GENRAL ENGINEERING

SYLLABUS

FIRST YEARCHEMICAL ENGINEERING AND TECHNOLOGY

NAAC Re- Accredited
B (CGPA 2.88)

University Institute of Chemical Technology

North Maharashtra University, JALGAON

2014-2015

PROGRAM OUTCOMES (POs)

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. An ability to function on multidisciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. Recognition of the need for, and an ability to engage in life-long learning.
j. Knowledge of contemporary issues.
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
l. An ability to work professionally in both software and hardware system areas including the design and realization of such systems.

HMC-101 Soft and Entrepreneurship Skills

Teaching Hours: 04
Practical Hours:02
Total Credits: 05

Course Description:
Through this course we have tried to bridge the gap of industry and institution by bringing in an awareness and practical approach to soft skills such as communication skills, presentation skills and written language. This course stresses on ability to communicate, public speech, e-presentations and structure of English language.
Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Course Objectives:
We have tried to achieve the following objectives through this course:
a) To make the student industry ready in terms of his/her ability to communicate effectively
b) To augment the ability of the student to create, compose and render presentations with or without the help of media
c) To understand the importance of public speech and the role language plays in that.
d) To enhance the ability of written communication by giving a primer on English

Course Outcomes:
Upon successful completion of this course the student will be able to:
a) Understand the importance of communicating effectively
b) Communicate effectively by removing barriers
c) Address an audience effectively and deliver speeches without inhibition
d) Create and deliver effective e-presentations
e) Understand the meaning and utility of Active Listening in communication
f) Use the vocabulary more effectively
g) Expand and enrich grammatical structure and vocabulary in English
h) Comprehend thoughts through body language and use it as a tool to understand non-verbal signals for better communication

Syllabus:

UNIT I
Communication Skills: Introduction to major grammatical models. Phonological and syntactical structure of present-day English. Language of science and technology. Aspects of style. Vocabulary building, spelling patterns, some common errors, Reading and Comprehension (10)

UNIT II

Communication Effectiveness: Formal and informal communication. The art of listening. Strategies for effective communication, Social perception communication, written communication. Managerial report writing. Graphical representation of technical data, Technical presentations design and delivery. Resume Writing, Audio Visuals in communication, Business etiquettes, social grace   (10)

UNIT III

Personality Development: Concept of Soft Skills, Problem solving, decision making, Positive Attitude and mindset, Analytical Skills, Desire to learn and to be trained, coping with stress, Multi-task ability, Time Management, Model of success and failure in adjustment. Approaches to the study of personality. Models of healthy & mature personality; Describing oneself and SWOT analysis, Emotional Intelligence   (10)

UNIT IV

Interpersonal skills and rapport: Work Ethics, Personal Integrity & commitment, Flexibility, Team work and spirit, Group process, Group task performance, Problem solving co-operation and competition, Motivational Skills, Personality and social phenomenon. Adaptation development processes, Cultural influences on personality and social behavior. Leaders and leadership skills, Managing Ability, Aggression and its management.   (10)

UNIT V

Entrepreneurship: Basis and challenges of entrepreneurship, Self-employment need and mode, Entrepreneurial characteristics, Opportunity identification and opportunity generation for technical entrepreneurship. Innovation and entrepreneurship in technology based organizations, Negotiation Skills, Networking with industries and institutions.   (10)

Laboratory:

To develop communication/expression skills in visual presentation and provide opportunity for bridge studies. Developing skills through exercises for coordinating eye, hand, body movements and developing necessary line control, Language Laboratory Practical Workshop on Group Discussion.

Preparing text and image files, preparing style-sheets, tags, fonts, windows and orphans, hyphenation, spacing and breaks, margins and columns, headers, footers, graphics, frames. Understanding these with reference to popular desk-top publishing packages. Students will be expected to prepare a technical report and make a short oral presentation.

ESC-101 Elements of Mechanical Engineering and Workshop Technology

Teaching Hours: 04
Practical Hours:04
Total Credits:06

Course Description:
Workshop Practice III covers the basic knowledge and practices on conventional lathe machine in machine shop I (Turning shop), various welding joints and welding processes in welding shop, pattern making practices in carpentry shop and casting practices in foundry shop in order to improve the practical skill of students in different workshops.

Workshop Practice I covers the basic knowledge and practices on measuring instrument, fitting shop, welding shop, Tin smithy, Black smithy, foundry shop and computer hardware workshop in order to improve the practical skill of students in different workshops.

Course Objective:
In workshop practice, students will get familiar with use of different workshop practices like fitting, welding, tin smithy, black smithy, foundry and computer hardware workshop. Students will also get familiar with different tools, machines, equipment, and job holding devices, job drawing, job material, job manufacturing operations and processes in different workshops.

Objective to develop following Intellectual skills:

a. Identification and selection of manufacturing processes/operations according to job requirement in different workshops.

b. Identification, selection and understanding of tools, equipment, machines and job material according to job drawing for different workshops.

c. Understanding working principle and construction of process planning sheet.

d. Identification, understanding of the working principle of computer hardware components.

Objective to develop following Motor skills:

a. Ability to handle measuring instruments.

b. Ability to read the job drawing.

c. Ability to understand the basic working principle of fitting operations, tools and equipment in fitting shop.

d. Ability to understand the basic working principle of welding operations, tools and equipment in welding shop.

e. Ability to understand the basic working principle of sheet metal operations, tools and equipment in tin smithy shop.

f. Ability to understand the basic working principle of black smithy operations, tools and equipment in black smithy shop.

g. Ability to understand the basic working principle of molding and casting operations, tools and equipment in foundry shop.

h. Ability to understand working principle of computer hardware and its application.

Course Outcomes:
Upon successful completion of these practical's the student will be able to hand
a) Measuring Instruments and fitting shop
b) Welding Shop
c) Tin smithy shop
d) Black smithy shop
e) Foundry shop
f) Computer Hardware Workshop
Syllabus
Unit I:
Pattern Making: Introduction, Pattern materials, Types of Pattern (Single Piece, Split, Gated, Sweep, Skelton & Segmental), Pattern Making Allowances.
Foundry: Moulding Tools (Only Hand Tools), Types of molding sand. Properties of molding sand, Sand Preparation, Die Casting, Its advantages & disadvantages. Defect in casting.
Metal Cutting Tools: Drills Taps & Threading Dies.   **(10)**

Unit II:
Study of Machine Tools: Lathe Machine (Its Operations & Major parts), Drilling Machine, Milling Machine, Grinding Machine. (Only Introduction)
Welding: Gas welding, Arc welding, TIG, MIG welding, and Soldering& Brazing.
Mechanical Working of metals: Rolling Forging Drawing, Stamping, Riveting & Punching Processes.   **(10)**

Unit III:
 Introduction to the law of thermodynamics: Zeroth, First & Second Law (Theory only), entropy concept as a consequence of the second law of thermodynamics (Theory only),
Study of air cycles: Otto Diesel, Semi Diesel Cycles. Representation of these on P. V. & T. S. diagrams. Calculations of Work &Power.   **(10)**

Unit IV:
Steam Engineering, Study of properties of steam, Types of steam turbines.
Elementary study of other types of power plants, Stationary & mobile plants. Direct energy conversion devices such as fuel cells. **:** Solar, Wind & Tidal energy plants operating principles merits, demerits & applications.   **(10)**

Unit IV:
Transmissions: Types of drives: group & individual drives, their merits & demerits, Belts Chain & gear drives. Gear trains for speed reduction. Speed ratio, Study of bearings: Journal, Ball & Roller Bearings. Shaft & Coupling. (Theory Only)   **(10)**
Reference Books:

1) Elements of Workshop Technology: S. K. Hajra Chaudhari & A. K. Hajra Chaudhari Vol: I, II
2) Workshop Tech: Chapman
3) Workshop Tech: S K Garg.
4) Production Technology: P. N. Rao Vol: I & II
5) Production Technology: P. C. Sharma
6) Elements of Mechanical Engineering: Joshi & Tumne.
7) Thermal Engineering (S. I. Units): P.L. Ballaney
8) Engineering Thermodynamics: Gupta & Prakash
9) Heat Engine by Jwele

ESC-102 Engineering Graphics

Teaching Hours:03
Practical Hours:04
Total Credits: 05

Course Description:

This course provides the elementary level knowledge of Engineering Drawing and Elements of Mechanical Engineering. Course includes introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection. The course also introduces students to concept of Energy and energy conservation, Energy management & Audit, Conventional Energy Sources, Working Principle of Work producing devices, work absorbing devices and various mechanical devices.

Course Objective:

This course covers introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection. The course also introduces students to concept of Energy and energy conservation, Energy management & Audit, Conventional Energy Sources, Working Principle of Work producing devices, work absorbing devices and various mechanical devices.

CourseOutcomes:

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

a) Use various drawing instruments to layout and draw a sheet.

b) Explain various types of lines used, Lettering, Numbering and Dimensioning and Scales.

c) Draw and explain Planes of projection, quadrants and first angle & third angle method of projection.

d) Illustrate Principles of Orthographic projection by Projection of straight line and plane in 1st and 3rd quadrant.

e) To draw front view, Top View and side View of Simple objects.

f) Orthographic projection with different sections and Conversion of simple views into orthographic views.

g) Illustrate Principles of Isometric projection and Isometric view.

h) Conversion of given orthographic view into isometric view.

i) Describe Energy, Different forms of energy and mass conservation laws.

j) Understand non Renewable energy sources and Renewable energy sources.

k) Explain energy management strategy and energy audit.

l) Illustrate with principle various conventional energy producing devices and energy absorbing devices.

m) Illustrate with principle various power transmission elements, drives, direction and flow control valves.

n) Explain types of Actuators, Simple Hydraulic & Pneumatic power unit with its applications, merits and demerits.

Syllabus

UNIT - I
Solid Geometry: Projections of solids like prism, pyramids, cylinders and cones. **(10)**

UNIT - II
Sections of solids. **(10)**

UNIT - III
Interpenetration of simple solids including cone and cylinder **(10)**

UNIT – IV
Machine drawing-Orthographic projections, First Angle and Third Angle methods of projections, Isometric Projections. **(10)**

UNIT – V

Conventions in dimensioning and in sections. Free Hand Sketches and Forms and proportions of screw treads, bolts, nuts, locking devices for nuts, studs, set-screws. **(10)**

REFERENCE BOOKS

1.   Engineering Drawings, Vol. I - N.D. Bhatt.
2.   Principles of Solid Geometry- Gupta and Arvikar.
3.   Engineering Drawing-Mali and Chaudhari.

ESC-103 Electrical Engineering & Electronics

Teaching Hours: 04
Practical Hours: 03
Total Credits: 5.5

Course Description:
This course provides an introduction to electrical and electronics engineering covering: basic electric circuit quantities and circuit analysis techniques; semiconductor devices such as diodes, transistors and operational amplifiers and their application; logic gates and their applications, introduction to Microprocessor and Micro-controller; and study of different transducers.

Course Objective:
The objective of the course is to provide students with a firm grasp of the essential principles of electric circuit analysis and basic electronics. This course will help student to understand the concepts and terminology that are used in electrical and electronics engineering. It is not an in-depth electrical/electronic course but, rather a course aimed at acquiring an understanding of basic principles that are used in electrical/electronic engineering.

Course Outcomes:
Upon successful completion of this course the student will be able to:
a) Cary out circuit reduction using series parallel, star delta and/or source transformation method.
b) Analyze DC circuits by using Loop analysis and Nodal analysis method and DC circuit Theorems.
c) Explain various terms related to AC quantities such as R.M.S. value, Average value, Form factor, Crest factor. Phase and phase difference.
d) Draw and Explain phasor diagrams of sinusoidal AC quantities and explain the terms impedance, reactance, admittance, conductance and susceptance. Active, reactive and apparent power.
e) Understand generation of 1-ϕ & 3-ϕ EMF.
f) Understand working principle of PN junction diode, Zener diode and their applications.
g) Describe different configuration of Bipolar Junction Transistor.
h) Understand CE amplifier and working of transistor as a switch.
i) Describe and Understand difference between unregulated and regulated power supplies, DC power supply and its various building blocks.
j) Understand operating principle of various transducers and their applications.
k) Understand operational amplifier and its applications.
l) Describe use of the Basic gate and Universal gate.
m) Understand block diagram of 8085 and 8051.
n) Describe types of Earthing, Fuses and lamps.

Syllabus

UNIT -I

- Basic concepts**:** Concept of Electric Current, resistance, voltage, Ohm's law. Types of supply system- AC supply -single phase & three phase supply, DC supply. Laws of Resistance- Concept of Resistivity and Conductivity. Concept of Electrical Work, Power and Energy - Calculation of electrical energy & electricity bill- Their SI units (simple numerical).
- Classification of Electric Current: Direct Current (DC) & Alternating Current (AC).
- Types of circuit – open, closed & short circuit. Effects of Electric Current (Only Introduction) - Heating Effect, Magnetic Effect, Chemical Effect. Types of connections - series, parallel & compound connections. Electrical safety and symbols.   **(10)**

UNIT- II

DC Motors: Definition, types of DC motors. Working, principle, back Emf, torques equation. Speed control of dc motor. Starting of dc motor – 3 point starter. Application of series, shunt & compound motors (simple numerical).

- DC generator: Definition, working & types of DC generator.
- Single phase transformer: Introduction, principle of operation. Emf equation, transformation ratio, regulation & efficiency (simple numerical).Construction & types of transformer - core type & shell type, step up & step down, instrument transformers. Single phase auto transformer – principle, advantages & disadvantages. Comparison of ideal transformer with practical transformer.
- Three phase transformer: Construction & types, Connections – star & delta, Transformer rating in KVA.   **(10)**

UNIT -III

- Single phase ac motors: Double field revolving theory. Types of Single phase induction motors. AC series motor (universal motor).Application of single phase motors.
- Three phase induction motor (I.M.): Construction of three phase induction motor. Principle of working/operation. Comparison between squirrel-cage and slip-ring induction motor. Applications of three phase induction motor (simple numerical).
- Synchronous Motor:Principle of working/operation. Applications of synchronous motors. Starting of Synchronous Motor.Comparison between I .M. & Synchronous Motor.

(10)

UNIT- IV

- Junction diode as a rectifier, zener diode, photo diode and LED. Bipolar junction transistor (BJT) construction and working, CB, CE and CC configuration. Relation between alpha and beta. Transistor as amplifier.
- Oscillator, positive and negative feedback, Barkhausen criteria, Hartly oscillator, a stable multivibrator   . **(10)**

UNIT- V

- Operational amplifiers: symbol, ideal characteristics, inverting and no inverting configuration.
- Op-amp as an adder, subtracter, differentiator and integrator.

- Logic gates: positive and negative logic, AND, OR & NOT gate, logic families (diode logic, DTL, TTL). Binary addition and subtraction, Boolean axioms.   **(10)**

Reference Books:

1. A Text Book of Electrical Technology vol. I, II, III, IV: B. L. Theraja, A. K. Theraja.
2. Basic Electrical Engg.:V. N. Mittle.
3. Electrical Machine Design: A. K. Sohawney.
4. Fundamentals of electrical Engg. vol.I, II: S.D Bhide and M.N. Navale.
5. Electronics principle: V.K. Mehta.
6. Basic electronics: B.Ggrobe.
7. Digital principle and application: Malvino- Leach.
8. Digital electronics: V.K.Jain.

List of practical:

Electrical engineering laboratory:

1. To verify Ohms law and measurement of power.
2. To determine the transformation ratio of single phase transformer.
3. To determine the efficiency and regulation of single phase transformer by direct loading.
4. To study starting, reversal rotation of 3 phase I.M. and measure the output voltage of generator.
5. To study starting, reversal rotation of DC shunt motor and measure the output voltage of generator.
6. To study speed control of DC shunt motor.
7. To calculate energy consumed by given load.

Electronics Laboratory:

1. Characteristics of zener diode.
2. Single stage R-C Coupled amplifier.
3. Astable multivibrator.
4. Study of logic gates.
   - A. OR and AND gates using diode logic.
   - B. OR, AND and NOT gate (truth table verification)
5. Basic operation using op-amp(Adder and subs tractor).
6. Study of CRO.(Minimum eight experiments of above)

ESC-104 Computer Science and Application

Teaching Hours: 03
Practical Hours: 03
Total Credits: 4.5

Course Description:

The objective of this course is to introduce the students to the fundamentals of computers, the concepts of the C and C++ programming language and enable them to apply these concepts for solving real world problems.

Course Objective:

This course covers introduction to Computers, Algorithms and flowcharts, C and C++ programming concepts including variables, control structures, arrays and structures.

Course Outcomes:

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

a) Understand the principles of designing structured programs.
b) Write and debug programs using an IDE.
c) Know use of the appropriate statements available in the C and C++ language.
d) Implement small to medium programs of varying complexity, using the most commonly used features of the language.
e) Employ good programming style, standards and practices, during program development.
f) Adapt programming experience and language knowledge to other programming language Contexts.
g) Explain the principles of structured program design.
h) Describe what is meant by a well-designed program.
i) Describe when and how to use the standard C and C++ statement.

Syllabus

UNIT-I

INTRODUCTION TO C:

C character set; Identifiers and Keywords; Data types and sizes; Constants; Variables and arrays; Type declaration; Expressions; Statements; Symbolic constants; Integer and float conversions, Type conversion in assignments; Hierarchy of operations. **(06)**

UNIT-II

OPERATORS & EXPRESSIONS:

Arithmetic operators, Unary operators, Relational and logical operators, Assignment operators, Conditional operator, Library functions.   **(06)**

UNIT- III
DATA INPUT AND OUTPUT:

Single character input (**getchar** FUNCTION) and output (**putchar** FUNCTION); Entering input data (**scanf** FUNCTION) and writing output data (**printf** FUNCTION).   **(06)**

UNIT –IV
CONTROL STATEMENTS:

While STATEMENT; **do-while** STATEMENT; **for** STATEMENT; Nested Loops; **if-else** STATEMENT; **switch** STATEMENT; **break** STATEMENT; **continue** STATEMENT; Comma (,) operator; **goto** STATEMENT.   **(06)**

 List of Practical's:

PREPARING AND RUNNING A C - PROGRAM:

Planning and writing a program; Compiling and executing the program; Error diagnostics; Logical debugging.

Application of C-language to solve the following problems.

1.   Introduction to Turbo-C editors

2.   To find molecular weight of a compound

3.   Rate constant for first order reaction

4.   Concentration of solution using Beer- Lamberts Law

5.   Energy of activation using rate constants at two different temperatures

6.   To find Molarity, Molality and Normality

7.   To determine entered number is prime or not.

8.   To find largest of given three numbers.

9.   To find smallest of given three numbers.

10.   To find factorial of a given number.

11.   To generate 15 terms of Fibonacci Series.

12.   Ascending and descending order of numbers.

13.   To find electronegativity of a compound.

14.   to find Simple interest and Compound interest.

15.   To swap two numbers using & without using third variable.

BASIC SCIENC

SYLLABUS

FIRST YEAR CHEMICAL ENGINEERING AND TECHNOLOGY

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BSL-101 (MATHEMATICS-I)

Theory:-4 Hr. /week
Teaching Hours: 03
Tutorial: 01
Total Credits (Theory): 04

Course Description:

This course is aimed at introducing the fundamentals of basic sciences to undergraduate students. The background expected includes a prior knowledge of Mathematics from HSC (science) and familiarity with various Formulae's, principles and theorems. The goals of the course are to understand the basic principles of science and their applications in different areas.

Course Objective:

The basic necessity for the foundation of Engineering and Technology being Mathematics, the main objective is to provide sufficient practice in the mathematical methods presented and develop mathematical skill and enhance thinking and decision making power of student.

Course Outcomes:

After completion of this course students will be able to:
a) Apply knowledge of mathematics in engineering and technology.
b) Identify, formulate and solve engineering problems.
c) Design Mathematical models for engineering problems and solve them.
d) Draw the rough sketch of Cartesian and polar curves.
e) Use partial derivative to find total derivative of implicit functions.
f) Solve definite integrals using special functions.
g) Solve ordinary differential equations using numerical methods.

Syllabus:

Unit -1

Linear Algebra and Applications

Rank of matrix, Normal form, Canonical form, Reduction to Normal form and Canonical form, System of linear equations- consistency and inconsistency by using rank of matrix, Linear dependence and independence of vectors, Eigen values and Eigen vectors, Cayley Hamilton theorem   (10)

Unit -2

Calculus of Functions of One Variable

ISntroduction to Successive differentiation, nth Derivative using Trigonometric, Partial Fractions and De-Moiver's theorem, Leibnitz's theorem (without proof), Power series expansion of functions using Maclaurin's Series, Expansion of functions using Taylor's Series, Application of Taylor's Series to approximation (10)

Unit -3

Special Functions

Properties of Gamma Function and examples, Properties of Beta Function and examples. (10)

Unit -4

Calculus of Functions of Several Variables

Partial Derivatives: Definition, rules, theorems, Euler's Theorem on Homogeneous Functions of Two Variables (Without Proof), Total Derivatives, Differentiation of Implicit Function, Change of Independent Variable (10)

Unit -5

Numerical Solution of Ordinary Differential Equations

Introduction, Taylor's Series Method, Euler Method, Modified Euler's Method, Picard's Method, Runge-Kutta Fourth Order Method (10)

Reference Books:

1. Advanced Engineering Mathematics: H.K. Das, S. Chand Publication Ltd.
2. Higher Engineering Mathematics: B.S.Grewal, Khanna Publication
3. Applied Mathematics: P.N. Wartikar and J.N. Wartikar, Pune Vidhayrthi Griha Prakashan Pune

BSC-102: ORGANIC CHEMISTRY-I

Theory- 4 H
Practical- 3H
Credits – 5.5

Course Description:
This course provides the knowledge of organic concept toundergraduateengineering students, and is designed to strengthen the fundamentals so that they can build their own interface of applied organic chemistry concept with their industrial applications in the branch of chemical engineering

Course Objectives:

1. To introduce the basicconcepts of organic chemistry and its significance in chemical and technology process industry.
2. To study stereoisomerism in organic compound & influence of it on molecular properties.
3. To study the name reactions with their mechanisms.
4. To study and apply the basic reactions to design synthesis of some classes of molecules with study of synthetic reagents.
5. To study interconvertion of functional group and their applications.

Course Outcomes:
Students completing this course will have basic knowledge of different classes of organic molecules, their important reactions, and some functional group interconvertions. They will have basic of knowledge of reaction components (reactant, reagents and products). They would also know how organic reactions are takes place, preliminary insight how to design the desired product and factors to take care of it.

Syllabus
UNIT-1:
BASIC CONCEPT AND REACTIONS
Factors affecting electron availability:inductive, resonance, hypercojucation and steric effect. Electrophiles and nucleophiles. Aldol reaction, cannizzaros reaction Darzen glycidic ester synthesis, Perkin reaction, Michel addition. Pinacol-Pinacolone rearrangement, Benzilic acid rearrangement, Beckmann rearrangement, (synthetic application & mechanism of these reactions).

(10)

UNIT-2:

ALKENES AND ALKYNES

Alkenes: Geometrical isomerism, E-Z isomers, Addition reactions of alkenes, Markovnikoffs rule, types of dienes, Diels-Alder reaction, Polymerization.Alkynes: Synthesis, acidity, Reaction of metal acetylides, formation of C-C bond. Reactivity of C=O, Cyanide, Oxygen, Sulphur , Nitrogen as a nucleophiles, Derivative of C=O(Oximes , hydrazones)   (10)

UNIT-3:

STEREOCHEMISTRY

Basic concept of stereochemistry Absolute configuration ,stereochemistry of compounds having two asymmetric carbon atoms, Walden inversion, separation of enantiomers, diastereomers, conformation of ethane , butane, cyclohexane, structures of cycloalkanes, asymmetric synthesis. Baeyer's angle strain concept.   (10)

UNIT-4:

ACIDS AND CARBOHYDRATE

 Carboxylic acids: Strength of carboxylic acids, H-Bonding, Mechanism of esterification & hydrolysis, tautomerism, Carbohydrates: structure of glucose, fructose, starch & cellulose, reaction & interconversions of glucose & fructose, Oxidation & reduction of glucose. Study of polymers Polyvinyl acetate, urea formaldehyde, phenol formaldehyde.   (10)

UNIT-5:

REAGENTS

Oxidation & Reduction: Mechanism and application of oxidizing and reducing agent like, dissolving metal reduction, catalytic hydrogenation, Meerwein-Pondorff-Verely reduction, $NaBH_4$, $LiAlH_4$, sodium dichromate, Hydrogen peroxide, catalytic oxidation,OsO_4 and peracid (Baeyer-Villiger oxidation), Oppenaer oxidation.   (10)

REFERENCE BOOKS

Organic Chemistry	Vol.I&II	I.L.Finar
Organic Chemistry		Morrison and Boyd
Organic Chemistry	S.H.Pine	
Reaction Mechanism in Organic Chemistry		Mukherji and Singh
Organic Chemistry		Bahl and Bahl
Organic Reaction Mechanism		P. S. Kalsi

Organic Chemistry Practicals-I

QUALITATIVE ANALYSIS OF ORGANIC COMPOUNDs

Identifications of an organic compound through
1. elemental analysis,
2. group detection,
3. Physical constant (m.p./b.p.)
4. Derivatisation. (minimum 06)
5. Purification techniques- TLC, Distillation, Recrystallization (Minimum 2)

REFERENCE BOOK:

1. Organic Qualitative Analysis and Separation   Kulkarni and Pathak
2. Practical Chemistry   Prof.R.B.Gujrathi,   Prof.V.S.Zope
3. Practical Chemistry   Prof.R.B.Gujrathi, Prof.A.P.Rajput

BSC- 103 Physical Chemistry

Theory lecturers: 04
Practical: 03
Credits: 04+1.5= 5.5

Course Description:

For undergraduate students this course provides the significant understanding of physical chemistry principles and thus they can relate the concepts for sustainable development in operations encountered in chemical process industries.

Prerequisite Course(S): Engineering Chemistry-I & II

Course Objectives:

1. To introduce the ideal and real gas concept and causes of deviation of gases from ideal behavior.
2. To study the role of critical constants in liquefaction of gases.
3. To study the rate expressions and order of reactions.
4. To understand the influence of various parameters on rate of reactions.
5. To study the basics of Electrochemistry and classification of electrode.
6. To study different types of catalysts.

Course Outcomes:

Students finishing this course will be capable to use fundamental physical chemistry principles to make predictions about ideal and real gases. Learners will apply chemical kinetics principles to investigate the order of reaction, effect of temperature and catalysts on reaction kinetics and time taken by reactants to change their initial concentration.

Syllabus:

UNIT 1:

Gaseous State: Real gases – Deviation from ideal behavior-Compressibility factor, Vander Waal equation of state- critical phenomenon and critical constants, Reduced equation of state, law of corresponding state, methods of determine critical constant, liqui-fication of gases.   **(10)**

UNIT 2:

Electrochemistry- Half cell, Cell terminology, types of cell , Electromotive force and its measurement, standard cell, cell reaction and emf, Convention regarding sign of emf, Single electrode potential, Reference electrodes, Classification of electrodes and its reaction, Free energy, Enthalpy and entropy of the cell reaction, Nernst equation and emf calculations, potentiometric titrations.   **(10)**

UNIT 3:

Chemical kinetics: Rate of reaction, Factors affecting rate of reaction, order and molecularity, First, Second and third order rate constant expression, Graphical representation, Methods of determination of order of reaction, Pseudo molecular reaction, and Arrhenius expression and activation energy.   **(10)**

UNIT 4:

Theories of reaction rates (collision and activated complex), Complex reactions, consecutive reaction. Catalytic reactions, Homogeneous and heterogeneous catalytic reaction, Enzyme catalyzed reactions, photochemical reactions, Thermal and dark reactions, Laws of photochemistry, Chain reactions, steps involved in chain reaction. Rate law of the reaction.

                                                                                    (10)

UNIT 5:

Investigation of molecular structure, Molar refraction, molar polarization, electrical polarization of molecule, Molecular structure and dipole moment, Rotational spectra of diatomic molecule, Nature of colloids; contact angle and wetting properties, emulsions.   **(10)**

Reference Book:

1. Element of Physical Chemistry: Glasston & Levis
2. Testbook of physical chemistry: A Findaly
3. Physical chemistry: A. J. More
4. Principle of Physical Chemistry: Prutton, Maron.
5. Physical Chemistry: V.S .Zope, A. M. Nemade and U.G Deshpande.
6. Physical Chemistry: P.W .Aitkin
7. Applied Colloid and Surface Chemistry by Richard M. Pashley and Marilyn E. Karaman

Physical Chemistry-I (Laboratory Course) (any eight experiments)

1. To determine the relative viscosity of liquid A, B and Water.
2. To Investigate the kinetics of the hydrolysis of ethyl acetate by NaOH
3. To Investigate the kinetics of the reaction between potassium persulphate and potassium iodide
4. To Investigate the strength of HCl by titrating with NaOH
5. To determine the pKa of monobasic acid
6. To determine E_{cal} (oxi) and hence pH of the given solution using quinhydrone electrode
7. To determine the molecular weight of polyvinyl Alcohol by viscosity measurement
8. To investigate the reaction between hydrogen Peroxide and KI

BSC- 104 Inorganic Chemistry

Theory lectures: 04
Practicals: 03
Total credits: 04+1.5 = 5.5

Course Description:

This course provides the students basic understanding of theoretical inorganic chemistry and to apply this understanding in how solid-state inorganic materials are used in current and emerging applications. Prerequisite Course(S): Engineering Chemistry-I & II

Course Objectives:

1. To differentiate between the essential features and properties of covalent, ionic and metallic bonding & the concept of hybridization and its types.
2. To study the atomic orbital concept, molecular orbital theory, VSEPR theory of chemical bonding. V.B.T., Cristal field theory.
3. To recognize different types of transition metals and recall their industrially important compounds with basic properties.
4. To study basics of metallurgical operations for extracting metals from ores.
5. To study of the Periodic table
6. To study of the inorganic Polymers

Course Outcomes:

Students completing this course will able to differentiate between ionic and covalent interactions observed in molecules. They would also able to construct molecular orbital diagrams for simple molecules and will predict the shapes of small molecules based on VSEPR theory. They would also study the technique of of metallurgical operations for extracting metals from ores. They will also identify the engineering materials best suited for particular application in industry.

Syllabus

UNIT-1:
Structure of atom, Bohr's theory, quantum theory, wave practical duality, Heisenberg's Principle, Schrodinger's equation, significance of E, Quantum Nos. Pauli's principle. Distribution of e-Aufbau principle, Derivation from Aufbau principle.   (10)

UNIT-2:
 Long from of periodic table, Types of elements, Periodic table, Atom-ionic radii, Ionization potential, Electron Affinity, Electro-negativities, Oxidation state.   (10)

UNIT-3:

Types of bond, bond parameter, lattice energy, application of lattice energy, bonding in Metals, Born- Haber cycle, crystal structure, co-valence, Hydrogen bonding, Co-ordinate Bond, Warner's theory, Co-ordination Number, Sphere, ligands, Nomenclature of Co-ordination compound.   (10)

UNIT-4:

Theory of bonds, Hybridization, VSEPR, VBT, MOT, CFT.   (10)

UNIT-5:
General principle of Metallurgy, occurrences, Mineral wealth of India, Ore-dressing, roasting, calculation, smelting, flux, types of furnace, refining of metal   (10)

Reference Books

1. Modern Inorganic Chemistry   Jolly

2. Advanced Inorganic Chemistry   Satya Prakash, Tuli, Basu

Inorganic Chemistry Practical

  i.   Semmicro Technique for qualitative analysis

 ii.   Volumetric analysis

        a. Standardization of HCL by Borax

        b. Strength of $H_2 O_2$ by $KMnO_4$.

        c. Ferrous ammonium sulphate by potassium dichromate external indicator.

        d. Estimation of Zn, Cu, Al,Pb by EDTA

        e. Determination and removal of Hardness of water by soda process.

        f. Determination of hardness of water by EDTA method.

        g. Estimation of halide by $AgNO_3$ (Minor titration)

BSC-105   PHYSICS

Course Description:

This course is aimed at introducing the fundamentals of basic sciences to undergraduate students. The background expected includes a prior knowledge of physics from HSC (science) and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principles of science and their applications in different areas. In this laboratory, course emphasis is on the understanding of basic principles, characteristic – properties of different instruments used in a field of optics, Heat and thermodynamics, Modern Physics and electronics. The learner here can use this knowledge and apply in various branches of engineering as required.

Course Objective:

The objective of this course is to provide learner with basic concepts and knowledge of sciences (various principles, theories, laws etc.) and to analyze it from experiments. The learner can apply the same in Chemical Engineering and Technology.

The objective of the laboratory is to impart the fundamental knowledge of physics to the students and develop their ability to apply the specific procedures to analyze the experimental results. In this lab, students will be familiar with the use of different equipment, basic principles, properties etc which they can apply in various disciplines of engineering during their studies and in future.

Course Outcomes:

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

a) Understand the impact of Engineering Solutions in global, economic, environmental and societal contexts.
b) Design and conduct experiments, analyze and interpret data.
c) Use the latest techniques, skills, and modern tools necessary for engineering practices.
d) Design a component, system or process to meet desired needs with in realistic constraints.
e) Identify, formulate and solve problems.
f) Describe the concepts of Electromagnetism , classification of magnetic substances and their different properties,
g) Understand to know about the basic concepts of Interference, Diffraction, Polarization, their production and various applications in chemical engineering and technology. Understand the concept of ultrasonic waves, its production and applications.
h) Describe the basics of heat transfer mechanism, blackbody radiation spectrum and related laws, photoelectric effect and concepts.

i) Understand about the semiconductor and superconducting materials and their applications.
j) Understand the production of X-rays, properties and applications in various fields. Basic properties, mechanism, terminology etc. of Laser and their types, Principles, construction and re-construction of Holography. Principle, structure, and propagation mechanism of Fiber optics communication and their Industrial applications and applications in modern technology.
k) Use the latest techniques, skills, and modern tools necessary for engineering practices.
l) Design a component, system or process to meet desired needs with in realistic constraints.
m) Can be able to determine the value of specific charge.
n) Determine wavelength of Laser, working of Laser, various properties and applications.
o) Describe working of solar cell, its characteristics, advantages, disadvantages and uses.
p) Can understand the phenomenon of diffraction & diffraction grating and determine wavelength of light using diffraction grating.
q) Describe working of photoelectric cell, its characteristics, and uses.
r) Determine the value of Planks constant.
s) Determine the value of Stefan's constant.
t) Can determine the specific rotation of sugar solution.
u) Able to determine the resistivity of the given semiconductor by using four probe method.
v) To understand the working and application of LED or Laser diode or IR diode on the basis of band theory of solids.

Syllabus:

UNIT ONE: Concept of electric & magnetic fields, Lorentz force, Millikan's oil drop experiment, Magnetic circuit, leakage & reluctance, comparison of electric and magnetic circuit.Magnetization, magnetic moment, magnetic dipole moment, magnetic susceptibility, diamagnetic , paramagnetic, & ferromagnetic materials, Curie's law , Antiferromagnetic & ferrimagnetic materials , Ferrites & their uses, Hysteresis Loop.   (10)

UNIT TWO: Interference of light, conditions for interference of light, Interference in thin films, Newton's Rings experiment - theory and applications, Diffraction, Fresnel &Fraunhofer diffraction, diffraction grating, grating equations. Concept of Polarization, Brewster's law, Law of Malus, Optical activity, Polariods, Applications of Polaroids. Production and detection of Ultrasonic waves, Properties and application of ultrasonic waves.   (10)

UNIT THREE: Black Body radiation, Energy Distribution in Black body spectrum, Plank's formulation, Rayleigh - Jeans Law, Wien's law & Stefan Boltzmann's Law as a   special case of Planks Law, Solar constant and temperature of Sun.Concept of photon, properties of photons, Photoelectric effect, Einstein's equation, photo-voltaic and photo-emissive cells, photo-multiplier tubes, solar cells-working, merits and demerits.   (10)

UNIT FOUR: Semiconductors, energy band diagram for conductor, semiconductor and insulator, Fermi level & Fermi Function. Position of Fermi level in semiconductors.Superconducting

materials, Principle of superconductivity, free electron model for superconductivity, Basic properties of superconductors, Physical properties of superconductors, Type-I and Type-II superconductors, Applications of superconductors. (10)

UNIT FIVE: Production & properties of X-Rays, characteristics and continuous X-rays, Moseley's law, engineering applications of X-rays.Laser principle, spontaneous and stimulated emission, population inversion, He-Ne Laser, Laser diodes, application of lasers-Holography. Optical fiber, principle, step index fiber, graded index fiber. (10)

REFERENCE BOOKS:
1. Concepts of Modern Physics , S.L. Gupta and S. Gupta.
2. Concept of Modern Physics, Aurther Biser, EditionThree
3. Engineering Physics R. K. Gaur & S.L. Gupta.
4. Applied Science - II by S. J. Walzade & S. N.Narkhede
5. Physics for Scientist and Engineers—5th Edition , Paul Tipler, Gene Mose
6. Text book of Engineering Physics, M N Avadhanulu, P G Kshrisagar, S. Chand Publication
7. M R Srinivasan, "Physics for Engineers", New Age International Publishers.
8. N Subrahmanyam, Brijal, M N Avadhanulu, "Optics", S. Chand.
9. Sanjay Jain, "Engineering Physics", Universities Press (India) Pvt Ltd.

Practicals List:

1. Determination of Stefan's constant.
2. Thermal conductivity by Lee's method.
3. Newton's Rings for the determination of radius of planoconvex lens.
4. Determination of specific rotation of given solution using polarimeter.
5. Determination of wavelength of Laser light by using diffraction grating.
6. To study I-V Solar cell characteristics.
7. To study I-V Characteristics of Photo-cell.
8. Surface Tension by capillary rise method.
9. e/m by Magnetron method.
10. Determination of Planck's constant using photocell.
11. Determination of conductivity of the sample by four probe method.
12. I-V characteristics of Laser diode or LED or IR diode.

Reference Books:
1. N Avadhanulu, A. A. Dani, P M Pokley, "Experiments in Engineering Physics", S. Chand.
2. S P Singh, "Advanced Practical Physics", Pragati Prakashan.