Detailed Syllabus for B.Tech. (Computer Engineering) – 1ˢᵗ Semester

Course Code: 05 BSC04	Engineering Chemistry	Credit: 3-0-0: 3

Pre-requisites: NA

Course Objectives:

1. Impart an understanding of Engineering chemistry's fundamental concepts, analytical methods and technological features.
2. Develop the capacity to analyze engineering problems based on the knowledge of chemistry.
3. Develop problem-solving ability.
4. Keep students abreast of the newest advancements and uses of contemporary materials.

Course Contents

Unit 1 Analytical Techniques for Engineers:

Role of materials in engineering fields; Quality control and assurance in engineering contexts.; Qualitative and quantitative analysis; Emerging trends and applications of analytical techniques for engineering; Instrumental methods of analysis: spectroscopy (UV and IR), chromatography (GLC and HPLC), Microscopy: SEM, Thermo-gravimetry: TGA.

Unit 2 Corrosion and material protection:

Introduction to corrosion and its impact on engineering materials; Mechanism, Types/forms of corrosion, Factors that enhance corrosion and choice of parameters to mitigate corrosion; Corrosion prevention techniques, advanced surface coatings and corrosion inhibitors; Case studies and real-world applications in corrosion prevention.

Unit 3 Electrochemical energy systems:

High energy electrochemical energy systems: Lithium-ion batteries principle, construction, working, advantages and applications, Na-ion Battery, fiber battery; New emerging Fuel cells-working principles, advantages, applications; Solar cells, Types Importance of silicon single crystal, polycrystalline and amorphous silicon solar cells- working principles, characteristics and applications; Green hydrogen technology

Unit 4 Nanomaterials for electronics:

Nanomaterials, classification, Nanoscale phenomena and quantum effects; Top-down and bottom –up approach, Synthesis methods: ball milling, RF sputtering, pulsed laser deposition, thin film deposition; Applications of nanomaterials in electronics; Fundamentals of Sensors and materials used in sensors, Synthesis of a sensor; Fundamentals of Super capacitor and materials used in super capacitor, Synthesis of a super capacitor.

Text Books:

1. Willard Dean, Merrittee, "Instrumental Methods of Chemical Analysis",Tata McGraw Hill Limited.

2. Jain and Jain "A textbook of Engineering Chemistry", Dhanpatrai Publication.

3. S. S. Dara, "A textbook of Engineering Chemistry", S. Chand Publication 2010 ed.

4. Shashi Chawla, "A textbook of Engineering Chemistry", Dhanpatrai Publication.

5. Charles P. Poole, Frank J. Owens "Introduction to Nanotechnology".

Course Code: 05 BSC04	Engineering Chemistry Laboratory	Credit: 0-0-2: 1

Pre-requisites: NA

Course Objectives:

1. To provide an experimental foundation for the theoretical concepts introduced
2. To achieve hands-on experimental skills and the study of practical applications will bring more confidence.

List pf experiments

1. To prepare a solution of NaOH and find the concentration of a given solution of sodium hydroxide by titrating it with the standard solution of oxalic acid using phenolpthalein as indicator.

2. To find the concentration of a given solution of Hydrochloric acid by titrating it with the standard solution of $Na_2 CO_3.10H_2O$ using methyl orange as indicator.

3. To find the concentration of a given solution of potassium permanganate by titrating it with the standard solution of Mohr's salt.

4. Synthesis of complex compound (copper ammonium complex).

5. Synthesis of polymer (Phenol formaldehyde/urea formaldehyde resin).

6. Synthesis of aspirin.

7. pH-metric analysis of a sample solution – soil, food stuff e.t.c.

8. Analysis of inorganic solution by spectroscopic method (Calorimetry)

9. Corrosion testing of electronic integrated circuits (anodic corrosion via Faradays law).

10. Finding the Calorific value of fuel by Bomb calorimeter (GCV, LCV)

11. Flash point-fire point and cloud point-pour point of fuel/lubricant

12. Synthesis of nanomaterials by green route (co-precipitation method)

Course Code: 05 BSC01	Engineering Mathematics	Credit: 3-1-0: 4

Pre-requisites: NA

Course Objectives:

- Apply the concepts of Quantum mechanics to one dimensional motion of electrons.
- Classify solids on the basis of Band theory and to calculate carrier concentrations.
- Evaluate the electrical conductivity and identify the type of semiconductor.
- Implement the fundamentals of LASER for different applications.

Course Contents

Unit 1 Matrices and Linear Algebra:

Matrices: Elementary operations, Gauss Elimination, Rank of matrices: Echelon form, Normal form, Determinants, Consistency and solution of system of linear equations, Eigen values, Eigen vectors, Caylay-Hamilton theorem. Vector space, subspace, linearly independent and dependent of vectors. Basis and Dimensions, Rank-Nullity theorem. S: Basic properties of matrices, Elementary transformation, Determinants.

Unit 2 Differential Calculus:

Expansions of function of one variable using Taylor's and Maclaurin's series, Asymptotes, Curve tracing, Limit and continuity of two variables, Partial and Total derivatives, chain rule, Jacobian, Taylor's theorem, Maxima and minima of two variables, Method of Lagrange's multipliers. S: Higher order derivatives, Limit and continuity of two variables, Jacobian.

Unit 3 Integral Calculus:

Beta and Gamma function, Evaluation of Double integrals in Cartesian and Polar co-ordinates, Change of order of integration, Evaluation of Triple integrals in Cartesian, Spherical and Cylindrical co-ordinates, Change of Variables, Applications to Area, Volume, surface area and Center of Mass. Vector differentiation, Gradient, Divergence and Curl, Line Integrals and Arc Length Parameterization, Surface Integral, Volume Integral, Path independence, Statements and illustrations of theorems of Green, Stokes and Gauss, applications. S: Beta and Gamma function, Area, Volume, Surface area.

Text Books:

1. Advanced Engineering Mathematics (10th edition) by Erwin Kreyszig, Wiley Eastern Ltd.

Reference Books:

1. Serge Lang, "Linear Algebra" Springer , 3rd edition.
2. Gilbert Strang," Linear Algebra and its applications", Cengage Learnings RS, 4th edition
3. Howard Anton and Chris Rorres ,"Elementary Linear Algebra ",John Wiley, and sons, 10th edition
4. K. D. Joshi , "Calculus for Scientists and Engineers" , CRC Press

5. Sudhir Ghorpade and Balmohan Limaye , "A course in Calculus and Real Analysis"1st edition,   Springer-Verlag, New York.

Course Code: 05 ESC01	Programming for Problem Solving	Credit: 3-0-0: 3

Pre-requisites: NA

Course Objectives

- To develop logic building skills for problem solving

- To translate the solution logic to computer programs using C language constructs

- To decompose a problem into modules and synthesize a complete program

- To decompose a problem into modules and synthesize a complete program

Course Contents

UNIT I Introduction to Problem Solving

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation.

UNIT II Introduction to 'C' Language

Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.

UNIT III Decision, Control and Looping Statements

Conditional Statements and Loops: Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured programming

UNIT IV Arrays, Pointers and Strings

Arrays: One dimensional arrays: Array manipulation Searching, Insertion, Deletion, Finding the largest/smallest element in an array Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix Null terminated strings as array of characters, Standard library string functions

Pointers: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation

UNIT V Functions

Functions: Top-down approach of problem solving, Modular programming and functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

Storage Classes: Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in multiple source files: extern and static

UNIT VI Structures and Unions

Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions

<u>Textbooks:</u>

1. Programming in ANSI C, 8th Edition, E. Balagurusamy

2. Programming in C, 3rd Edition, Reema Thareja

3. Let Us C, 19th Edition Yashwanth Kanetkar

4. Programming in C, Byron Gottfryed

Course Code: 05 ESC01	Programming for Problem Solving Laboratory	Credit: 0-0-2: 1

Pre-requisites: NA

Course Objectives:

- To provide an experimental foundation for the theoretical concepts introduced
- To achieve hands-on experimental skills and the study of practical applications will bring more confidence.

List pf experiments

- Programs on conditional control constructs.
- Programs on loops (while, do-while, for).
- Programs using user defined functions and library functions.
- Programs on arrays, matrices (single and multi-dimensional arrays).
- Programs using pointers (int pointers, char pointers).
- Programs on structures and unions

Course Code: 05 PCC01	Fundamentals of Computer Science	Credit: 3-0-0: 3

Pre-requisites: NA

Course Objectives

- To understanding of basic concepts of computer science and engineering.
- To learn the basic components of Computer and their requirements.
- To understand basics of computer and working with OS.
- To develop working skills with productivity tools and graphics designing.
- To acquire basics about the digital systems.
- To introduce the basic Networking Concept and Internet.

Course Contents

UNIT I Introduction to Computer

Generations of Computer (I-V); Block Diagram of a Computer; Functions of the Different Units- Input unit, Output unit, Memory unit, CPU (ALU+CU).

UNIT II Input & Output Devices

Keyboard, Point and draw devices, mouse, joystick, track ball, light pen; Data Scanning devices - image scanner, OCR, OMR, MICR, Bar code reader, card reader; Voice Recognition Device, Digitizers; Output Devices- Monitor, Printer, laser printer, dot-matrix printer, ink jet printer, Projector.

UNIT III Memories (Brief Introduction)

[Memory hierarchy]: Registers [Types of Registers]; Cache Memory; Primary Memory- RAM, SRAM, DRAM, ROM, Firmware; Secondary Memories: Hard disk- tracks, sectors, clusters, cylinders; Floppy [data storage mechanism];

UNIT IV Software, Computer Languages and Number System

System Software: Operating System- function and types; Program Language Translators-Assembler, Compiler, Interpreter; Utility Programs; Communication Software; Performance Monitoring Software.

Application Software: Software hierarchy and dependence between the different layers.

Computer Languages: Machine language, Assembly language, High level language

Digital Number System: Number System Conversion; Arithmetic Operations-Boolean, Octal, Hexadecimal, etc.

UNIT V Networking & Web Designing

The need and use of Computer Networks. Concepts of Networking-LAN, WAN, MAN. ISP's in India and their responsibilities. Video Conference, downloading and uploading files. Introduction to HTML, Basic tags, Formatting tags, Stylesheets, Table handling, Lists, Hyperlinks in HTML.

UNIT VI Cloud Computing

Introduction, Advantages & Disadvantages, Cloud Computing Technologies, Types of Clouds, Cloud Computing Models (Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS)), Virtualization.

Textbooks:

1. Sinha K P, Sinha P., Computer Fundamentals, BPB Publication, 2017.

2. Rajaraman V., Adabala N., Fundamentals of Computers, PHI, 2014.

3. Bartee Thomas C., Digital Computer Fundamentals, McGraw Hill Education India, 2001.

4. Goel A., Computer Fundamentals, Pearson, 2010.

5. Rajaraman V., Adabala N., Fundamentals of Computers, Sixth Edition, PHI, 2015.

Reference Books:

1. Bartee Thomas C., Digital Computer Fundamentals, McGraw Hill Education India, 2001.

2. Goel A., Computer Fundamentals, Pearson, 2010.

3. Rajaraman V., Adabala N., Fundamentals of Computers, Sixth Edition, PHI, 2015.

4. Jain Satish, Iyer G M, Web Designing and Publishing, BPB Publications, 2020.

5. Kundu Sudakshina, Fundamentals of Computer Networks, Second Edition, PHI, 2008.

Course Code: 05 ESC02	Engineering Drawing and Computer Graphics	Credit: 1-0-4: 3

Pre-requisites: Programming for Problem Solving, Introduction to C Programming

Course Objectives:

- Familiarize with different drawing tools, technical standards and procedures for construction of different geometries and engineering objects.
- Develop the ability to visualize and communicate three dimensional shapes and their sections by representing three-dimensional objects into two-dimensional views using concept of orthographic projection.
- Apply the visualization practices to draw isometric projection from a given orthographic view.
- Draw the development of lateral surfaces of assembly and cut sections of different geometrical solids for engineering applications.
- Draw 2D and 3D drawings using computer aided drafting tool

Course Contents

UNIT I Introduction to Engineering Drawings

covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain, Diagonal and Vernier Scales; Orthographic Projections covering, Principles of Orthographic Projections- Conventions

UNIT II Projection points

Projections of Points, Projection of lines inclined to one parallel to other and inclined to both planes; Projections of planes, parallel to one plane perpendicular to other. Inclined to both plane

UNIT III Projections of Regular Solids

covering, those inclined to both the Planes- Draw simple annotation, dimensioning and scale. Sections of simple solids,

UNIT IV Isometric Projections

covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids

UNIT V Overview of Computer Graphics covering

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Textbooks:

1. 1. N.D. Bhatt, "Elementary Engineering Drawing", Charotar Publishing House, Anand (India)
2. M. L. Dabhade, "Engineering Graphics" I, Vision Publications, Pune
3. Dhananjay Jolhe, "Engineering Drawing", Tata McGraw Hill publishing company Ltd., New Delhi

Reference Books:

1. Warren Luzzader, "Fundamentals of Engineering Drawing", Prentice Hall of India, New Delhi.
2. Shah, M.B. & Rana B.C. , "Engineering Drawing and Computer Graphics", Pearson Education
3. Agrawal B. & Agrawal C. M. , "Engineering Graphics", Tata McGraw Publication
4. Suraj Singh, " Civil Engineering Building Practice ",

Course Code: 05 ESC04	Design Thinking & Idea lab	Credit: 0-0-2: 1

Pre-requisites: NA

Course Objectives:

- Develop a comprehensive understanding of design thinking principles, methodologies, and their applications in various industries.
- Cultivate creative problem-solving skills through brainstorming and ideation techniques.
- Explore the intersection of design thinking with entrepreneurship, focusing on turning ideas into viable products or services.

Course Contents

Introduction to Engineering: "Engineering" as a vehicle for social and economic development; the impact of science/engineering on our day-to-day lives; the process of engineering a product; various career options.

Introduction and identifying the need: Understanding the unique needs of the user - empathize - define - ideate - prototype - test. Case Studies - Develop an appreciation for the design process and its application in specific settings (Guest lectures, Videos, Field visits, Interplay lectures of design-based movies).

Problem Formulation: Framing a problem statement neutrally using adequate checks. Case studies.

Concept Generation: Generate multiple concepts using various creativity tools and thinking styles.

Prototyping: Select from ideas and make quick prototypes (mock-ups) using available material.

Evaluation: Iterative process of ideation, prototyping and testing-Take the mock-ups to users for feedback and iterate the process till users feel delighted.

STUDENTS' RESPONSIBILITIES:

- Forming diverse teams of 3–5 members each to work collaboratively throughout the semester.
- Proactively engaging to observe the objects and interactions in their daily life and society from a design perspective.
- Identifying general societal and social problems that may be effectively addressed using design thinking principles
- Presenting and reporting the tasks to the concerned faculty members using their creative communication and people skills.

Activities:

Some of the activities which are undertaken as a part of this course include:

- Field Visits

- Case Studies on innovation, failures etc

- Guest lecture

- Group Discussions

- Presentation by student

- Experiential learning workshops

Textbooks:
1. Design Thinking: A guide to creative problem solving for everyone, Andrew Pressman, Routledge Taylor and Francis group, 2019, 1st Edition.
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown.

Course Code:	Sprots/Yoga/NCC (Audit)	Credit: 0-0-2: 0

Non-credit Course

Sports/NSS/NCC/YOGA/Painting/Music/Classical dance