NOTIFICATION

No. 166/2023 Dated : 17/10/2023

Subject : Implementation of the new syllabus of the subjects of Semester I & II of the Course B.Tech. (Chem. Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology) as per NEP - 2020 guidelines.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabus of the subjects of Semester I & II of the Course Bachelor of Technology (Chemical Technology) (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology) as per NEP - 2020 guidelines to be implemented from the academic session 2023-2024 onwards as mentioned below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

1SCT1 APPLIED INORGANIC CHEMISTRY
Level 4.5 (UG-Certificate)

Subject Code: 1SCT1	Title: Applied Inorganic Chemistry	Credits = 4		
		L	T	P
Semester: I	Total contact hours:	3	0	2

Course Objective:
To impart a sound knowledge on the principles of inorganic chemistry involving the different application oriented topics required for Food, Petro, Pulp and Paper, Oil and Paint Technologicalbranches.

Course Outcomes:
The student should be conversant with:

- Concept of atomic structure, related various theories and principles.
- Knowledge with respect to water and various treatments of water.
- Utilization of engineering materials towards different applications.
- The principles involved in corrosion control.

SECTION-A

UNIT I : Atomic structure : Bohr's theory, Modern quantum theory of atom, deBroglie's equation, Exclusion Principle, Hunds rule, Aufbau principle, quantum number and distribution ofelectrons. Atomic size, ionization energy, factors determining ionization energy, electron affinityand electro negativity. (6 Hrs)

UNIT II: Chemical Bonds and their types: ionic bond, covalent bond, metallic bond. Hydrogenbond, coordinate bond, odd electron bond, van der waal's forces, lattice energy, Born Habercycle, hybridization and molecular shapes, resonance. (8 Hrs)

UNIT III: Water: Impurities in water and their effect on hardness, Estimation of hardness byEDTA and Soap solution method, softening of water, methods of softening : Lime Soda, Zeoliteprocess and Ion Exchange method, problems based on Lime Soda & Zeolite process, industrialuses, boiler corrosion structure of water, concept of bond and free water. (10 Hrs)

SECTION-B

UNIT IV: Alloys: Introduction, purpose of making alloys, composition, properties, differenttypes of alloys, carbon steel, copper (Brass, Bronze) , Nickel, Aluminum, Tin. (8 Hrs.)

UNIT V: Corrosion: Definition, factors affecting the rate of corrosion, different types ofcorrosion, cathodic and anodic prote prevention against corrosion, protective coating, metallic,inorganic, organic coating and corrosion inhibitors. (8 Hrs.)

UNIT VI: Cement: Raw materials, compositions, manufacture, by wet and dry process,properties of cement, special cements. *Glass:* Different kinds of glass, manufacture of glass color imparting on glass uses of glass. *Refractory*: Classification, raw materials, manufactures application in industry. (6 Hrs.)

Reference Book: Chemical Process Industries: R. N. Shreve, McGraw Hill, New York.

Text Books:

- Fundamental Concepts of Inorganic Chemistry: E. S. Gilbert, McGraw Hill Kogukushaltd, Int. students Edn.
- Concise Inorganic Chemistry, J.D. Lee, Low Price Ed.
- A Textbook on Engineering Chemistry: S. S. Dara.
- Outlines of Chemical Technology .E. Dryden, East-west press New Delhi.
- Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson and P. L. Gaus, John Wiley &Sons, Inc, Singapore 3rd Ed,1996.

1 SCT6: APPLIED INORGANIC CHEMISTRY- LAB.

List of Experiments:

[**NOTE :** Minimum EIGHT laboratory experiments mentioned above have to be performed.]

1. Determination of Normality and strength of Sodium hydroxide by Oxalic acid.
2. To determine the normality and strength of Hydrochloric acid by sodium hydroxide.
3. Determination of normality and strength of Oxalic acid by using potassium permanganatesolution.
4. Determination of permanent NaOH and Na_2CO_3 in the given alkali mixture solution.
5. Determination of $NaHCO_3$ and Na_2CO_3 in the given alkali mixture solution.
6. Determination of hardness of water by using EDTA method.
7. Determination of free chlorine in a water sample.
8. Estimation of copper iodometrically using hypo solution.
9. Estimation of Zinc in the given sample.
10. Estimation of Iron from the given solution.
11. To estimate amount of Tin in the given stannous chloride solution.
12. To estimate the percentage of lime in cement.
13. To determine the amount of copper in given sample of brass.
14. To estimate the percentage of iron in plain carbon steel.

1SCT2 & 1SCT7 ENGINEERING PHYSICS

Level 4.5 (UG-Certificate)

SubjectCode:1SCT2	Title: Engineering Physics	Credits=4		
		L	T	P
Semester: I	Total contact hours:	3	0	2

Course Pre-requisites:

1. Elementary idea about electric charge, electricity & magnetism.
2. Basic knowledge of material science.
3. Fundamental knowledge of optics.

Course Objective:

To enable the students to co-relate the theoretical principles of fundamentals of modern aspects in Physics with application oriented studies of engineering.

Course Outcomes:

At the end of the course the students would be exposed to get fundamental, knowledge in:

1. Classify semiconducting materials and understand the working of diodes.
2. Explain key concepts and principles of Quantum Physics.
3. Apply the fundamentals of electric and magnetic fields in mass spectrograph and Cathode Ray Oscilloscope.
4. Utilize the knowledge of interference and diffraction of light.
5. Gain the knowledge of LASER, optical fibre its types and applications.
6. Understand ultrasonic, fluid dynamics and its applications.

SECTION-A

Unit I: Solid State Physics: Classification of solids on the basis of energy band diagram, Covalent bonds, bound & free electrons, holes, electron and hole mobilities, Intrinsic and Extrinsic semiconductors, energy band diagram for semi-conductors, Fermi and Impurity levels, semi-conductor conductivity with derivation, P-N junction diode, Zener diode, Light Emitting Diode. (07 Hrs.)

Unit II: Modern Physics: Planck's hypothesis, properties of Photons, de-Broglie's concept of matter waves, Compton effect, Heisenberg's Uncertainty Principle (only statement), applications of uncertainty principle (electrons cannot exists in the nucleus and binding energy of electronic atom). (07 Hrs.)

Unit III: **Electric and Magnetic Fields**: Motion of electron in uniform transverse electric field and transverse magnetic fields, velocity selector (energy filter), positive rays, Bain bridge mass spectrograph, Cathode ray oscilloscope: block diagram and working of each block. Hall effect. (07 Hrs.)

SECTION-B

Unit IV: **Interference and Diffraction of light**:Fundamental condition of interference, thin film interference due to reflected light, Newton'sring; equation for radius of bright and darkrings, determination of wave length, Refractive Index of medium using Newton's ring experiment, Fresnel and Fraunh offer class of diffraction, single slit diffraction, plane transmission determination of wavelength of light using plane transmission diffraction grating. (8Hrs)

Unit V: Fibre Optics and LASER: Principle and construction of optical fibre, acceptance angle and acceptance cone, numerical aperture, types of optical fibres and refractive index profile, attenuation in optical fibres, different mechanisms of attenuation, application of optical fibres, LASER: spontaneous and stimulated emission of radiation, Pumping, Optical Pumping, RubyLASER (Construction and Working), Characteristics & Applications of Laser. (8Hr)

Unit VI: Ultrasonics: Ultrasonic waves, Production of Ultrasonic waves (piezo-electric method) , properties of Ultrasonic waves and applications.
Fluid dynamics: Viscosity, Stoke's law, liquid flow (streamline and turbulent), flow of liquids through a capillary tube (Poiseuille's equation), Continuity equation, Bernoulli's theorem (only derivation). (08 Hrs.)

Text Books:

- M.N.Avadhanulu & P.G.Kshirsagar: Engineering Physics, S. Chand Pub., 2008.
- Dr. (Mrs.)S.D.Wakde &J.S.Bakare: Engineering Physics, SSGMCOE,. 2004.

Reference Books:

- R.K.Gaur &S.L. Gupta: Engineering Physics, Dhanpat Rai & Sons.
- Hitendra K. Malik &A.K.Singh: Engineering Physics, Tata McGraw Hill.
- Beiser: Modern Physics, Tata McGraw Hill.
- Mani & Mehta: Mordern Physics, Affiliated East- West Press.
- N.Subrahmanyam,Brijlal,M.N.Avadhanulu:ATextBookofOptics,S.Chand&Company.

1SCT7: ENGINEERING PHYSICS - Lab.

List of Experiments:

[**Note:** Minimum Eight (08) experiments should be conducted.]

1. Determination of Band gap energy of semi-conductor.
2. To study the forward and reverse characteristics of P-N junction diode.
3. To study the reverse characteristics of Zener diode.
4. To study the forward characteristics of Light Emitting Diode.
5. To determine the wavelength of mono-chromatic light by Newton's Rings' method.
6. Determination of wavelength of spectral lines using diffraction grating.
7. Determination of grating element of a diffraction grating using LASER beam.
8. Study of Hall Effect
9. Amplitude and frequency measurement of ac signal using CRO.
10. Study of CRO
11. Determination of unknown frequency of ac signal using Lissajiou's pattern
12. To determine resolving power of telescope.
13. Determination of Planck's constant using photo cell.
14. To determine the coefficient of viscosity of water by capillary flow.
15. To determine the specific charge (e/m) of electron by Thomson method.
16. Experiment on the basis of Non Destructive Testing.

****

1SCT3 ENGINEERING MATHEMATICS - I

Level 4.5 (UG-Certificate)

Subject Code:1SCT3	Title: Engineering Mathematics -1	Credits=3		
		L	T	P
Semester: I	Total contact hours:	3	0	0

Course objectives:

- To identify algebraic problems from practical areas and obtain the solutions in certain cases.
- To understand maxima and minima concept.
- To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.

Course Outcomes: On completion of the course, the students will learn to:

- Able to understand Successive differentiation and its applications to Engineering Problems.
- Able to understand maxima minima concept.
- Able to apply Demoiver's theorem in various concepts of complex number.
- Able to solve differential equations of certain types that they might encounter in the same or higher semester.

SECTION-A

Unit I: Differential Calculus: Successive Differentiation, Leibnitz's Theorem, Expansions of function using Taylor's and Maclaurin's theorems; Indeterminate Forms Using L'Hospital Rule. (8)

Unit II: Multivariable Differential Calculus: Partial differentiation, total differential co-efficients, Euler's theorem on homogeneous function, Maxima & Minima of a function of several connected independent variables (Lagrange's multipliers). (7)

Unit III: Complex Numbers: Demoiver's theorem and its applications, Hyperbolic and inverse hyperbolic functions, separation of real and imaginary parts, Logarithm of complex numbers. (8)

SECTION- B

Unit IV: First order and First Degree Ordinary Differential Equations: Ordinary differential equations of first order and first degree in various Forms, (Variable separable, linear differential equation, homogeneous differential, exact differential equation) and reducible to above forms. (7)

Unit V: First order and Higher Degree Ordinary Differential Equations: Solution of differential equation of first order and higher degree by various methods. Applications of Ordinary Differential Equations:
Applications of differential equations of first order and first degree to the problems on orthogonal trajectories and Chemistry. (8)

UnitVI: Sequences and Series: Convergence of Sequence and Series, Test for Convergence, Comparison Test, RatioTest, Root Test, Raabe's Test. (7)

Text / Reference Books:

- Wartikar P.N.,Wartikar J.N.–A Text of Applied Mathematics,Volume -I, II, Pune V.G.Prakashan, Pune.
- Grewal B.S.–Higher Engineering Mathematics, (latest Edn.), Khanna Publishers.
- Kreyszig E.K.–Advanced Engineering Mathematics, John Wiley.
- Ramana B.V.- Higher Engineering Mathematics. (TMH).
- Singh R.R. And Bhatt M.-Higher Engineering Mathematics, (TMH).
- N.P.Bali and Manish Goyal–A Text Book of Engineering Mathematics, Laxmi Publications.
- Veerarajan T. Engineering Mathematics for first year, (TMH).

****

1SCT4 COMPUTER PROGRAMMING

Course Learning Objectives: The course will enable students to:
CLO1: Learn basics of Computers, Number Systems.
CLO1: Write algorithms, flowcharts and programs.
CLO2: Implement different programming constructs and decomposition of problems into functions.
CLO3: Use and implement data structures like arrays and structures to obtain solutions.
CLO4: Define and use of pointers with simple applications.

Course Outcomes: At the end of course, the students will be able-
To explain fundamental concepts of computer and computing.
To test and execute the programs and correct syntax and logical errors.
To implement conditional branching, iteration and recursion.
To use arrays, pointers and structures to formulate algorithms and programs.
To recognize various problem solving techniques and computer applications.
To apply programming concepts to solve real life problems.

UNIT I: Fundamental of the Computer and Computing Concepts : Generation of computers, Classification of computers, Basic Anatomy of Computer System, Input Devices, Processor, Output Devices, Memory Management, Types of Computer Software, Overview of Operating system, Networking Concepts, Microsoft Office, Number systems: Decimal, Binary, Hexadecimal, Octal, Conversion of Numbers, Binary Arithmetic Operations, Programming Languages, Logic gates (Hours: 8)

UNIT II: C Fundamentals: Introduction, Importance of C, Basic Structure of C Programs, Program execution, Basic programs based on C such as Printing Message, Adding two numbers, Interest calculations, Use of subroutines, math function. C tokens, Keywords and Identifiers, Character set, Data Types, Constant and Variables, Declaration of Variables, Declaration of Storage Class, Operators, Types of Operators: Arithmetic, Relational, Logical, Assignment, Increment-decrement, Conditional, Bitwise, Special. Arithmetic expression, Evaluation of Expression, Precedence of Arithmetic Operators, Input-Output Operation: Reading and Writing Character, Formatted Input, Formatted Output. (Hours: 8)

UNIT III: C Control Constructs: Decision-making using if, if-else, nested if, else if ladder and switch-case statements,?:Operator, Goto Statement, Loops using for, while, do-while statements, break and continue statements, Jumps in Loops, Concise Test Expressions. (Hours: 8)

UNITIV: Array, Strings and Structures: Introduction to array, One Dimensional Array: Declaration & Initialization, Two Dimensional: Declaration & Initialization, Multi-Dimensional, Strings: Declaration and Initialization, Reading String from terminal, Writing String to Screen, Putting Strings together, Comparison of Two Strings, String-Handling Functions, Table of Strings, Other features of String (Hours: 8)

UNITV: User Defined Functions, &Pointers: Functions, Need for User defined Functions, Multi Function Program, Elements of User Defined Functions, Return Values and their types, Function Calls, Function Declaration, and Categories of Functions. Definition and uses of pointers, Address of operator, Pointer Arithmetic, pointers and functions, parameter passing mechanism using pointers, pointers and arrays, arrays of pointers, pointers and string. (Hours: 8)

UNIT VI: Structures and File Management: Structures – Define, Declaration, Accessing the members of a Structure, Accessing address of variable, Introduction to File Management, Defining and Opening File, Closing File, Input/output Operations on File. (Hours: 8)

Text Book: E Balagurusamy: Computing Fundamentals & C Programming :Tata Mc Graw-Hill, 2nd Edition .

Reference Books:

1. Pradeep Dey and Manas Ghosh,“ Computer Fundamentals & Programming in C” Oxford University Press, 2006.
2. K R Venugopal and S R Prasad, “Mastering C” Tata-Mc Graw Hill.
3. Seymour Lipschutz, “Data Structure Using C”, Tata-Mc Graw Hill.
4. Herbert Schildt- C Complete Reference (Tata-Mc Graw Hill).

Weblinks and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/105/106105171/

1SCT8 COMPUTER PROGRAMMING LABORATORY / PRACTICAL

Suggested List of Experiments:

Sr. No.	Name of Experiment/ Practical
1	Introduction to Operating System DOS ,Windows, Linux
2	Introduction to Networking Terminologies and Different Protocols
3	Introduction to Word, Excel, Power Point and usage
4	Introduction to if, if-else ,nested if-else statement one program for each one
5	Introduction to jump statement break ,continue, goto with example
6	Introduction to Loops for, while, do-while loop with example
7	Introduction to Switch case statement with example
8	Introduction to Call by value function call with example
9	Introduction to Call by reference function call with example
10	Introduction to recursion with example program of Factorial
11	Introduction to String handling function with example(strcat , strncat, strcmp, strncmp)

12	Introduction to String handling function with example(strupr ,strlwr, strcpy, strncpy,strstr)
13	Introduction to pointers with example(*,&)
14	Introduction to chain of pointers with example
15	Introduction to structures with example
16	Introduction to single Dimensional array with Example (search the element in the array)
17	Introduction to Multi-Dimensional array with Example (Addition of matrix Multiplication of matrix)
18	Introduction to Multi-Dimensional array with Example (transpose of matrix)
19	Introduction to Storage class variables with example(auto, static, extern, register)
20	Introduction to File handling function with example(fopen ,fclose, getc, putc,getw ,putw ,fseek, fwrite)

1SCT5 MECHANICAL TECHNOLOGY

Aim:
The course is aimed at developing the basic Mechanical Engineering knowledge to the technology students that are imperative for effective understanding of Mechanical processes and operation.

Course Objectives:
On completion of the course the students expected:

1. To understand the manufacturing process, metals and alloys.
2. To basic principles of casting, patterns, mould making and its technology.
3. To understand theory of metal cutting and machine tool classification.
4. To specify, identify and classify operators of Lathe, Drill and grinding.
5. To understand various joining processing and operations like Welding, Soldering and Brazing.
6. To understand the Non-Conventional Machining processes.

SECTION–A

Unit I: Introduction to manufacturing process. Fundamentals of metals and alloys. Different engineering materials, properties. Ferrous and non – Ferrous non –metals used in foundry. (7)

Unit II: Introduction to pattern making-Pattern materials, tools, pattern making allowances. Types of patterns, General properties of molding sands, Basic principle and Terminology, tools of sand casting, types of gate risers and runners, Preparation of sand mould of different types, core making, Introduction to casting processes and methods. (7)

Unit III: Casting process and their principle of operation and applications permanent mould casting, slush casting, investment casting, centrifugal casting, continuous casting, die casting equipment and processes, and casting methods. Casting inspections, casting defects, their causes and remedies. (9)

SECTION–B

Unit IV: Theory of Metal cutting, Tool material, Tool Geometry, Tool life, Tool wear, Machinability, Metal cutting economy, Cutting fluid, Machine Tool classification. (8)

Unit V: Specification, construction, operations and accessories of Lathe, Shaper, Drill and Grinder. Facing, Turning, Drilling, Shaping, Planner and Slotter machine operations. (7)

Unit VI: Joining Processes, Brazing, Soldering and Welding, Gas Welding. Electric are and resistance welding, thermit welding TIG, MIG, Spot Welding and Plasma Welding. (7)

Text Book: Elements of Workshop Technology, Vols. I and II by S.K.Hajra Choudhary and S.K.Bose, Asia Publishing House, Bombay, 2nd Edition.

Reference Books:

1. Production Technology by R.D. Jain and B.C. Gupta, Khanna Publishers, Delhi, 1972.
2. Production Technology, Vols. I,II and III by W.A.J. Chapman, Edward Arnold Publishers, Ltd. London.1961.
3. Process and Materials of Manufacture by R.A. lindberg, PHI Pub.
4. Workshop Technology Vol. I &II by Bawa.

1SCT10 COMMUNICATION SKILLS

Subject Code: 1SCT10	Title: Communication Skill	Credits =2		
		L	T	P
Semester: I	Total contact hours:	0	0	4

Course Outcomes: On completion of the course the students expected:

- The learning outcome of students will be assessed through assignments, tests and final exams and most importantly through practical performances.
- Through these tests, it would be revealed that students are able to reproduce their understanding of concepts/principles of communication in English language.
- Students can present themselves well in front of large audience on a variety of topics. Moreover they get the knack for structured conversation to make their point of views clear to the listeners.

List of Practicals:

- Exercise 1: Types of communication, barriers to communication, effectivecommunication
- Exercise 2: Foundation of language: grammaticality and acceptability, word power, accuracy and appropriateness.
- Exercise 3: Assignment on vocabulary building & Writing skill :nature of writing, stages of writing (pre, while and post), qualities of effective writing, what makes writing poor, the what, how and why of writing, drafting, summarizing, letter writing, writing reports.
- Exercise 4: Speaking: pronunciation, stress, intonation and pauses, formal and informal expressions, conversation skills, presentation skills, business etiquette.
- Exercise 5: Group Discussion- To study about group discussion technique.
- Exercise 6: Interview skill- To study about personal interview.
- Exercise 7: Planning and Mot- To study how to plan and execute an activity in a group.
- Exercise 8: Seminar skill- To study how to conduct and deliver a seminar.
- Exercise 9: Conference – To study how to conduct conference.
- Exercise 10: Interpersonal communication- Conduct an activity for social cause.
- Exercise 11: Project- Writing class newsletter.

Text Books:

1. S. Mishra & C. Muralikrishna, "Communication Skills for Engineers", PearsonEducation.
2. T.M. Farhathullah , "Communication Skills for Technical Students", Orient Longman.
3. Saran Freeman, "Written Communication in English", Orient Longman.
4. Raymond Murphy, "Essential English Grammar (Elementary & Intermediate)", CUP.
5. Shirley Tailor, "Communication for Business: A Practical Approach", Longman.
6. Krishna Mohan & Meera Banerji, "Communication Skills", Macmillan.
7. R. C. Sharma & Krishna Mohan, "Business Correspondence and Report Writing", TataMcGraw Hill.
8. Elements of style-Strunk and white.

Websites:

9. http://www.englishpage.com
10. http://www.english-4u.de/
11. http://www.nonstopenglish.com/
12. http://www.business-english.com
13. http://www.breakingnewsenglish.com/
14. http://www.elllo.org/

****

SEMESTER: II

2SCT1 APPLIED PHYSICAL CHEMISTRY
Level 4.5 (UG-Certificate)

Subject Code: 2SCT1	Title: Applied Physical Chemistry	Credits = 4		
		L	T	P
Semester: II	Total contact hours:	3	0	2

Course Objectives:

- To understand the wave mechanics & its applications
- To understand the electrical properties of conducting fluid.
- To know the rate, order, energy of activation of chemical reactions and their determination.
- To know the use of kinetics and thermodynamics to elucidate mechanisms of reactions.
- To understand the basic concepts, the 1st and 2nd Laws of Thermodynamics,Thermodynamic functions and their applications.

Course Outcomes: On completion of the course the students expected to:

- To evaluate the energy of electron confined in potential well
- Evaluate the properties of non-ideal gases, intermolecular forces, & probability consideration of molecular speed in gases.
- Understand the Critical phenomenon in gases & calculations of critical constants.
- Understand and evaluate the rate, order, energy of activation of simple and complex Chemical reactions.
- Understand the ion transport & electrical properties of conducting solutions.
- Use of thermodynamic functions to understand the spontaneity of chemical reaction & Thermodynamic equilibrium.

SECTION- A

UNIT I: Basic principle of wave mechanics, Schrodinger wave equation, application of Schrodinger wave equation, Derivation of energy of particle in one dimensional potential well, linear harmonic oscillator, Activity and activity coefficient, Gibbs Duhem equation. (8 Hrs.)

UNIT II: Kinetic molecular theory of gases: Equation of state of ideal and real gases,Distribution of molecular speeds in an ideal gas, Molecular collisions and mean free path,Vander Waals equation, Principle of corresponding states. (8 Hrs.)

UNIT III: Estimation of molecular diameter , molecular velocities, Root means square velocity(RMS) , average velocity and most probable velocity ,collision number, collision frequency,critical constants, diffusion, heat conduction in gases numerical. (6 Hrs.)

SECTION- B

UNIT IV: Chemical Kinetics: Scope of kinetics, elementary reaction steps and rate expression , complex reactions and their molecularity and order determination, factors affecting reaction rate, Kinetics of zero, first, second and third order reaction with examples, numerical. (8 Hrs.)

UNIT V: Methods for determination of order of reaction: Integration methods, graphicalmethod, isolation method, Von't-Hoff method and fractional change method, half life period,energy of activation, Arrhenius equation, numerical. (8 Hrs.)

UNIT VI: Thermodynamics: Objective and scope of thermodynamics, definition ofthermodynamics system, state, property, first law of thermodynamics, second law ofthermodynamics, processes, enthalpy, free energy, Gibbs Helmholtz equation & its applications. (7 Hrs.)

Text Books:

- Text Book of Physical Chemistry: P. L. Sony, Sultan Chand and Sons, New Delhi.
- Advance Physical Chemistry: Gurudeep Raj, GEOL, Publication, Meerut.

Reference Books:

- Physical Chemistry: G. M. Barrow . Benjamin Publication.
- Thermodynamic for Chemist: Glasstone, S. Affiliated, East Press , New Delhi.
- Physical Chemistry, P. W. Atkins, Oxford University. Press 8th Ed.

2 SCT7 APPLIED PHYSICAL CHEMISTRY- LAB.

List of Experiments:

(**NOTE: Minimum EIGHT laboratory experiments shall be conducted**)

1. To determine the Surface tension of given sample by stalagmometer method.
2. To determine the viscosity of a given liquid by Ostwald viscometer.
3. To study the partition coefficient of iodine between organic solvent and water.
4. To study the hydrolysis of ethyl acetate in presence of sodium hydroxide.
5. To study the hydrolysis of an ester in presence of hydrochloric acid
6. To investigate the autocatalytic reaction between potassium permanganate and oxalicacid.
7. To determine energy of activation of the reaction between potassium persulpahte andpotassium iodide.
8. To determine the refractive index of given liquids by Abbe's refractometer.
9. Determine the specific and molar refraction of a given liquid by Abbe's refractometer.
10. Kinetic study of Second order reaction of equal concentration.
11. To Determination heat of neutralization HCl by NaOH.
12. To Determination the integral heat of solution of KNO_3.
13. Determine the solubility of benzoic acid in water at different temperature and hence itsheat of solution.
14. To study the effect of addition of an electrolyte on the solubility of monobasic organicacid at room temperature.

2SCT6/1A5 WORKSHOP /WORKSHOP PRACTICE

Course Objectives:

- To give students' hands on experience' of craftsmanship.
- To make students familiar with different work trades.
- To develop quality & safety consciousness amongst the students.
- To develop awareness of fire safety amongst the students.
- To develop respect towards labor work amongst the students.
- .To develop skill sets for creating entities from primitive engineering materials.
- To develop skill sets for establish in connections through wires and cables.
- This exercise also aims at inculcating respect for physical work and hard labor in addition to some value addition by getting exposed to inter-disciplinary engineering domains.

Course Outcomes:

- Upon completion of this course, the students will gain knowledge of different manufacturing processes which are commonly employed in industry.
- Upon completion of this course, the students will be able to fabricate the components using various manufacturing techniques.
- The students will be conversant with the concept of dimensional accuracy and tolerances.

Performance:

Students should perform minimum six jobs out of following:

I) SMITHY: Introduction to smithy operations like upsetting, drawing, bending, Forming; Tools-hammer, hot and cold chisels, swages, drifts, flatters, tongs, anvils and various smithy tools & equipment's, their use. Forging Principle, forge welding, use of forged parts.

One job on smithy: Job involving upsetting, drawing down, flattering. Change of cross-sectional area like round to rectangular or making a ring from around bar, S–Hook, forming such as a square / hexagonal headed bolt, hook etc.

II) FITTING: Introduction to different fitting tools. Use and setting of fitting tools for marking, center punching, chipping, cutting, filing, drilling, their use, different measuring tools, Files – Material and Classification.

One job on fitting: involving operations like marking, filing, hack saw cutting, drilling and tapping, making simple assemblies like a male-female type pair.

III) TAPS & DIES: introduction to Taps & Dies, Different sizes of Taps & Dies their uses, holding instruments of taps & dies.

One job on taps & dies: Job involving, External and internal threads on plate or pipe, marking, center punching, cutting, filing, drilling.

IV) SHEET METAL: Introduction to sheet metal tools, their use, different sheet metal joints, soldering, surface development. Specifications of metal sheets, Surface coatings; Operations like cutting, bending, folding, punching, riveting; Joining by brazing and soldering.

One job on sheet metal: Job involving soldering operation like marking, cutting, bending, joining operations of small sheet metal parts. Typical examples: sheet metal tray, funnel, dust bin, etc.

V) WELDING: Classification & brief introduction to welding processes- Arc, Gas and Resistance. Definition of welding, brazing and soldering processes, and their applications. Oxy-Acetylene Gas welding process, Equipment and Techniques, Type of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding Electrodes, constituents and functions of Electrode coating. Welding positions. Type of welding joint. Common welding defects such as cracks, under-cutting, slag inclusions, Porosity.

One job on welding: Job consisting of edge preparation for arc welding of different parts like lap welding of two plates, butt welding of two plates and welding to join plates at right angles.

VI) CARPENTRY: Brief study of various hand tools like chisel, saw, planer. Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards. Use of marking tools & hand tools such as marking gauge, try squares, steel rules, saws, jack plane, etc. Use of power tools, safety precautions.

One job on carpentry: Job like preparing a wooden joint; involving operations like wood sizing, planning, marking, sawing, chiseling and groove making. Use and setting of hand tools like hack saw, jack plane, chisels and gauges for construction of various joints like T – Lap joint, Bridle joint, Corner mortise joint, Dovetail / butt joint such as a tray, frame etc.

VII) Machine Tools and Processes: Introduction to different machining tools, different measuring tools.

One job on Lathe: Job involving marking, metal removing showing basic operations like plain turning, facing, step turning etc.

VIII) FOUNDARY: Moldings and, preparation of moldings and, pattern, core, runner, riser cope & drag box.
One job on molding: Preparation of sand mould with pattern, core with runner riser.

IX) PRINTED CIRCUIT BOARDS: PCB etching and drilling, tinning and soldering techniques. Assembly of Electronic components on the printed circuit board (PCB).

One job of PCB design: Job involving development of PCB for electronic circuit which comprises of layout design, masking, etching, drilling, tinning & component soldering.

X) PLASTIC INJECTION MOULDING: Introduction, principle, equipment & its operation, mould introduction & setting, Safety precautions and demonstration of plastic injection molding process Demonstration).

REFERENCES:

1. B.S.Raghuvanshi, A Course in Workshop Technology, Vol.– I, Dhanapat Rai and Sons.
2. Hajara Choudhari, Elements of Workshop Technology, Vol.–I, Media Promoters.
3. Gupta and Kaushik,Workshop Technology,Vol.–I, New Heights.

4. Chapman, Workshop Technology,Vol.–I, The English Language Book Society.
5. H.S.Bawa,Workshop Technology, Vol.-I, TMH Publications, New Delhi.
6. S.K.Hajra Choudhary,Elements Of WorkshopTechnology, Media Promoters & Publishers Pvt. Ltd.
7. WorkshopTechnology,VolI, II and III, Chandola S.P.,Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
8. K.T.Kulkarni, Introduction to Industrial Safety, K. T. Kulkarni, Pune Reference Books.
9. Hwaiyu Geng, Manufacturing Engineering Hand book, McGraw Hill Publishing Co. Ltd.
10. Lawrence E.Doyle, Manufacturing Processes and Materials for Engineers, Prentice Hall Inc.

NOTE: Journal should be prepared and submitted based on information of tools and equipments used, jobs prepared by using various tools, equipments, machines in the above trades of performance sections. The term work shall be assessed based on a) the record of attendance, b) Term work done, c) the written/ practical / oral tests on the term work to decide the depth of understanding. The term work is to be assessed weekly.

Practical Examination:

Practical examination will consist of actual preparation of one job from any of the above performance sections. Duration of examination will be 3 hrs. Total marks are 25, out of which 15 marks are for job preparation and 10 marks for viva voce which should be conducted when the students are on job.

*****

2SCT2 : INTRODUCTION CHEMICAL TECHNOLOGY

Level 4.5 (UG-Certificate)

Subject Code: 2SCT2	Title: Introduction Chemical Technology	Credits = 4		
		L	T	P
Semester: II	Total contact hours:	3	0	2

Course Objectives:

- Student will get the knowledge about the unit process, kinetics and mechanism ofNitration, Sulphonation and sulphation.
- Students will get introduces to polymer chemistry and technical preparation of somepolymers.
- Students will get introduced to aromatic compounds and natural products, properties andapplications of organic compounds and their derivatives.

Course Outcomes: Students will be able to :

- Synthesized some simple organic compounds, polymers and understand the kinetics andmechanism of unit processes.
- Analyzed aromaticity and list properties of aromatic compounds.
- Write mechanisms of aromatic reactions.
- List some of the Aromatic chemistry and chemistry of natural products.
- List some properties of amines and their derivatives.
- Know the unit process like halogenation, sulfonation and nitration.

SECTION-A

Unit I: Aromatic hydrocarbons: Preparation, properties and applications of Benzene, andNaphthalene. Study of unit Process of Nitration, nitrating agents, kinetics and mechanism ofaromatic nitration. Technical preparation of nitrobenzene and nitronaphthalene. (10)

Unit II: 1. Phenols : Basic concepts, classification, preparation, properties and applications ofPhenol, resorcinols, cresols, catechol. Epoxides and sulphur acids: Methods of preparation,General reaction, ethylene and propylene oxides – their reactions and applications (11)

Unit III: Amines and their derivatives: Basic concepts, classification of amines, preparation,properties and applications of aniline and Benzene diazonium chloride. Natural products:Terpenes, alkaloids, plant pigments, their applications (9)

SECTION-B

Unit IV: Study of Unit Process of Sulphonation, Sulphonating agents, kinetics of mechanism ofsulphonation. Technical preparation of Sulphonation of Benzene (9)

Unit V: Study of Unit Process of Halogenation, halogenating agents, thermodynamics, kineticsTechnical preparation of DDT and Vinyl chlorides. Principles of polymer chemistry andpractices: Classification of polymerization; Types of polymers; Technical preparation ofPolyvinylchloride, Bakelite. (11)

Unit VI: Chemicals in food products: Study of preservatives, sweetening agents and antioxidants. Carbohydrates: Basic concepts, classification, industrial applications of glucose, sucrose and starch. (10)

Books Recommended:

- Organic Chemistry (Vol. I & II): I. L. Finar, Longman Group Ltd. And the English Language Book Society, London, 6th edition.
- Advance Organic Chemistry: Fieser and Fieser, Asia Pub. House, Mumbai, 1961.
- Unit Process in Organic Synthesis: P. H. Groggins, McGraw Hill, 5th edition. Experiments shall be conducted)

2SCT8: Introduction Chemical Technology – LAB.

List of Practicals: [**NOTE**: Minimum 6-8 Experiment shall be conducted]

1. Preparation of Urea formaldehyde resin
2. Preparation of Phenol formaldehyde resin
3. Preparation of Iodoform
4. Preparation of *p*-Nitroacetanilide
5. Green synthesis of di-benzylpropanone
6. Identification of given organic compound
7. Identification of given organic compound
8. Identification of given organic compound
9. Identification of given organic compound
10. Estimation of Organic compound
11. Estimation of Organic compound

2SCT3 : ENGINEERING MECHANICS

Level 4.5 (UG-Certificate)

Subject Code: 2SCT3	Title: Engineering Mechanics	Credits = 4		
		L	T	P
Semester: II	Total contact hours:	3	0	2

Course Objectives:

Students will be taught:

- Concepts related to Forces and its effects, resolution and composition of coplanar forces.
- Application of principles of statics to the system of rigid bodies.
- Analysis of simple structures like trusses and beams.
- Concepts related to friction, its application.
- Concepts related to centroid, moment of inertia, radius of gyration.
- Concepts related to kinematic and kinetic equations, and its applications to various typesof motion.
- Concepts related to conservation of momentum and laws of impacts.

Course Outcomes: Students will be able to:

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

- Compose and resolve the forces along with its effect.
- Apply principles of statics to the system of rigid bodies and analyze simple structures.
- Calculate frictional forces for simple contact, wedges and belt friction.
- Locate centroid and calculate moment of inertia.
- Calculate various kinematic quantities.
- Solve the problems using different kinetic equations related to direct and interconnectedbodies.
- Apply principle of conservation of momentum and laws of impact.

SECTION-A

UNIT-I (STATICS): Resultant: Concept of a force, force systems, moment of a force about apoint, couple, resolution and compositions of coplanar force system.

Equilibrium: Free-body diagrams, equations of equilibrium, problems of equilibrium involvingco-planar force system acting on a particle, rigid body and system of rigid bodies. (07)

UNIT-II (STATICS): Trusses: Definitions, assumptions, types, Analysis of simple plane perfecttrusses by method of joints and method of section.

Friction: Definitions of friction, types, angle of friction, angle of repose, cone of friction, Coulomb's laws of friction. Applications to simple contact friction, wedges and belt friction.(08)

UNIT-III (Centroid and Moment of Inertia):
Centroid, First Moment of Area, Problem on location of Centroid of composite sections, Second Moment of Area, Radius of Gyration, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Introduction to principal axes and principal moment of inertia. (07)

SECTION-B

UNIT-IV (DYNAMICS - KINEMATICS):
Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components (involves Problems on calculation of total acceleration, radius of curvatureand projectile motion). (07)

UNIT-V (DYNAMICS KINETICS): Kinetics of rectilinear, curvilinear and rotary motion of a particle acted upon by a force system, Application of D'Alembert's principle, concept of dynamic equilibrium, rectilinear motion of several interconnected particles. (08)

UNIT-V (DYNAMICS KINETICS): Application of Work-Energy and Impulse-Momentum equation to a body or a system of bodies, Law of Conservation of Momentum to a system of bodies in a rectilinear translation. Direct Central Impact, Collision of Two Bodies, Coefficient of Restitution. (08)

Text Books:

- Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
- Bhavikatti, S. S. and Rajashekarappa, K. G., Engineering Mechanics, New AgeInternational Publishers, New Delhi.

Reference Books:

- Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore
- Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill InternationalC.,Auckland.
- Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-HillInternational C., Auckland.
- Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

2SCT8 ENGINEERING MECHANICS – Lab.

List of Practicals :

(Two compulsory graphical solutions to the problems of statics)

1. Verification of Law of Polygon of forces.
2. Verification of Principle of Parallel Forces/ Reactions at the supports of simple beam.
3. Determination of the Forces in members of Jib crane.
4. Determination of coefficient of friction on inclined plane.
5. Determination of Coefficient of coil friction.
6. Determination of law of machine for screw jack/differential axle wheel /single and doublepurchase crab (for any two machines).
7. Determination of mass moment of inertia of Fly Wheel
8. Determination of gravitational acceleration by Compound pendulum.

****

2SCT4 /1B4 ENGINEERING GRAPHICS

Course Objectives:

1) To acquire and apply Engineering Graphics knowledge for communicating ideas, information and instructions, as well as to understand the conventions of Engineering Drawing
2) To understand the representations of 3-D objects, their projections and sectional views
3) To understand the representations of orthographic and isometric views of 3-Dobjects
4) To introduce students with the drafting commands of commercial graphics software.

Course Outcomes:

On successful completion of the course, the students will be able to attain following Course Outcomes:

1) Students will able to read/prepare/understand the Engineering Drawings.
2) Students will able to create the projections and sectional views of 3-D objects.
3) Students will able to draw the orthographic and isometric views of 3-D objects.
4) Students will able to use graphics software to create Engineering drawings and represent engineering systems.

SECTION- A

Unit I: Introduction to Engineering Drawing and Projection: Introduction to Projections**,** projection of point, line and plane, projection on auxiliary plane.

Unit II: Projection of Solids: Projection of solids for prism, pyramid, cone and cylinder**.**

Unit III: Section of Solids: Section of solids for prism, pyramid, cone and cylinder**.**

SECTION- B

Unit IV: Development of Surfaces: Development of Surfaces for prism, pyramid, cone and cylinder**.**

Unit V: Orthographic Projection: Conversion of pictorial view of objects to orthographic projections by using first and third angle projection methods.

Unit VI: Isometric Views and Projections: Construction of isometric views and projection of given two dimensional views.

LIST OF BOOKS RECOMMENDED:

Text Books:

1. Bhatt N.D. & Panchal V.M. Engineering Drawing, 49th Edn.,Charotar Pub. House, Anand, Gujrat, 2007.
2. Shah P.J.–Engineering Drawing, S.Chand Publication, 2008.
3. Dhawan R.K.–Engineering Drawing, S.Chand Publication, (5th Edn., 2008).
4. Tickoo Sham– AutoCAD, BPB Publications.

Reference Books:

1. Naraynan K.L.,Kannaiah P.– Engineering Drawing, Scitech.
2. Jolhe D.A.– Engineering Drawing, Tata Mc-Graw Hill Publication, 2008.

2SCT10 / 1B8 ENGINEERING GRAPHICS – LAB.

List of Practicals:

Every student will submit a set of at least SIX drawing sheets (from 1 to 8 listed below) and perform at least ONE practical (from 9 to 10 listed below) using CAD software.

Examination will consist of viva-voce based on the syllabus.

1. Projection of straight line
2. Projection of planes
3. Projection of solids
4. **Section of Solids**
5. **Development of Surfaces**
6. Orthographic projection
7. Isometric projection / view
8. Free hand sketches of simple machine elements, like:
   (a) Screw threads ISI profile
   (b) Types of nuts, bolts, studs, sets crews, washers, locking arrangement of nuts & bolts
   (c) Foundation bolts–Rag, eye, lewis types.
9. Drafting of basic 2-D geometrical shapes using CAD software
10. Drafting of basic 3-D geometrical shapes using CAD software.

****

2SCT5: ANCIENT CHEMICAL ENGINEERING

Level 4.5 (UG-Certificate)

Subject Code: 2SCT5	Title: Ancient Chemical Engineering	Credits = 2		
		L	T	P
Semester: II	Total contact hours:	2	0	0

Course Objectives:

- Preserve and disseminate Indian Knowledge system for further research and societal application
- This course offers an introduction to the history and historiography of science from ancient India to the present.

Course Outcomes:

On successful completion of the course, the students will be able to attain following Course Outcomes:

- Introduction for those who have no prior background in the field and to deepen the knowledge.
- Students acquire basic knowledge after completion of the course.

Unit I: Introduction & Natural Knowledge in the Past: Introduction, Chemistry and Alchemy, Other technologies; Pyrotechnic Practices, The Indus or Harappan civilization, Food practices in ancient India, history of Indian food culture. Origin of colors, colors made in ancient India. Ancient Indian writing tools, materials from Bhurjapatra to paper. Fuels in past, energy trends and development.

Unit II: Need of Chemical Engineering and Chemical Technology: Define Chemical Engineers, industrial revolution, processing, contribution to society; Food, Water, Natural resources management and environment conservation in ancient India.

Unit III: Importance of the Study of History of Chemical Engineering: Overview, Traditional practices, Chemistry of Ancient India since Ayurveda period, Principles of Chemical Engineering, Contribution of various personalities in Chemical engineering & technology.

Unit IV: Scientific & Industrial Revolution of Chemical Industries: Introduction, Initial raw materials for production and product applications, various techniques with operating parameters, limitations, research and innovations from laboratories to the industry and society, Case study of chemical Industries, Technology vision 2035, Different category, Technology vision Grand Challenges,

List of Books Recommended:

1. Dee. H. Barker and C.R. Mitra" A History of Chemical Technology and Chemical Engineering inIndia 1980.
2. Van Antwerpen, F. J.; Fourdrinier, Sylvia "Highlights of the First Fifty Years of the AmericanInstitute of Chemical Engineers;" AIChE: New York, 1958.
3. de Tocqueville, Alexis "Democracy in America;" (Reeve, Bowen, Bradley translation,) VintageBooks, Random House: New York, Vol. 1, p. 326.
4. "Report of the President (MIT) for the Academic Year 1887-1888."
5. Lewis, W. K. "MIT Catalogue, 1888-1889," pp. 3, 5.
6. Van Antwerpen, F. J.; Fourdrinier, Sylvia "MIT Catalogue, 1888-1889" .
7. Stine, C. M. A. "Chemical Engineering in Modern Industry," AIChE Trans. 1928, 5.
8. Little, A. D. "Twenty-five Years of Chemical Engineering Progress;" AIChE: New York, 1933.
9. White, A. H. "Twenty-five Years of Chemical Engineering Progress;" AIChE: New York, 1933.

****