
CO3	Determine maxima and minima of multivariable functions
CO4	Evaluate areas and volumes using double, triple integrals

COURSE CONTENT

UNIT I Matrices

Rank of a matrix by Echelon form, Normal form, Cauchy–Binet formulae (without proof), Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss-Seidel Iteration Methods.

UNIT II Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic forms, Reduction of Quadratic form to Canonical forms by Orthogonal Transformation.

UNIT III Differential Calculus

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof), Problems and applications on the above theorems.

Functions of Several Variables: Continuity and Differentiability, Partial derivatives, Total derivatives, Chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobians, Functional dependence, Maxima and Minima of functions of two variables, Method of Lagrange multipliers.

UNIT IV Multiple Integrals (Multi variable Calculus)

Double integrals, Triple integrals, Change of order of integration, Change of variables to polar, cylindrical and spherical coordinates, Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOK

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

REFERENCE BOOKS

1. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition
2. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint)
4. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition
5. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th Edition
6. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, 3rd Edition (Reprint 2021)


(Course Coordinator)



DR. CH. BABY RANI
Associate Professor & Head
Department of Mathematics
R. Siddhartha Engg. College
B. JAYAWADA-520 00

**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE (AUTONOMOUS)
VIJAYAWADA**

DEPARTMENT OF CHEMISTRY

L	T	P	C
3	0	0	3

**SYLLABUS
ENGINEERING CHEMISTRY
(23BS1102A)**

(Common to Civil and Mechanical Engineering branches)

Course outcomes (COs)

CO1:	Analyse various water treatment methods and boiler troubles.
CO2:	Apply the knowledge of basic electrochemistry principles for electrochemical energy systems and corrosion.
CO3:	Compare mechanistic aspects of polymerisation, and different polymers and conventional fuels for their effective utilisation.
CO4:	Evaluate various modern engineering materials for their applications in engineering and other fields.

UNIT I

(11 lectures)

Water Technology-I (Domestic water): Specifications for drinking water - World Health Organization (WHO) standards, domestic water treatment – sedimentation, coagulation, disinfection by chlorination – breakpoint chlorination, desalination of brackish water – electrodialysis and reverse osmosis (RO).

Water Technology-II (Industrial water): Hardness of water, Estimation of hardness of water by EDTA Method, Estimation of dissolved oxygen – Boiler troubles – scales, caustic embrittlement – reasons, disadvantages and control methods – conditioning, Industrial water treatment – Ion-exchange method, concept of adsorption and its applications.

UNIT II

(12 lectures)

Electrochemistry: Electrodes, electrochemical cell, Nernst equation, cell potential calculations, Primary cells – zinc-air battery, Secondary cells –lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells – working principle of a fuel cell and working of hydrogen-oxygen fuel cell.

Corrosion: Introduction, electrochemical corrosion – hydrogen evolution and oxygen absorption corrosion, differential aeration corrosion, galvanic corrosion, factors affecting the corrosion, cathodic protection, copper electroplating and copper electroless plating.

UNIT III**(11 lectures)**

Polymer chemistry: Introduction, functionality of monomers, mechanism of chain growth, step growth polymerization, thermoplastics and thermosetting plastics: Preparation, properties and applications of PVC, polystyrene, Nylon 6,6 and Bakelite. Elastomers – Preparation, properties and applications of Buna S and Buna N.

Fuel Chemistry: Fuels- classification, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (proximate and ultimate analysis), Liquid fuels - refining of petroleum, concept of knocking, octane and cetane number, alternative fuels – biomass, biogas, biodiesel.

UNIT IV**(11 lectures)**

Modern Engineering Materials-I: *Composites*: classification – particle, fibre and layered reinforced composites, properties and engineering applications. *Lubricants*: classification, mechanisms, properties of lubricating oils- viscosity, viscosity Index, flash point, fire point, and applications.

Modern Engineering Materials-II: *Building materials*: Portland cement, constituents, setting and hardening of cement, refractories – classification and properties – refractoriness, RUL test, porosity, and applications. *Nanomaterials*: classification, properties and applications.

Textbooks:

1. Engineering Chemistry, Jain and Jain, 17th Edition, Dhanpat Rai, 2018.
2. Engineering Chemistry, Prasantha Rath & S. Aruna Kumari, Cengage Publishers, 2023.

Reference Books:

1. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
2. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition.

M. Anagabava
COURSE COORDINATOR

S. Srinivasulu
HEAD OF THE DEPARTMENT

HEAD
Department of Chemistry
V.R. Sundararama Engineering College
Vijayawada-520007

**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE (AUTONOMOUS)
VIJAYAWADA**

DEPARTMENT OF CHEMISTRY

L	T	P	C
3	0	0	3

**SYLLABUS
CHEMISTRY**

(23BS1102B / 23BS2102B)

(Common to ECE, EEE, EIE, CSE, IT, AIDS and AIML)

Course outcomes (COs)

CO1	Apply the principles of quantum mechanics for determining structure and bonding of molecules.
CO2	Apply the principles electrochemistry for its applications in chemical analysis, electrodes, electrochemical sensors and energy sources.
CO3	Explain the mechanistic aspects of polymerisation and conduction, types, preparation, properties and applications of polymers.
CO4	Compare different spectroscopic and chromatographic techniques for their application in qualitative and quantitative analysis.
CO5	Choose engineering materials including nanomaterials based on their properties for their applications in various industrial fields.

UNIT I

(12 lectures)

Structure and Bonding Models: Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2 , particle in one dimensional box, Molecular orbital theory, bonding in homo and heteronuclear diatomic molecules, energy level diagrams of O_2 , N_2 , NO and CO, calculation of bond order, π - molecular orbitals of butadiene and benzene.

Engineering Materials: Semiconductors - Introduction, basic concept, applications, Superconductors - Introduction, basic concept, applications, Supercapacitors - Introduction, basic concept, classification, applications. -

UNIT II

(11 lectures)

Electrochemistry: Electrochemical cell, Nernst equation, potential and emf calculations and numerical problems, potentiometry – potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, cell constant and specific conductance, conductometric titrations (acid-base titrations), Electrochemical sensors – potentiometric sensors and amperometric sensors- principle with examples.

Electrochemical Energy Systems: Types of electrochemical energy systems - Primary cells – Zinc-air battery, Secondary cells – lithium-ion batteries – working of the batteries including

cell reactions, Fuel cells – hydrogen–oxygen fuel cell - working of the cells, Polymer Electrolyte Membrane fuel cells (PEMFC).

UNIT III

(11 lectures)

Polymer Chemistry: Introduction to polymers, functionality of monomers, addition and condensation polymerization, mechanism of chain growth and step growth polymerization, coordination polymerization with specific examples. Plastics – Thermo and thermosetting plastics, preparation, properties and applications of PVC, Teflon, Bakelite, Nylon-6,6. Elastomers – Buna-S, Buna-N –Preparation, properties and applications. Conducting Polymers – Principle and examples, mechanism of conduction in undoped, doped polyacetylene and applications, Biodegradable polymers – polyglycolic acid (PGA), Polylactic acid (PLA).

UNIT IV

(11 lectures)

Instrumental Methods of Analysis: Electromagnetic spectrum, Interaction of radiation with matter, UV-Visible Spectroscopy- principle, electronic transitions, Lambert-Beer's law, Instrumentation, applications, IR spectroscopy- principle, types of vibrations, selection rule, Instrumentation, Chromatography- basic principle and classification.

Nano materials: Introduction, classification of nanomaterials. Properties and applications of fullerenes, carbon nanotubes, graphene and nanoparticles.


Textbooks:

1. Engineering Chemistry, Jain and Jain, 17th Edition, Dhanpat Rai, 2018.
2. Engineering Chemistry, Prasantha Rath & S. Aruna Kumari, Cengage Publishers, 2023.

Reference Books:

1. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. J.D.Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb 2008.
4. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition.


COURSE COORDINATOR


HEAD OF THE DEPARTMENT
HEAD
Department of Chemistry
V.R. Siddhartha Engineering College
Vijayawada-520002

L	T	P	C
3	0	0	3

BASIC ELECTRICAL & ELECTRONICS ENGINEERING -

23ES1103B

(Common to All branches of Engineering)

Course Objectives

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes: After the completion of the course students will be able to

CO1. Describe the fundamentals of DC, AC circuits and safety measurements.

CO2. Demonstrate the concepts of electrical machines, measuring instruments and electricity bill.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing phenomenon, Safety Precautions to avoid shock.

UNIT II Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Voltage, Current, temperature sensors, basic block diagram of multimeter.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, calculation of electricity bill for domestic consumers.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/10810807>

Designation	Name in Capitals	Signature with Date
Course Coordinator	V. RAVINDRANADH	<i>[Signature]</i> 12/12/23
Module Coordinator	Smt. S. V. R. L. KUMARI	<i>[Signature]</i>
Program Coordinator	Dr. A. RAMA DEVI	<i>[Signature]</i> 12/12/23
Head of the Department	Dr. P. V. R. L. NARASIMHAM	<i>[Signature]</i>

**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE::VIJAYAWADA**
(AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

Course Outcomes:

CO5. Demonstrate the working principles of basic Electronic devices, circuits and instrumentation System (L3).

CO6. Implementation of simple Combinational and Sequential circuits using Logic gates (L3).

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT II DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009.

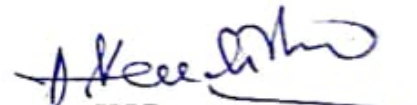
Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

End examination pattern:

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 10 marks such that each question carries 2 marks.
- iii) In each part, questions from 2 to 4, there shall be either/or type questions of 15 marks each. Student shall answer any one of them.
- iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

G. Venkata Subbaiah
Course co-ordinator


HOD

L	T	P	C
3	0	0	3

23ES1104**Introduction to Programming (Common to All Branches)**

Course Category:	Engineering Science	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3-0-0
Prerequisites:	--	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OBJECTIVES

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging on control structures and arrays.
- To foster logical thinking and problem-solving skills on strings and pointers.
- To familiarize students with programming concepts such as functions, structures and files.

COURSE OUTCOMES

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

- CO1** Understand basics of computers, the concept of algorithm and algorithmic thinking.
- CO2** Analyze a problem and develop an algorithm to solve problems on control structures and arrays.
- CO3** Implement various problems using strings and pointers.
- CO4** Understand the concept of functions, user defined data types and file handling.

UNIT I: Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT II: Control Structures and Arrays

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue, Arrays indexing, memory model, programs with array of integers, two dimensional arrays.

UNIT III: Strings and pointers

Introduction to Strings. Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers.

UNIT IV: Functions, User Defined Data types and File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, User-defined data types-Structures and Unions, Basics of File Handling.


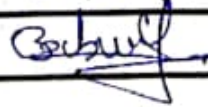
Note: The syllabus is designed with C Language as the fundamental language of implementation.

Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988.
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition.

Course Coordinator		Head of the Department
Name:	S. BABU	 Professor & Head
Signature:		

Dept. of Computer Science & Engineering
V.R. Siddhartha Engineering College
VIJAYAWADA - 520 007

L	T	P	C
1	0	4	3

Course Objectives:

ENGINEERING GRAPHICS

(Common to All branches of Engineering)

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric projections.

Course Outcomes:

- CO1: Understand the principles of engineering drawing, including engineering curves and scales.
- CO2: Draw and interpret orthographic projections of points, lines and planes in front, top and side views.
- CO3: Understand and draw projection of solids in various positions in first quadrant and Explain principles behind development of surfaces.
- CO4: Explain principles behind the Sections of solids, Prepare isometric views and conversion of simple solids.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions of regular polygons by general methods.

Curves: Construction of ellipse, parabola and hyperbola by general method and Involute. Draw normal and tangent to Curves.

Scales: Plain scales and diagonal scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in first quadrant only.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Projections of solids (Prisms and Pyramids only) in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Projection of Solids with axis inclined to one reference plane and parallel to another plane.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

UNIT IV

Sections of Solids: Section planes perpendicular to VP and inclined to HP only, Sectional views (Front View and Top View only) and Sections of solids in simple position only.

Isometric Views: Draw an Isometric views of Simple solids

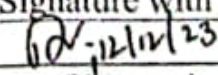
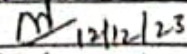
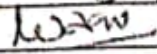
Conversion of Views: Conversion of isometric views to orthographic views of Simple solids.

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Tata McGraw Hill, 2009.
2. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
3. Engineering Drawing, M.B. Shah and B.C. Rana, Pearson Education Inc, 2009.
4. Engineering Drawing with an Introduction to Auto CAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

Designation	Name in capitals	Signature with Date
Course Coordinator	Dr Alapati Venkateswarlu	 12/12/23
Program Coordinator	Dr N. Ravikumar	 12/12/23
Head of the Department	Dr N. Vijaya Sai	 12/12/23

Professor & Head
Department of Mechanical Engineering
V.R. Siddhartha Engineering
VIJAYAWADA-520 06