

Eng-112ENGLISH

Total contact hours

Theory	64	T	P	C
Practical	0	2	0	2

AIMSAt the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day-to-day use and will inculcate skills of reading, writing and comprehension.

COURSE CONTENTS

ENGLISH PAPER "A"

1 PROSE/TEXT **16 hours**

1.1 First eight essays of Intermediate English Book-II

2 CLOZE TEST **4 hours**

2.1 A passage comprising 50-100 words will be selected from the text. Every 11th word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

ENGLISH PAPER "B"

3 GRAMMAR **26 hours**

3.1 Sentence Structure.

3.2 Tenses.

3.3 Parts of speech.

3.4 Punctuation.

3.5 Change of Narration.

3.6 One word for several

3.7 Words often confused

4. COMPOSITION **8 hours**

4.1 Letters/Messages

4.2 Job application letter

4.3 For character certificate/for grant of scholarship

4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles

4.5 Essay writing

4.6 Technical Education, Science and Our life, Computers, Environmental

Pollution, Duties of a Student.

4 hours

5. TRANSLATION

6 hours

5.1 Translation from Urdu into English.

For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

1. Intermediate English Book-II.

2. An English Grammar and Composition of Intermediate Level.

3. A Hand Book of English Students By Gatherer.

Eng-112ENGLISH

INSTRUCTIONAL OBJECTIVES

PAPER-A

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY

- 1.1 Manipulate, skimming and scanning of the text.
- 1.2 Identify new ideas.
- 1.3 Reproduce facts, characters in own words
- 1.4 Write summary of stories

2. UNDERSTAND FACTS OF THE TEXT

- 2.1 Rewrite words to fill in the blanks recalling the text.
- 2.2 Use own words to fill in the blanks.

PAPER-B

3. APPLY THE RULES OF GRAMMAR IN WRITING AND SPEAKING

- 3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
- 3.2 State classification of time, i.e present, past and future and use verb tense correctly in different forms to denote relevant time.
- 3.3 Identify function words and content words.
- 3.4 Use marks of punctuation to make sense clear.
- 3.5 Relate what a person says in direct and indirect forms.
- 3.6 Compose his writings.
- 3.7 Distinguish between confusing words.

4. APPLY THE CONCEPTS OF COMPOSITION WRITING TO PRACTICAL SITUATIONS

- 4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship.
- 4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
- 4.3 Describe steps of a good composition writing.
- 4.4 Describe features of a good composition.
- 4.5 Describe methods of composition writing
- 4.6 Use these concepts to organize facts and describe them systematically in practical situation.

5. APPLIES RULES OF TRANSLATION

- 5.1 Describe confusion.

5.2 Describe rules of translation.

5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

Math-113 APPLIED MATHEMATICS-I

T	P	C
3	0	3

Total Contact Hours

Theory 96 Hours.

Pre-requisite: Must have completed a course of Elective Mathematics at Matric level.

AIMS: After completing the course the students will be able to

1. Solve problems of Algebra, Trigonometry, vectors, Mensuration, Matrices and Determinants.
2. Develop skill, mathematical attitudes and logical perception in the use of mathematical instruments as required in the technological fields.
3. Acquire mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

- | | |
|--|----------------|
| 1. QUADRATIC EQUATIONS | 6 Hours |
| 1.1 Standard Form | |
| 1.2 Solution | |
| 1.3 Nature of roots | |
| 1.4 Sum & Product of roots | |
| 1.5 Formation | |
| 1.6 Problems | |
| 2. ARITHMETIC PROGRESSION AND SERIES. | 3 Hours |
| 2.1 Sequence | |
| 2.2 Series | |
| 2.3 nth term | |
| 2.4 Sum of the first n terms | |
| 2.5 Means | |
| 2.6 Problems | |
| 3. GEOMETRIC PROGRESSION AND SERIES. | 3 Hours |
| 3.1 nth term | |
| 3.2 Sum of the first n terms | |
| 3.3 Means | |
| 3.4 Infinite Geometric progression | |
| 3.5 Problems | |
| 4. BINOMIAL THEOREM | 6 Hours |

- 4.1 Factorials
 - 4.2 Binomial Expression
 - 4.3 Binomial Co-efficient
 - 4.4 Statement
 - 4.5 The General Term
 - 4.6 The Binomial Series
 - 4.7 Problems.
- 5. PARTIAL FRACTIONS 6 Hours**
- 5.1 Introduction
 - 5.2 Linear Distinct Factors Case I
 - 5.3 Linear Repeated Factors Case II
 - 5.4 Quadratic Distinct Factors Case III
 - 5.5 Quadratic Repeated Factors Case IV
 - 5.6 Problems
- 6. FUNDAMENTALS OF TRIGONOMETRY 6 Hours**
- 6.1 Angles
 - 6.2 Quadrants
 - 6.3 Measurements of Angles
 - 6.4 Relation between Sexagesimal & circular system
 - 6.5 Relation between Length of a Circular Arc & the Radian Measure of its central Angle
 - 6.6 Problems
- 7. TRIGONOMETRIC FUNCTIONS AND RATIOS 6 Hours**
- 7.1 Trigonometric functions of any angle
 - 7.2 Signs of trigonometric Functions
 - 7.3 Trigonometric Ratios of particular Angles
 - 7.4 Fundamental Identities
 - 7.5 Problems
- 8. GENERAL IDENTITIES 6 Hours**
- 8.1 The Fundamental Law
 - 8.2 Deductions
 - 8.3 Sum & Difference Formulae
 - 8.4 Double Angle Identities
 - 8.5 Half Angle Identities
 - 8.6 Conversion of sum or difference to products
 - 8.7 Problems
- 9. SOLUTION OF TRIANGLES 6 Hours**
- 9.1 The law of Sines

- 9.2 The law of Cosines
- 9.3 Measurement of Heights & Distances
- 9.4 Problems

10. MENSURATION OF SOLIDS

30 Hours

- 10.1 Review of regular plane figures and Simpson's Rule
- 10.2 Prisms
- 10.3 Cylinders
- 10.4 Pyramids
- 10.5 Cones
- 10.6 Frusta
- 10.7 Spheres

11. VECTORS

9 Hours

- 11.1 Scalars & Vectors
- 11.2 Addition & Subtraction
- 11.3 The unit Vectors i, j, k
- 11.4 Direction Cosines
- 11.5 Scaler or Dot Product
- 11.6 Deductions
- 11.7 Dot product in terms of orthogonal components
- 11.8 Vector or cross Product
- 11.9 Deductions
- 11.10 Analytic Expression for $a \times b$.
- 11.11 Problems

12. MATRICES AND DETERMINANTS

9 Hours

- 12.1 Definition of Matrix
- 12.2 Rows & Columns
- 12.3 Order of a Matrix
- 12.4 Algebra of Matrices
- 12.5 Determinants
- 12.6 Properties of Determinants
- 12.7 Solution of Linear Equations
- 12.8 Problems

REFERENCE BOOKS

1. Ghulam Yasin Minhas - Technical Mathematics Vol-I, Ilmi Kitab Khana, Lahore.
2. Prof. Riaz Ali Khan - Polytechnic Mathematic Series Vol I & II, Majeed Sons, Faisalabad
3. Prof. Sana Ullah Bhatti - A Text Book of Algebra and Trigonometry, Punjab Text Book Board, Lahore.

INSTRUCTIONAL OBJECTIVES

1. USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATIONS.

- 1.1 Define a standard quadratic equation.
- 1.2 Use methods of factorization and method of completing the square for solving the equations.
- 1.3 Derive quadratic formula.
- 1.4 Write expression for the discriminant.
- 1.5 Explain nature of the roots of a quadratic equation.
- 1.6 Calculate sum and product of the roots.
- 1.7 Form a quadratic equation from the given roots.
- 1.8 Solve problems involving quadratic equations.

2. UNDERSTAND APPLY CONCEPT OF ARITHMETIC PROGRESSION AND SERIES.

- 2.1 Define an Arithmetic sequence and a series.
- 2.2 Derive formula for the n th term of an A.P.
- 2.3 Explain Arithmetic Mean between two given numbers.
- 2.4 Insert n Arithmetic means between two numbers.
- 2.5 Derive formulas for summation of an Arithmetic series.
- 2.6 Solve problems on Arithmetic Progression and Series..

3. UNDERSTAND GEOMETRIC PROGRESSION AND SERIES.

- 3.1 Define a geometric sequence and a series.
- 3.2 Derive formula for n th term of a G.P.
- 3.3 Explain geometric mean between two numbers.
- 3.4 Insert n geometric means between two numbers.
- 3.5 Derive a formula for the summation of geometric Series.
- 3.6 Deduce a formula for the summation of an infinite G.P.
- 3.7 Solve problems using these formulas.

4. EXPAND AND EXTRACT ROOTS OF A BINOMIAL.

- 4.1 State binomial theorem for positive integral index.
- 4.2 Explain binomial coefficients: $(n,0), (n,1), \dots, (n,r), \dots, (n,n)$
- 4.3 Derive expression for the general term.
- 4.4 Calculate the specified terms.
- 4.5 Expand a binomial of a given index.
- 4.6 Extract the specified roots.
- 4.7 Compute the approximate value to a given decimal place.
- 4.8 Solve problems involving binomials.

5.RESOLVE A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS.

- 5.1 Define a partial fraction, a proper and an improper fraction.
- 5.2 Explain all the four types of partial fractions.
- 5.3 Set up equivalent partial fractions for each type.
- 5.4 Explain the methods for finding constants involved.
- 5.5 Resolve a single fraction into partial fractions.
- 5.6 Solve problems involving all the four types.

6. UNDERSTAND SYSTEMS OF MEASUREMENT OF ANGLES.

- 6.1 Define angles and the related terms.
- 6.2 Illustrate the generation of an angle.
- 6.3 Explain sexagesimal and circular systems for the measurement of angles.
- 6.4 Derive the relationship between radian and degree.
- 6.5 Convert radians to degrees and vice versa.
- 6.6 Derive a formula for the circular measure of a central angle.
- 6.7 Use this formula for solving problems.

7.APPLY BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC FUNCTIONS.

- 7.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
- 7.2 Derive fundamental identities.
- 7.3 Find trigonometric ratios of particular angles.
- 7.4 Draw the graph of trigonometric functions.
- 7.5 Solve problems involving trigonometric functions.

8.USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS.

- 8.1 List fundamental identities.
- 8.2 Prove the fundamental law.
- 8.3 Deduce important results.
- 8.4 Derive sum and difference formulas.
- 8.5 Establish half angle, double angle & triple angle formulas.
- 8.6 Convert sum or difference into product & vice versa.
- 8.7 Solve problems.

9.USE CONCEPTS, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES.

- 9.1 Define angle of elevation and angle of depression.
- 9.2 Prove the law of sines and the law of cosines.
- 9.3 Explain elements of a triangle.

9.4 Solve triangles and the problems involving heights and distances.

10.USE PRINCIPLES OF MENSURATION IN FINDING SURFACES, VOLUMES AND WEIGHTS OF SOLIDS.

- 10.1 Define mensuration of plane and solid figures.
- 10.2 List formulas for perimeters & areas of plane figure.
- 10.3 Define pyramid and cone.
- 10.4 Define frusta of pyramid and cone.
- 10.5 Define a sphere and a shell.
- 10.6 Calculate the total surface and volume of each type of solid.
- 10.7 Compute weight of solids.
- 10.8 Solve problems of these solids.

11.USE THE CONCEPT AND PRINCIPLES OF VECTORS IN SOLVING TECHNOLOGICAL PROBLEMS.

- 11.1 Define vector quantity.
- 11.2 Explain addition and subtraction of vector.
- 11.3 Illustrate unit vectors i, j, k .
- 11.4 Express a vector in the component form.
- 11.5 Explain magnitude, unit vector, direction cosines of a vector.
- 11.6 Derive analytic expression for dot product and cross product of two vector.
- 11.7 Deduce conditions of perpendicularity and parallelism of two vectors.
- 11.8 Solve problems

12.USE THE CONCEPT OF MATRICES & DETERMINANTS IN SOLVING TECHNOLOGICAL PROBLEMS.

- 12.1 Define a matrix and a determinant.
- 12.2 List types of matrices.
- 12.3 Define transpose, adjoint and inverse of a matrix.
- 12.4 State properties of determinants.
- 12.5 Explain basic concepts.
- 12.6 Explain algebra of matrices.
- 12.7 Solve linear equation by matrices.
- 12.8 Explain the solution of a determinant.
- 12.9 Use Crammers Rule for solving linear equations.

Phy-113 APPLIED PHYSICS

Total Contact Hours

Theory	64	T	P	C	
Practicals	96		2	3	3

AIMS: The students will be able to understand the fundamental principles and concept of physics, use these to solve problems in practical situations/technological courses and understand concepts to learn advance physics/technical courses.

COURSE CONTENTS

1 MEASUREMENTS. 2 Hours.

- 1.1 Fundamental units and derived units
- 1.2 Systems of measurement and S.I. units
- 1.3 Concept of dimensions, dimensional formula
- 1.4 Conversion from one system to another
- 1.5 Significant figures

2 SCALARS AND VECTORS. 4 Hours.

- 2.1 Revision of head to tail rule
- 2.2 Laws of parallelogram, triangle and polygon of forces
- 2.3 Resolution of a vector
- 2.4 Addition of vectors by rectangular components
- 2.5 Multiplication of two vectors, dot product and cross product

3 MOTION 4 Hours.

- 3.1 Review of laws and equations of motion
- 3.2 Law of conservation of momentum
- 3.3 Angular motion
- 3.4 Relation between linear and angular motion
- 3.5 Centripetal acceleration and force
- 3.6 Equations of angular motion

4 TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA. 4 Hours.

- 4.1 Torque
- 4.2 Centre of gravity and centre of mass
- 4.3 Equilibrium and its conditions
- 4.4 Torque and angular acceleration
- 4.5 Rotational inertia

5 WAVE MOTION. 5 Hours

- 5.1 Review Hooke's law of elasticity
- 5.2 Motion under an elastic restoring force
- 5.3 Characteristics of simple harmonic motion
- 5.4 S.H.M. and circular motion
- 5.5 Simple pendulum
- 5.6 Wave form of S.H.M.
- 5.7 Resonance
- 5.8 Transverse vibration of a stretched string

6 SOUND.

5 Hrs

- 6.1 Longitudinal waves
- 6.2 Intensity, loudness, pitch and quality of sound
- 6.3 Units of Intensity of level and frequency response of ear
- 6.4 Interference of sound waves silence zones, beats
- 6.5 Acoustics
- 6.6 Doppler effect.

7 LIGHT.

5 Hours

- 7.1 Review laws of reflection and refraction
- 7.2 Image formation by mirrors and lenses
- 7.3 Optical instruments
- 7.4 Wave theory of light
- 7.5 Interference, diffraction, polarization of light waves
- 7.6 Applications of polarization in sunglasses, optical activity and stress analysis

8 OPTICAL FIBER.

2 Hours

- 8.1 Optical communication and problems
- 8.2 Review total internal reflection and critical angle
- 8.3 Structure of optical fiber
- 8.4 Fiber material and manufacture
- 8.5 Optical fiber - uses.

9 LASERS.

3 Hours

- 9.1 Corpuscular theory of light
- 9.2 Emission and absorption of light
- 9.3 Stimulated absorption and emission of light
- 9.4 Laser principle
- 9.5 Structure and working of lasers
- 9.6 Types of lasers with brief description.
- 9.7 Applications (basic concepts)
- 9.8 Material processing
- 9.9 Laser welding

- 9.10 Laser assisted machining
- 9.11 Micro machining
- 9.12 Drilling, scribing and marking
- 9.13 Printing
- 9.14 Lasers in medicine

10 HEAT. 4 hrs.

- 10.1 Review of calorimetry and gas laws
- 10.2 Thermal expansion of solids, liquids and gases
- 10.3 Heat of fusion, vaporization
- 10.4 Humidity, absolute and relative
- 10.5 Law of cooling
- 10.6 Thermoelectricity
- 10.7 Thermocouple.

11 THERMODYNAMICS. 4 Hours

- 11.1 Heat energy and internal energy
- 11.2 First law of thermodynamics
- 11.3 Isometric and adiabatic processes
- 11.4 Efficiency of heat engine
- 11.5 Second law of thermodynamics (both statements)
- 11.6 Heat engine and refrigerator.

12 TRANSFER OF HEAT. 5 Hours

- 12.1 Review: modes of transfer of heat
- 12.2 Emission and absorption of heat
- 12.3 Black Body Radiation
- 12.4 Laws of Energy Distribution
- 12.5 Planck's Quantum Theory
- 12.6 The Photoelectric effect.
- 12.7 X-rays, production, properties and uses.

13 ELECTROMAGNETIC WAVES. 3 Hours

- 13.1 Magnetic field around a current carrying conductor
- 13.2 Electric field induced around a changing magnetic flux
- 13.3 Moving fields
- 13.4 Types of electromagnetic waves
- 13.5 Generation of Radio Waves
- 13.6 Spectrum of electromagnetic waves.

14 ATOMIC NUCLEUS. 5 Hours

- 14.1 Structure of the nucleus

- 14.2 Radioactivity
- 14.3 Radioactive series
- 14.4 Transmutation of elements
- 14.5 The fission reaction
- 14.6 The fusion reaction
- 14.7 The nuclear reactor.

15 NUCLEAR RADIATIONS.

5 Hours

- 15.1 Properties and interaction with matter
- 15.2 Radiation detectors
- 15.3 Radiation damage and its effects
- 15.4 Radiation therapy
- 15.5 Radioactive tracers
- 15.6 Application of radiation techniques in archeology, agriculture, chemical industry, polymerization, sterilization, food preservation, gauging and control, radiography.

16 ARTIFICIAL SATELLITES.

2 Hours

- 16.1 Review law of gravitation
- 16.2 Escape velocity
- 16.3 Orbital velocity
- 16.4 Geosynchronous and geostationary satellites
- 16.5 Use of satellites in data communication.

17 MAGNETIC MATERIALS.

2 Hours

- 17.1 Magnetism
- 17.2 Domains theory
- 17.3 Para, dia and ferromagnetism and magnetic materials
- 17.4 B.H. curve and hysteresis loop.

18 SEMI CONDUCTOR MATERIALS.

2 Hours

- 18.1 Crystalline structure of solids
- 18.2 Conductors, semiconductors, insulators
 - 18.3 P-type and N-type materials
 - 18.4 P-N junction
 - 18.5 P-N junction as a diode
 - 18.6 Photovoltaic cell (solar cell)

RECOMMENDED BOOKS

- 1 Tahir Hussain, Fundamentals of Physics Vol-I and II
- 2 Farid Khawaja, Fundamentals of Physics Vol-I and II
- 3 Wells and Slusher, Schaum's Series Physics .

- 4Nelkon and Oyborn, Advanced Level Practical Physics
- 5Mehboob Ilahi Malik and Inam-ul-Haq, Practical Physics
- 6Wilson, Lasers - Principles and Applications
- 7M. Aslam Khan and M. Akram Sandhu, Experimental Physics Note Book

Phy-113APPLIED PHYSICS

INSTRUCTIONAL OBJECTIVES

1 USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS.

- 1.1 Write dimensional formulae for physical quantities
- 1.2 Derive units using dimensional equations
- 1.3 Convert a measurement from one system to another
- 1.4 Use concepts of measurement and Significant figures in problem solving.

2 USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS.

- 2.1 Explain laws of parallelogram, triangle and polygon of forces
- 2.2 Describe method of resolution of a vector into components
- 2.3 Describe method of addition of vectors by rectangular components
- 2.4 Differentiate between dot product and cross product of vectors
- 2.5 Use the concepts in solving problems involving addition resolution and multiplication of vectors.

3 USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS.

- 3.1 Use law of conservation of momentum to practical/technological problems.
- 3.2 Explain relation between linear and angular motion
- 3.3 Use concepts and equations of angular motion to solve relevant technological problems.

4 USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS.

- 4.1 Explain Torque
- 4.2 Distinguish between Centre of gravity and centre of mass
- 4.3 Explain rotational Equilibrium and its conditions
- 4.4 Explain Rotational Inertia giving examples
- 4.5 Use the above concepts in solving technological problems.

5 USE CONCEPTS OF WAVE MOTION IN SOLVING RELEVANT PROBLEMS.

- 5.1 Explain Hooke's Law of Elasticity
- 5.2 Derive formula for Motion under an elastic restoring force
- 5.3 Derive formulae for simple harmonic motion and simple pendulum
- 5.4 Explain wave form with reference to S.H.M. and circular motion
- 5.5 Explain Resonance
- 5.6 Explain Transverse vibration of a stretched string

5.7 Use the above concepts and formulae of S.H.M. to solve relevant problems.

6 UNDERSTAND CONCEPTS OF SOUND.

- 6.1 Describe longitudinal wave and its propagation
- 6.2 Explain the concepts: Intensity, loudness, pitch and quality of sound
- 6.3 Explain units of Intensity of level and frequency response of ear
- 6.4 Explain phenomena of silence zones, beats
- 6.5 Explain Acoustics of buildings
- 6.6 Explain Doppler effect giving mathematical expressions.

7 USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS and LENSES.

- 7.1 Explain laws of reflection and refraction
- 7.2 Use mirror formula to solve problems
- 7.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, camera and sextant.

8 UNDERSTAND WAVE THEORY OF LIGHT

- 8.1 Explain wave theory of light
- 8.2 Explain phenomena of interference, diffraction, polarization of light waves
- 8.3 Describe uses of polarization given in the course contents.

9 UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER.

- 9.1 Explain the structure of the Optical Fiber
- 9.2 Explain its principle of working
- 9.3 Describe use of optical fiber in industry and medicine.

10 UNDERSTAND THE STRUCTURE, WORKING AND USES OF LASERS.

- 10.1 Explain the stimulated emission of radiation
- 10.2 Explain the laser principle
- 10.3 Describe the structure and working of lasers
- 10.4 Distinguish between types of lasers
- 10.5 Describe the applications of lasers in the fields mentioned in the course contents.

11 UNDERSTAND CONCEPTS OF HEAT.

- 11.1 Explain calorimetry
- 11.2 Explain Gas laws giving mathematical expressions
- 11.3 Explain Thermal expansion of solids, liquids and gases
- 11.4 Distinguish between heat of fusion, vaporization
- 11.5 Distinguish between absolute and relative Humidity
- 11.6 Describe Laws of cooling
- 11.7 Explain basic concepts of Thermoelectricity
- 11.8 Describe Thermocouple, giving its principle, structure and working.

12 UNDERSTAND LAWS OF THERMODYNAMICS.

- 12.1 Distinguish between heat energy and internal energy
- 12.2 Explain first law of thermodynamics giving its applications
- 12.3 Distinguish between isometric and adiabatic processes
- 12.4 Explain second law of thermodynamics describing alternate statements
- 12.5 Distinguish between work of heat engine and refrigerator.

13 UNDERSTAND LAWS OF ENERGY DISTRIBUTION AND EMISSION OF RADIATION.

- 13.1 Explain modes of transfer of heat
- 13.2 Explain Black Body Radiation and Laws of Energy Distribution
- 13.3 Describe Planck's Quantum Theory
- 13.4 Explain photoelectric effect
- 13.5 Explain production, properties and uses of X-rays.

14 UNDERSTAND NATURE, TYPES, GENERATION AND SPECTRUM OF ELECTROMAGNETIC WAVES.

- 14.1 Explain magnetic field due to current and electric field due to changing magnetic flux
- 14.2 Explain moving fields
- 14.3 Describe types of electromagnetic waves
- 14.4 Explain generation of Radio Waves
- 14.5 Explain spectrum of electromagnetic waves.

15 UNDERSTAND THE STRUCTURE OF THE ATOMIC NUCLEUS AND RELEVANT ACTIVITIES.

- 15.1 Describe the structure of the Nucleus
- 15.2 Explain Radioactivity and Radioactive series
- 15.3 Explain transmutation of elements
- 15.4 Distinguish between fission reaction and fusion reaction
- 15.5 Explain the structure and working of the nuclear reactor.

16 UNDERSTAND NUCLEAR RADIATIONS THEIR EFFECTS AND USES.

- 16.1 Describe properties of nuclear radiations and their interaction with matter
- 16.2 Explain working of radiation detectors
- 16.3 Explain damaging effects of nuclear radiations
- 16.4 Explain radiation therapy
- 16.5 Describe radioactive tracers
- 16.6 Describe applications of radiation techniques in course contents.

17 UNDERSTAND TYPES AND USES OF ARTIFICIAL SATELLITES.

- 17.1 Explain escape velocity
- 17.2 Explain orbital velocity
- 17.3 Distinguish between geosynchronous and geostationary satellites
- 17.4 Describe uses of artificial satellites in data communication.

18 UNDERSTAND BASIC CONCEPTS AND CLASSIFICATION OF MAGNETIC MATERIALS.

- 18.1 Explain domains theory of magnetism
- 18.2 Distinguish between para, dia and ferromagnetism and magnetic materials
- 18.3 Distinguish between B and H
- 18.4 Describe B.H. Curve
- 18.5 Describe hysteresis loop.

19 UNDERSTAND BASIC CONCEPTS OF SEMI-CONDUCTOR MATERIALS AND THEIR USES.

- 19.1 Explain crystalline structure of solids
- 19.2 Distinguish between conductors, semiconductors and insulators
- 19.3 Describe semiconductors giving examples with reference to their structure
- 19.4 Distinguish between P-type and N-type materials
- 19.5 Explain working of P-N junction as a diode
- 19.6 Explain working of solar cell.

LIST OF PRACTICALS.

1 Draw graphs representing the functions:

a) $y = mx$ for $m = 0, 0.5, 1, 2$

b) $y = x^2$

c) $y = 1/x$

2 Find the volume of a given solid cylinder using vernier callipers.

3 Find the area of cross-section of the given wire using micrometer screw gauge.

4 Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers' trolley.

5 Verify law of parallelogram of forces using Grave-sands apparatus.

6 Verify law of triangle of forces and Lami's theorem

7 Determine the weight of a given body using

a) Law of parallelogram of forces

b) Law of triangle of forces

c) Lami's theorem

8 Verify law of polygon of forces using Grave-sands apparatus.

9 Locate the position and magnitude of resultant of like parallel forces.

10 Determine the resultant of two unlike parallel forces.

11 Find the weight of a given body using principle of moments.

12 Locate the centre of gravity of regular and irregular shaped bodies.

13 Find Young's Modules of Elasticity of a metallic wire.

14 Verify Hooke's Law using helical spring.

15 Study of frequency of stretched string with length.

16 Study of variation of frequency of stretched string with tension.

17 Study resonance of air column in resonance tube and find velocity of sound.

18 Find the frequency of the given tuning fork using resonance tube.

19 Find velocity of sound in rod by Kundt's tube.

20 Verify rectilinear propagation of light and study shadow formation.

21 Study effect of rotation of plane mirror on reflection.

22 Compare the refractive indices of given glass slabs.

23 Find focal length of concave mirror by locating centre of curvature.

24 Find focal length of concave mirror by object and image method

25 Find focal length of concave mirror with converging lens.

26 Find refractive index of glass by apparent depth.

27 Find refractive index of glass by spectrometer.

28 Find focal length of converging lens by plane mirror.

29 Find focal length of converging lens by displacement method.

30 Find focal length of diverging lense using converging lens.

31 Find focal length of diverging lens using concave mirror.

32 Find angular magnification of an astronomical telescope.

- 33 Find angular magnification of a simple microscope (magnifying glass)
- 34 Find angular magnification of a compound microscope.
- 35 Study working and structure of camera.
- 36 Study working and structure of sextant.
- 37 Compare the different scales of temperature and verify the conversion formula.
- 38 Determine the specific heat of lead shots.
- 39 Find the coefficient of linear expansion of a metallic rod.
- 40 Find the heat of fusion of ice.
- 41 Find the heat of vaporization.
- 42 Determine relative humidity using hygrometer.

Comp-122COMPUTER APPLICATIONS

Total contact hours				
Theory	32 Hours	T	P	C
Practicals	96 Hours		1	3
Pre-requisite	None			2

AIMS This subject will enable the student to be familiar with the operation of a Micro-computer. He will also learn DOS, BASIC language and word processing to elementary level.

COURSE CONTENTS

- 1. ELECTRONIC DATA PROCESSING (EDP) 6 Hours**
 - 1.1 Basics of computers
 - 1.2 Classification of computers
 - 1.3 Block diagram of a computer system
 - 1.4 Binary number system
 - 1.5 BIT, BYTE, RAM, ROM, EROM, EPROM
 - 1.6 Input and output devices
 - 1.7 Secondary storage media details
 - 1.8 Processors and types
 - 1.9 Using computer for system software
 - 1.10 Using computers for application software.
 - 1.11 Common types of software and their application.

- 2. DISK OPERATING SYSTEM (DOS) 6 Hours**
 - 2.1 Internal commands
 - 2.2 External commands
 - 2.3 Batch files
 - 2.4 Advance features.

- 3. BASIC LANGUAGE 10 Hours**
 - 3.1 Introduction to high level languages
 - 3.2 Introduction to BASIC
 - 3.3 REM Statement
 - 3.4 Assignment statement
 - 3.5 Input statement
 - 3.6 Read-Data statement
 - 3.7 IF-THEN statement
 - 3.8 IF-THEN Else statement
 - 3.9 FOR-NEXT statement
 - 3.10 DIM statement

- 3.11 L PRINT statement
- 3.12 STOP statement
- 3.13 END statement
- 3.14 Logic of a BASIC Programme
- 3.15 Running a BASIC Programme
- 3.16 Saving and Retrieving a Programme
- 3.17 Advance features

4. WORD PROCESSING

7 Hours

- 4.1 Starting word processor session
- 4.2 Opening a document
- 4.3 Saving a document
- 4.4 Ending word processor session (Temporarily)
- 4.5 Retrieving a document
- 4.6 Spell check
- 4.7 Margins and tab setting
- 4.8 Aligning Paragraph
- 4.9 Printing a document
- 4.10 Advance features

5.COMPUTER GRAPHIC IN BASIC

3 hours

- 5.1Graphic fundamentals
 - 5.2Points and lines
- 5.3Dots in space
- 5.4A lightening blot
- 5.5Shapes
- 5.6Expanding circles and rectangles

RECOMMENDED BOOKS

1. Ron S. Gottfrid, Programming with BASIC,
 2. Any Word Processor Latest Release (e.g., Word, Word-Perfect etc).
 3. ABC'S of DOS (latest release).
- 4.Judd Robbins, Mastering DOS 6.0 and 6.2

Comp-122COMPUTER APPLICATIONS

INSTRUCTIONAL OBJECTIVES

- 1. UNDERSTAND ELECTRONIC DATA PROCESSING (EDP).**
 - 1.1 Describe basics of computers.
 - 1.2 Enlist different classification of computers.
 - 1.3 Explain block diagram of a computer system.
 - 1.4 Describe binary number system.
 - 1.5 State the terms used in computers such as BIT, BYTE, RAM, ROM, EROM, EPROM.
 - 1.6 Identify input and output devices.
 - 1.7 Describe secondary storage media.
 - 1.8 Explain processor.
 - 1.9 Name different types of processors.
 - 1.10 Explain the use of computer for system software.
 - 1.11 Explain the use of computer for application software.
 - 1.12 Enlist common types of software and their application.
 - 1.13 Explain various application of above softwares mentioned in 1.12

- 2. UNDERSTAND DISK OPERATING SYSTEM (DOS).**
 - 2.1 Explain the use of various internal command of DOS.
 - 2.2 Explain the use of various external command of DOS.
 - 2.3 Describe batch files.
 - 2.4 Identify advanced features

- 3. UNDERSTAND BASIC LANGUAGE.**
 - 3.1 Explain high level languages.
 - 3.2 Explain Basic language.
 - 3.3 Describe Rem statement
 - 3.4 Describe assignment statement
 - 3.5 Explain Input statement
 - 3.6 Explain Read-Data statement
 - 3.7 Explain If-Then Statement
 - 3.8 Explain If-then-Else Statement
 - 3.9 Explain For-Next Statement
 - 3.10 Explain DIM Statement
 - 3.11 Explain LPRINT statement
 - 3.12 Explain stop statement
 - 3.13 Explain end Statement
 - 3.14 Describe Logic of Basic program
 - 3.15 Describe running a Basic Program
 - 3.16 Describe saving & retrieving Basic Program

3.17 Describe some Advance features of Basic program

4. UNDERSTAND WORD PROCESSING SESSION

- 4.1. Describe word-processing
- 4.2 Name command to be entered on Dos-prompt to load word-processor
- 4.3 Identify initial screen
- 4.4 Describe the command to open a document
- 4.5 Describe the procedure for naming the document
- 4.6 Explain importance of giving extension to a document
- 4.7 Describe saving and retrieving a document
- 4.8 Explain importance of saving the work at regular intervals
- 4.9 State temporarily Ending word-processing session & document retrieval
- 4.10 State procedure to re-enter word processor
- 4.11 State procedure to re-open the document and editing
- 4.12 Describe spell-check facility
- 4.13 Describe Margins & Tab Setting
- 4.14 Describe to align paragraph
- 4.15 Describe Re-editing techniques
- 4.16 Describe procedure to set-up printer
- 4.17 Describe command for printouts
- 4.18 Explain multiple-copy printout procedure
- 4.19 Explain some advance features
- 4.20 Describe procedure of condensed printing
- 4.21 Describe procedure for change of fonts

5.UNDERSTAND PROGRAMMING INSTRUCTIONS FOR COMPUTER GRAPHIC IN BASIC LANGUAGE

- 5.1Identify graphic fundamentals in basic language
- 5.2Explain to draw points and lines
- 5.3Explain to draw dot in space
- 5.4Explain to draw lighting blot
- 5.5Explain to draw shapes
- 5.6Explain to draw expanding circles and rectangles

Comp-122COMPUTER APPLICATIONS

LIST OF PRACTICALS

96 hours

DOS

- 1 Identify key board, mouse, CPU, disk drives, disks, monitor & printer
- 2 Practice for booting up of a computer system with DOS system disk and power off system at DOS prompt
- 3 Practice for CLS, VER, VOL, DATE & TIME commands
- 4 Practice for COPY, REN commands
- 5 Practice for DEL, TYPE, PATH, PROMPT, COPY CON, MD, CD, RD commands
- 6 Practice of the practicals at S. No. 3, 4, 5
- 7 Practice for FORMAT command with /s, /4, /u switches
- 8 Practice for DISKCOPY, DISKCOMP commands
- 9 Practice for SCANDISK, XCOPY, DELTREE, TREE, LABEL commands
- 10 Practice for PRINT, UNDELETE commands
- 11 Practice for the practicals at S. No. 8, 9, 10, 11
- 12 Practice for creating a batch file

BASIC

- 1 Practice for loading & unloading BASIC software and identify role of function keys in Basic
- 2 Identify role of various keys in continuation with ALT key in BASIC programming
- 3 Practice for CLS, LOAD, SAVE, FILE, RENUM command by loading any existing BASIC Program
- 4 Practice for editing any existing BASIC Program
- 5 Prepare BASIC Program to display sum of two numbers using INPUTS
- 6 Prepare BASIC Program to display sum of two numbers using READ-DATA
- 7 Prepare BASIC Program to multiply two numbers
- 8 Prepare BASIC Program to calculate Area of Rectangle, when length and width are given
- 9 Prepare BASIC Program to calculate area of a circle when radius/diameter is given
- 10 Prepare very simple BASIC Programs using IF-THEN-ELSE and FOR-NEXT statement
- 11 Identify DIM statement
- 12 Practice for LPRINT statement for various Programs hard-copy output

WORD PROCESSING

- 1 Practice for loading & unloading a word processor
- 2 Practice for creating document & saving it
- 3 Practice for spell-check facility of the word-processor
- 4 Practice for editing an existing document
- 5 Practice for various word-processing Menu Options
- 6 Practice for printing a document
- 7 Practice for margin and TAB setting and document alignment
- 8 Practice for some advance features

CHT-153 BASIC CHEMICAL ENGINEERING

T	P	C
2	3	3

TOPICS.

1 UNITS AND DIMENSIONS

- 1.1 Primary and Secondary quantities
- 1.2 Dimensions of Secondary quantities
- 1.3 System of Measurement
- 1.4 Units and their conversion

Conversion of units of following quantities into English/Metric system.

Pressure
Viscosity
Density
Force
Energy
Work
Gas constant

- 1.5 Dimensional and Dimension less formula.

2 GRAPH, TYPES OF GRAPH.

- 2.1 Drawing simple graph.

3 PRODUCTION OF LOW TEMPERATURE BY REFRIGERATION

- 3.1 Definition, methods of refrigeration
- 3.2 Refrigerant and their properties
- 3.3 Application of Refrigeration
- 3.4 Schematic diagram of Refrigeration
- 3.5 Working Principle of refrigerator

4 PIPE AND TUBES

- 4.1 Type of pipes
- 4.2 Cast iron pipe, wrought iron pipe, steel pipe Aluminium pipes, plastic pipe, Rubber pipes.
- 4.3 Pipe standards.
- 4.4 Pipe fitting
- 4.5 Types of valves
- 4.6 Construction, working and application of gate valve, globe valve ball valve, plug cock.

5 STEAM TRAP AND THEIR TYPES

Bucket trap, expansion trap, inverted bucket trap,
Impulse trap.

6 THERMAL INSULATION,

- 6.1 Insulating material, properties and uses.
- 6.2 Insulation technique for steam pipes and vessels.
- 6.3 Insulation technique for low temperature pipes

7 SYMBOLS

- 7.1 Symbols for fitting
- 7.2 Symbols for equipments

8 PETROLEUM TESTS

8.1 Flash point, Aniline point, pour point, cloud point, Diesel index, sedimentation Number

8.2 Octane number, Cetane number

9 INTRODUCTION TO PHOTOCOPYING

REFERENCE BOOKS

Manual for basic chemical Engineering

Introduction to chemical Engineering by Walter L Bedger and
Julims T Bencharo

Introduction to chemical Engineering by Little John

CHT-153 BASIC CHEMICAL ENGINEERING

INSTRUCTIONAL OBJECTIVES

1. UNITS AND DIMENSION

- 1.1. The students will know the primary and secondary quantities.
 - 1.1.1 Define primary quantity and secondary quantity.
 - 1.1.2 Give examples of primary quantities and secondary quantities.
- 1.2 Understand Dimensions of secondary Quantities.
 - 1.2.1 Explain the secondary quantities in terms of primary quantities.
 - 1.2.2 Write the dimension of secondary quantities.
- 1.3 Understand the Systems of Measurement.
 - 1.3.1 Name different systems of measurement.
 - 1.3.2 Name basic quantities of each system.
 - 1.3.3 Develop dimensions of derived quantities in each system.
- 1.4 Understand units and their conversions.
 - 1.4.1 Develop units to measure the derive quantities in different systems.
 - 1.4.2 Define different units used.
 - 1.4.3 Convert the units of one system into the other system.
- 1.5 Understand Dimensional and Dimensionless Formula.
 - 1.5.1 Differentiate between dimensional formula and dimensionless formula.
 - 1.5.2 Check the dimension of an engineering formula. Like Reynold Number Potential Energy. Kinetic energy.

2. GRAPH

- 2.1 Understand the concept of graph.
 - 2.1.1 Define graph.
 - 2.1.2 Explain the types of graph.
- 2.1.3 Give comparison between tabular and graphic representation of data.
- 2.2 Understand the method of Drawing Simple Graph.
 - 2.2.1 Explain the steps necessary to draw a graph.
 - 2.2.2 Draw a simple graph.
 - 2.2.3 Note the end point from a graph.
 - 2.2.4 Take reading from a graph.
 - 2.2.5 Make extrapolation and interpolation on a graph.

3. PRODUCTION OF LOW TEMPERATURE BY REFRIGERATION.

- 3.1 Know the Methods of refrigeration.
 - 3.1.1 Define the refrigeration.
 - 3.1.2 Name different methods of refrigeration based on the refrigeration used.
 - 3.1.3 Compare different methods of REFRIGERATION.

- 3.2 Understand Refrigeration and their properties.
 - 3.2.1 Define the refrigerant.
 - 3.2.2 Name different refrigerants used in the field.
 - 3.2.3 Enlist the properties of a good refrigerant.
- 3.3 Understand application of refrigeration
 - 3.3.1 Give domestic application of refrigeration.
 - 3.3.2 Give industrial application of refrigeration.
- 3.4 Understand Schematic diagram of refrigeration.
 - 3.4.1 Draw a schematic diagram of refrigeration.
 - 3.4.2 Explain the function of each component in the diagram.
- 3.5 Understand working principle of refrigeration.
 - 3.5.1 Explain working principle of single fluid refrigerator.
 - 3.5.2 Explain working principle of two fluid refrigeration.

4. PIPES AND TUBES

- 4.1 Know the types of pipes.
 - 4.1.1 Enlist the types of pipes used by chemical industries.
 - 4.1.2 Give the field of applications of different types of pipes used
 - 4.1.3 Give characteristics of different types of pipes used by chemical engineer.
- 4.2 Apply the pipe standards.
 - 4.2.1 Understand the concept of schedule Nos used for pipe.
 - 4.2.2 Select the schedule No according to the pipe duty (Pressure).
- 4.3 Understand pipe fittings.
 - 4.3.1 Define pipe fittings.
 - 4.3.2 Enlist the different pipe fitting used.
- 4.3.3 Explain the functions of different pipe fittings used in chemical industries.
- 4.4 Know the types of valves.
 - 4.4.1 Define valve.
 - 4.4.2 Enlist the types of a valves.
- 4.5 Understand construction and working of valves
 - 4.5.1 Explain the construction and working of gate value
 - 4.5.2 Explain the construction and working of globe value.
 - 4.5.3 Explain the construction and working of ball value
 - 4.5.4 Select a proper valve according to need

5. STEAM TRAP

- 5.1 Know the steam trap
 - 5.1.1 Explain the function of steam trap
 - 5.1.2 Enlist the types of steam traps
- 5.2 Understand different types of Traps
 - 5.2.1 Explain the construction and working of bucket trap

- 5.2.2 Explain the construction and working of inverted Bucket trap
- 5.2.3 Explain the construction and working of expansion trap
- 5.2.4 Explain the construction and working of impulse trap

6. THERMAL INSULATION

- 6.1 Understand insulating materials, properties and uses
 - 6.1.1 Define thermal insulation
 - 6.1.2 Explain the need of thermal insulation
 - 6.1.3 Enlist the insulating materials used in chemical industry
 - 6.1.4 Enlist the properties of a good insulating material

- 6.2 Apply the insulation technique for steam pipes and valves
 - 6.2.1 Explain the method of steam pipe insulation (lagging)
- 6.2.2 Calculate the thickness of insulation layer on steam pipe by using the formula ($q=KADT$)
- 6.3 Understand insulation technique for low temperature pipes
 - 6.3.1 Decide the nature of insulation material for low temperature pipes
 - 6.3.2 Explain the method of pipe insulation

7. SYMBOLS

- 7.1 Understand symbols of fittings
 - 7.1.1 Read symbols of fittings
 - 7.1.2 Draw symbols to represent different fittings

- 7.2 Understand symbols for equipments
 - 7.2.1 read symbols of equipments
- 7.2.2 Draw symbols to represent different equipments and vessels of chemical engineering

8. PETROLEUM TEST

- 8.1 Understand different tests of petroleum
 - 8.1.1 Understand the importance of petroleum testing
- 8.1.2 Define flash point, Aniline point pour point and cloud point
- 8.1.3 Explain procedure to perform above tests for petroleum sample
 - 8.1.4 Define diesel index
 - 8.1.5 Explain procedure to find diesel index
 - 8.1.6 Define sedimentation number
 - 8.1.7 Explain method to note sedimentation No
 - 8.1.8 Define octane number and cetane number

9. INTRODUCTION TO PHOTOCOPYING

- 9.1 Understand the photocopying
 - 9.1.1 Explain the concept of photocopying
 - 9.1.2 Explain the methods of photocopying
- 9.1.3 Enlist the precautions to be observed while operating a photocopier

CHT. 153 BASIC CHEMICAL ENGINEERING.

LIST OF PRACTICALS

- 1 Calculation of dimensions of different secondary quantities.
- 2 Determination of units of different quantities in different measuring systems.
- 3 Conversion of units in different systems
- 4 Drawing of simple graph.
- 5 Graph reading
- 6 Production of low temperature by use of refrigerant, study of refrigerator/Deepfreezers.
- 7 Pipe cutting
- 8 Pipe Threading
- 9 Pipe fittings
- 10 Installation of valves
- 11 Insulation of steam traps
- 12 Insulation of steam pipe lines
- 13 Demonstration of Flash point
 - a Aniline point
 - b Pour point
 - c Cloud point
 - d Diesel index
- 18 Study of Photo copy machine, Photocopying practice
- 19 Preparation of Transparencies.

OBJECTIVES

- 1 To present the students the principles of General chemistry.
- 2 To develop understanding of the scientific methods as applied to the development of laws of chemistry.
- 3 To prepare the students for advance Laboratory Work.
- 4 To present the basic knowledge of Metallurgy to the students.

TOPICS COURSE OUTLINES

1 CONCEPT OF CHEMISTRY

- 1.1 Language of Chemistry
- 1.2 Molecular formula, Empirical formula
- 1.3 Chemical Equation

2 CHEMICAL LAWS

- 2.1 Law of conservation of mass, Law of constant proportion and their problems.
- 2.2 Law of Reciprocal proportion, Law of multiple proportion and their problems.

3 ATOMIC STRUCTURE

- 3.1 Passage of electricity through electrolytes solution and gases.
- 3.2 Rutherford atomic model and its defects.
- 3.3 Plank's theory, different types of spectrum and Bohr's theory, Defects in Bohr's theory.
- 3.4 Calculation of Energy, Raduis and ware number.
- 3.5 Frequency of Electron by Bohr's atomic model.

4 CHEMICAL BOND

- 4.1 Ionic Bond
- 4.2 Covalent bond, definition with examples in each case.
- 4.3 Ionization Potential, Electron Affinity.
- 4.4 Electronegativity and Bond Energy.
- 4.5 Co-ordinate coralent Bond, sigma and --- Bond definition with example in each
- 4.6 NY bradization, structure of CH₄, H₂O and NH₃ etc.

5 GASES

- 5.1 Behavior of gases, Kinetic theory of gases.
- 5.2 Boyle's and Charles law, General gas equation solution of problems (concerning gas laws)
- 5.3 Grahm's law of diffusion Dalton's law of partial pressure and Gay Lussac law.

6 LIQUIDS

- 6.1 Properties of liquid viscosity its measurement.
- 6.2 Surface tension and its measurement.

7 SOLIDS

- 7.1 Preparation and properties of solid.
- 7.2 Classification of solid classification of crystal Lattice Energy.

8 SOLUTION

- 8.1 Solution Types of solution units.
- 8.2 Ideal and non ideal solution

9 OXID

- 9.1 Oxidation and reduction Important oxidising and reducing agents.
- 9.2 Balancing of equation by oxidation number method.

10 WATER

- 10.1 Sources impurities of water causes of hardness.
- 10.2 Hard and soft water, removal of permanent and temporary hardness.

11 ALLOYS DEFINITION AND CHEMISTRY

- 11.1 Composition properties and uses of stainless steel.
- 11.2 German silver Bronze.
- 11.3 Nichrom and Amalgam.
- 11.4 Bell metal and solder.

12 ACID AND BASE

- 12.1 Concept of acid and base properties of acid of base.
- 12.2 Strong and weak acid and base examples.
- 12.3 Basicity and acidity.

13 SALT

- 13.1 Salt types.
- 13.2 Examples of types of salts

14 METALS

- 14.1 Difference between metal and non metal.
- 14.2 General methods of purification of ores.

15 IRON ORES, IRON PURIFICATION

- 15.1 Manufacture of pig iron from blast furnace.
- 15.2 Manufacture of steel and its uses.

16 COPPER

- 16.1 Ores Extraction
- 16.2 Refining and uses of copper.

17 ALUMINIUM

17.1 Ores and Extraction and uses.

18 CHROMIUM

18.1 Ores Extraction uses.

TEXT AND REFERENCE BOOKS

- 1 Chemistry part I for class XI
- 2 Chemistry part II for class XII
recommended by the text book Board Punjab.
- 3 Practical chemistry for Intermediate classes.

INSTRUCTIONAL OBJECTIVES.**1. CONCEPT OF CHEMISTRY.**

- 1.1 Understand language of chemistry 2. HRS
 - 1.1.1 Give symbols of various elements
 - 1.1.2 Describe valency
 - 1.1.3 Explain radicals
- 1.2 Write molecular formula and empirical formula 1. HRS
 - 1.2.1 Write molecular formula of different compounds
 - 1.2.2 Write empirical formula of different compounds
- 1.3 Understand chemical equation 2. HRS
 - 1.3.1 Write skeleton equation
 - 1.3.2 Balance chemical equation by hit and trial method
 - 1.3.3 Balance chemical equation by partial equation method
 - 1.3.4 Balance chemical equation by ionic method

2 TOPIC CHEMICAL LAWS

- 2.1 Understand law of conservation of mass and law of constant proportion
 - 2.1.1 State law of conservation of mass
 - 2.1.2 State law of constant proportion
 - 2.1.3 Solve the problem based on law of constant proportion
- 2.2 Understand law of reciprocal proportion and law of multiple proportion
 - 2.2.1 State law of reciprocal proportion
 - 2.2.2 State law of multiple proportion
 - 2.2.3 Solve problems based on law of multiple proportion

3 ATOMIC STRUCTURE

- 3.1 Understand passage of electricity through electrolytic solution
 - 3.1.1 Name the particles of atoms
 - 3.1.2 Describe discovery of electron
 - 3.1.3 Describe discovery of proton
 - 3.1.4 Explain discovery of neutron
- 3.2 Understand Rutherford's model atom and Bohr's atom
 - 3.2.1 Enlist theories of atom
 - 3.2.2 Describe Rutherford's model atom
 - 3.2.3 Tell defects in Rutherford's model atom
- 3.3 Understand Planck's theory
 - 3.3.1 Illustrate Planck's theory
 - 3.3.2 Enlist defects in Planck's theory
 - 3.3.3 Define band spectrum
 - 3.3.4 Define line spectrum
 - 3.3.5 Explain Bohr's theory of atom
 - 3.3.6 Give arrangement of electrons in Bohr's atom

- 3.3.7 Enlist postulates of Bohr's theory
- 3.4 Understand energy of atom 1. HRS
 - 3.4.1 Define wave number
 - 3.4.2 Calculate energy of atom
- 3.5 Understand frequency of electron 1. HRS
 - 3.5.1 Define frequency of electron
 - 3.5.2 Calculate frequency of electoral

4. CHEMICAL BOND

- 4.1 Understand ionic bond 2. HRS
 - 4.1.1 Define ionic bond
 - 4.1.2 Illustrate ionic compounds
 - 4.1.3 Enlist ionic compounds
- 4.2 Understand covalent bond 3. HRS
 - 4.2.1 Explain covalent bond
 - 4.2.2 Define single bond and give examples
 - 4.2.3 Illustrate double bond and give examples
 - 4.2.4 Describe triple bond and give examples
 - 4.2.5 Describe covalent compounds
 - 4.2.6 Name covalent compounds
- 4.3 Know ionization potential 2. HRS
 - 4.3.1 Define ionization potential
 - 4.3.2 Illustrate electron affinity
 - 4.3.3 Give ionization potential of different atoms
- 4.4 Know electro negativity 2. HRS
 - 4.4.1 Explain electro negativity
 - 4.4.2 Define bond energy
 - 4.4.3 Give example of electro negativity
- 4.5 Understand co ordinate bond
 - 4.5.1 Describe co ordinate bond
 - 4.5.2 Understand hybridization
 - 4.5.3 Describe hyridization
- 4.6 Give example of Sigma bond
 - 4.6.1 Distinguish between Sigma and pie bond
 - 4.6.2 Illustrate structure of different hybridized atom

5 GASES

- 5.1 Understand behaviour of gases 1. HRS
 - 5.1.1 Explain kinetic theory of gases
 - 5.1.2 Describe temperature effect on gases
- 5.2 Understand gas laws 2. HRS
 - 5.2.1 State boyel's law
 - 5.2.2 State charler law
 - 5.2.3 Describe absolute temperature
 - 5.2.4 Derive gas equation
 - 5.2.5 Solve problem based on gas equation
 - 5.2.6 State Graham's law of diffusion
 - 5.2.7 Explain dalton's law of partial pressure
 - 5.2.8 State gay lussanc law
 - 5.2.9 Solve problems based on graham's low of diffusion

5.2.10 Solve problems based on gay lssac's law

6 LIQUIDS

- 6.1 Understand properties of liquids 2. HRS
 - 6.1.1 Define viscosity
 - 6.1.2 Give units of viscosity in different systems
 - 6.1.3 Enlist methods of measurement of viscosity
 - 6.1.4 Explain measurement of viscosity by ostwald's viscometer
 - 6.1.5 Describe temperature effect on viscosity
- 6.2 Understand surface tension 2. HRS
 - 6.2.1 Describe surface tension
 - 6.2.2 Name the units of surface tension
 - 6.2.3 Enlist methods for the measurement of surface tension.
 - 6.2.4 Explain measurement of surface tension by torsion balance.

7. SOLID

- 7.1 Understand properties of solids.
 - 7.1.1 Enlist the properties of solids
 - 7.1.2 Explain density
 - 7.1.3 Give units of density
 - 7.1.4 Give effect of temperature on volume.
 - 7.1.5 Define amorphous state
 - 7.1.6 Explain colloidal state.
 - 7.1.7 Distinguish amorphous state, collridal state and solid state.
- 7.2 Understand crystal habits.
 - 7.2.1 Name types of crystals
 - 7.2.2 Define crystal lattice.

8. SOLUTION

- 8.1 Understand types of solution
 - 8.1.1 Name of types of solution
 - 8.1.2 Give example of different type of solution
 - 8.1.3 Enlist the units used for the coricentration of sol
 - 8.1.4 Know ideal and no ideal solution
- 8.2 Know ideal and no ideal solution.
 - 8.2.1 Give examples of ideal solution
 - 8.2.2 Distinguish between ideal solution and non ideal solution

9. OXIDATION, REDUCTION

1. HRS

- 9.1 Understand oxidation and reduction.
 - 9.1.1 Describe oxidation with examples
 - 9.1.2 Describe reduction with examples
 - 9.1.3 Enlist oxidizing agent
 - 9.1.4 Name reducing agent.
- 9.2 Understand balancing equation by oxidation number

- 9.2.1 Calculate oxidation number of an element in a compound.
- 9.2.2 Balance the equation.

10. UNDERSTAND WATER.

- 10.1.1 Enlist water sources
- 10.1.2 name the impurities of water
- 10.1.3 Explain causes of hardness..
- 10.1.4 Define hard water
- 10.1.5 Describe soft water.
- 10.1.6 Explain causes of harshness.
- 10.1.7 Explain removal of permanent hardness by different methods.
- 10.1.8 Explain removal of temporary hardness by different methods.

11. ALLOYS

- 11.1 Know composition of alloys
 - 11.1.1 Define alloys
 - 11.1.2 Give examples of alloys with their composition
 - 11.1.3 Enlist general properties of alloys
 - 11.1.4 Give uses of alloys.
- 11.2 Know German silver and bronze
 - 11.2.1 Give composition of German silver.
 - 11.2.2 Give composition of bronze
 - 11.2.3 Enlist uses of German silver.
 - 11.2.4 Give uses of bronze
- 11.3 Know Nichrom and Amalgam
 - 11.3.1 Give the composition of Nick Rom
 - 11.3.2 Enlist uses of Nick Rom
 - 11.3.3 Define amalgam
- 11.4 Know bell metal and solder.
 - 11.4.1 Give composition of bell metal
 - 11.4.2 Define solder
 - 11.4.3 Give composition of solder
 - 11.4.4 Enlist uses of bell metal
 - 11.4.5 Give uses of solder

12. ACID AND BASE

- 12.1 Understand properties of acid and base
 - 12.1.1 Define acid
 - 12.1.2 Distinguish between acid and base
 - 12.1.3 Describe general properties of acids
 - 12.1.4 Explain in general properties of bases.
- 12.2 Understand strong and week acid
 - 12.2.1 Give examples of strong acid
 - 12.2.2 Enlist examples of weak acid
 - 12.2.3 Distinguish between strong and weak acid
- 12.3 Know acidity and basicity
 - 12.3.1 Define acidity.
 - 12.3.2 Define basicity

12.3.3 Calculate acidity and basicity.

13 SALT

- 13.1 Understand types of salts 2. HRS
 - 13.1.1 Define salt
 - 13.1.2 Name types of salt
 - 13.1.3 Explain mental salt with examples
 - 13.1.4 Explain acidic salt with examples
 - 13.1.5 Explain basic salt with examples
 - 13.1.6 illustrate double salt with examples
 - 13.1.7 Distinguish between double salt and complex salt

14 METAL

- 14.1 Understand metals 1. HRS
 - 14.1.1 Define metals
 - 14.1.2 Give examples of materials
 - 14.1.3 Differentiate metals and non metals
- 14.2 Understand purification of ores 2. HRS
 - 14.2.1 Define ores
 - 14.2.2 Name impurities of ores
 - 14.2.3 Enlist methods of purification of ores
 - 14.2.4 Explain different methods of purification of ores
- 14.3 Understand methods of extraction of metals 1. HRS
 - 14.3.1 Name methods of extraction of metals
 - 14.3.2 describe different methods of extraction

15 IRON

- 15.1 understand iron purification 1. HRS
 - 15.1.1 List ores of iron
 - 15.1.2 Name impurities of iron ores
 - 15.1.3 List steps involed in the purification of iron
- 15.2 Understand manufacture of pig iron 2. HRS
 - 15.2.1 Define pig iron
 - 15.2.2 Name the furnaces used for manufacture of pig iron
 - 15.2.3 List the material required for melting of pig iron
 - 15.2.4 Explain reactions of blast furnace
- 15.3 Understand manufacture of steel 1. HRS
 - 15.3.1 Enlist types of steel
 - 15.3.2 Give composition of steel
 - 15.3.3 Describe manufacture of steel

16 COPPER

- 16.1 Understand extractijon of copper 2. HRS
 - 16.1.1 Enlist ores of copper
 - 16.1.2 Name the extraction methods of copper
 - 16.1.3 Name equipment used for extraction of copper
 - 16.1.4 Describe copper extraction
- 16.2 Understand copper refining and uses of copper 1. HRS
 - 16.2.1 Explain refining of copper
 - 16.2.2 Enlist of copper

17. ALUMINIUM

- 17.1 Understand extraction of aluminium 1. HRS
17.1.1 List ores of aluminium
17.1.2 Name methods of aluminium extraction
17.1.3 Explain electrolysis of bauxite
17.1.4 Give the uses of aluminium

18 CHROMIUM

- 18.1 Understand chromium extraction 1. HRS
18.1.1 Enlist chromium ores
18.1.2 Describe chromium extraction
18.1.3 Name alloys of chromium
18.1.4 Enlist use of chromium

BOOKS RECOMMENDED

1. Chemistry part-I (for F.Sc students) by Dr. K.M. Ibne Rasa
Dr. M. Afzal
2. Practical chemistry for intermediate class.

LIST OF PRACTICALS.

Salt Analysis
Acidic Radicals
Dilute Acid Group
Concentrated Acid Group
Special Group
BASIC RADICALS
IST group Radicals
IIND group Radicals
 2nd A
 2nd B
IIIRD Group Radicals
4th Group Radicals
5th Group Radicals
6th Group Radicals
ANALYTICAL BALANCE WEIGHING TECHNIQUES
SEPARATION OF SALTS BY
 Sublimation process
 Filtration process
 Settlement process
PRACTICAL NOTE BOOK
SALT ANALYSIS SCHEME

MT-143 BASIC ENGINEERING DRAWING & CAD-I

T	P	C
1	6	3

Total contact hrs.

Theory 32
Practicals 192

Pre-requisite: None

AIMSAt the end of this course the students will be able to understand the fundamentals of engineering drawing used in the various fields of industry specially in the Mechanical Technology. The student will be familiarized with the use of conventional drawing instruments as well as the modern technology used for this subject. The CAD portion of the subject will provide the student the knowledge & use of computer in the subject of Engineering Drawing.

COURSE CONTENTS

PART-A ENGINEERING DRAWING

- 1. USES AND APPLICATIONS OF TECHNICAL DRAWING 1 Hours**
 - 1.1 Technical drawing and the technician.
 - 1.2 Use of technical drawing.
 - 1.3 Common drawing forms.
 - 1.4 Application of drawing forms.
 - 1.5 Practices and conventions.

- 2. DRAWING TOOLS AND ACCESSORIES. 2 Hours**
 - 2.1 Drawing pencil
 - 2.2 Drawing papers specifications
 - 2.3 Drawing Instruments
 - 2.4 Use and care of drawing instruments and material.

- 3. ALPHABET OF LINES USED IN DRAWING 2 Hours**
 - 3.1 Importance the alphabet of lines.
 - 3.2 Common alphabet of lines
 - 3.3 Uses and correct line weightage of the line.
 - 3.4 Application of line

- 4. LETTERING. 2 Hours**
 - 4.1 Importance of good lettering.
 - 4.2 Single stroke of gothic.
 - 4.3 Letter strokes.
 - 4.4 Letter guide lines.
 - 4.5 Vertical single stroke gothic
 - 4.6 Inclined single stroke gothic
 - 4.7 Composition of lettering

- 5. DRAWING LINES TECHNOLOGY 2 Hours**

- 5.1 Introduction to sketching techniques
 - 5.2 Sketching lines
 - 5.3 Sketching circles and arcs
 - 5.4 Sketching ellipse.
 - 5.5 Sketching views of objects
- 6. GEOMETRICAL CONSTRUCTIONS 2 Hours**
- 6.1 Introduction to geometry
 - 6.2 Definition of terms
 - 6.3 Different conventional shapes, surfaces and objects
 - 6.4 Basic geometrical construction
 - 6.5 Construction, ellipse, parabola
 - 6.6 Involute and cycloids
- 7. INTRODUCTION TO MULTI-VIEW PROJECTIONS 3 Hours**
- 7.1 Definition and concept of multi-view drawings
 - 7.2 Proceptual vies of plan of projections
 - 7.3 Orthographic projections
 - 7.4 1st angle and 3rd angle projections
 - 7.5 Principal views
 - 7.6 Arrangement of views
 - 7.7 Multi-view drawings
- 8. INTRODUCTION TO PICTORIAL DRAWINGS. 2 Hours**
- 8.1 Uses of pictorial
 - 8.2 Three types of pictorial views
 - 8.3 Isometric sketching of rectangular block
 - 8.4 Isometric sketching of Arcs and circles
 - 8.5 Oblique sketching of rectangular block
 - 8.6 One point perspective sketching of a rectangular block.
 - 8.7 Two point perspective sketching of a rectangular block.
 - 8.8 Preparation of pictorial drawings of simple objects.
- 9. BASIC DIMENSIONING. 2 Hours**
- 9.1 Definition of dimensioning.
 - 9.2 Types of dimensioning.
 - 9.3 Elements of dimensioning.
 - 9.4 System of measurements.
 - 9.5 Dimensioning multi-view drawings.
 - 9.6 Dimensioning pictorial views.
 - 9.7 Dimensioning rules and practices.
 - 9.8 Notes and specification
- 10. SECTIONING AND SECTIONAL VIEWS. 2 Hours**
- 10.1 Definition and purpose.
 - 10.2 Cutting planes position and cutting plane lines
 - 10.3 Types of sectional views.
 - 10.4 Conventional section lines of different materials.
 - 10.5 Practice sectioned views.

- 11. MULTI-VIEW DRAWING OF MACHINE ELEMENTS** **2 Hours**
11.1 Terminology and drawing of rivets and riveted joints
11.2 Terminology and drawing of screw threads
11.3 Terminology and drawing of keys and cotters
11.4 Description and drawing of simple bearings
11.5 Describe and drawing of simple coupling

PART-B : CAD-I

- 12. CAD FUNDAMENTALS** **2 Hours**
12.1 CAD & its importance
12.2 Purposes
12.3 Advantages

- 13. CAD SOFTWARE** **2 Hours**
13.1CAD Abbreviations
13.2CAD Help
13.3Co-ordinate systems

- 14. BORDER TEMPLATE** **2 Hours**
14.1Drawing area
14.2 SNAP & GRID
14.3Pedit & Qsave

- 15.TITLE BLOCK** **2 Hours**
15.1Change Command
15.2Layer creation
15.3Zooming
15.4Typefaces of CAD
15.5Plotting

- 16.LINES & CIRCLES** **2 Hours**
16.1Dedit
16.2Analyzed line drawing
16.3U & Redo command
16.4Drawing a circle

RECOMMENDED BOOKS:

1. Engineering drawing by French Wirk
- 2.ABC's of Auto CAD Release-12 by Alan R Miller

MT-143 BASIC ENGINEERING DRAWING & CAD-I

INSTRUCTIONAL OBJECTIVES

SECTION-I ENGINEERING DRAWING

1. USES AND APPLICATIONS OF TECHNICAL DRAWING

1.1 Know the uses of Technical Drawing

1.1.1 Describe the importance of Technical Drawing from the point of view of a Technician

1.1.2 Explain the main uses of Technical Drawing from the point of view of a Technician

1.2 Recognizes the different application of Technical drawing

1.2.1 Identify commonly used drawing forms

1.2.2 Illustrate the different drawing forms

1.2.3 Differentiate different drawing forms

1.2.4 Develop Technical vocabulary

2. KNOW THE COMMON DRAWING TOOLS AND ACCESSORIES

2.1 Identify the uses of different pencils for Technical Drawing.

2.2 Identify different paper sizes for drawing.

2.3 Identify different types of papers suitable for drawing.

2.4 Identify different types of erasers and their uses.

2.5 Maintain a well sharpened pencil for drawing.

2.6 Describe the drawing instruments.

2.7 State the use of drawing instruments.

3. UNDERSTAND THE IMPORTANCE OF ALPHABET, CORRECT WEIGHTAGE AND APPLICATION OF LINES USES IN TECHNICAL DRAWING.

3.1 Knows the importance of lines.

3.2 Knows the Alphabet of lines.

3.3 Identify the lines characteristics of each alphabet of lines.

3.4 Draw horizontal, vertical and inclined lines

3.5 Draw a line with correct weightages

4. APPLIES THE GOOD LETTERING IN A DRAWING

4.1 Know the importance of lettering in a Technical engineering drawing.

4.2 Identify the letter style used in Technical drawing.

4.3 State letter strokes and guide lines.

4.4 Perform better stroke in single stroke gothic.

4.5 Print vertical single stroke letters and numbers.

4.6 Print inclined single stroke letters and numbers.

4.7 Observe stability and pleasing appearance of letters in printing

5. UNDERSTAND SELECTING OF CIRCLES, ARCS, AND VIEWS OF OBJECTS.

5.1 Draw a circle and an arc using circular line method.

5.2 Draw a circular arc using square method.

5.3 Draw an ellipse using rectangular method.

5.4 Draw views of simple objects.

6. APPLY DRAWING SKILL WITH THE AID OF DRAWING INSTRUMENTS IN GEOMETRICAL CONSTRUCTION

- 6.1 Define common terms used in geometrical construction.
- 6.2 Explain different geometrical shapes, surfaces of objects.
- 6.3 Draw basic geometrical construction.
- 6.4 Draw involute, cycloid, spiral, tangent to circle and arc

7. UNDERSTAND THE MULTI VIEW OF PROJECTIONS SPECIFIC OBJECTIVE

- 7.1 Define the concept of multi-view drawings.
- 7.2 Knows principle planes of projections.
- 7.3 Knows the orthographic method of projection.
- 7.4 Explain the 1st and 3rd angle projections.
- 7.5 State six principle views.
- 7.6 Practice multi-view projections.

8. APPLY THE USE, TYPES AND METHODS OF PICTORIAL VIEWS

- 8.1 Knows the use of pictorial views.
- 8.2 Knows the pre-requisite of pictorial drawing.
- 8.3 State three types of pictorial drawings.
- 8.4 Draw isometric view of rectangular Blocks, Arcs, circles.
- 8.5 Draw oblique sketching of rectangular blocks.
- 8.6 Draw one-point perspective view of a Rectangular block.
- 8.7 Draw Two point perspective view of a rectangular block.
- 8.8 Prepare/draw pictorial drawings of simple objects.

9. APPLY GOOD DIMENSIONING ON MULTIVIEWS AND PICTORIALS.

- 9.1 Define dimensioning.
- 9.2 Identify the types of dimensioning.
- 9.3 Enlist the elements of dimensioning.
- 9.4 Identify the system of measurements.
- 9.5 Indicate complete dimension on multi view drawings.
- 9.6 Indicate complete dimension on pictorial drawings.
- 9.7 Follow the general rules for dimensioning.
- 9.9 Indicate notes and specification on multiview drawings.

10. APPLY THE SECTIONING METHODS OF MATERIAL AND DRAW SECTIONAL VIEWS.

- 10.1 Define sectioning and its purpose.
- 10.2 Describe cutting planes and lines.
- 10.3 State types of sectional views.
- 10.4 Explain conventional section lines of different materials.
- 10.5 Practice sectioning.

11. APPLY DRAWING METHODS TO DRAW MULTIVIEWS OF MACHINE ELEMENTS.

- 11.1 Draw multiviews of vee-block.
- 11.2 Draw multiviews of Gland
- 11.3 Draw keys & cotters.
- 11.4 Draw Multi views of simple bearing.

SECTION-II COMPUTER AIDED DESIGN.

12. UNDERSTAND CAD FUNDAMENTALS.

- 12.1 Define CAD.
- 12.2 Describes importance of CAD.
- 12.3 States purpose of CAD.
- 12.4 Explain advantages of CAD.
- 12.5 Establish importance of CAD usage in industry.

13. UNDERSTAND CAD SOFTWARE.

- 13.1 Describe computer system requirements for CAD (e.g Auto CAD release 12 or latest).
- 13.2 State procedure of giving command to CAD.
- 13.3 State CAD (e.g autocad rel. 12 or latest) abbreviations.
- 13.4 State use of function keys.
- 13.5 Describe procedure of giving commands with a mouse.
- 13.6 Explain procedure of getting general help for a specific command.
- 13.7 Explain drawing cursor and coordinate read out.
- 13.8 Explain cartesian notion.
- 13.9 Explain polar notation.

14. UNDERSTAND BORDER TEMPLATE OF A DRAWING.

- 14.1 Describe setting up of drawing area.
- 14.2 Describe setting of displayed digits.
- 14.3 Explain changing the drawing limits.
- 14.4 Explain use of grid system (auto rel-12 or latest).
- 14.5 Explain adjustment of drawing scale.
- 14.6 Explain procedure of drawing line with line command.
- 14.7 Explain P-edit command for widening boarder.
- 14.8 Explain procedure of saving boarder template.

15. UNDERSTAND ADDING A TITLE BLOCK TO THE BORDER DRAWING.

- 15.1 Describe checking the drawing time.
- 15.2 Explain Change command.
- 15.3 Explain creation of layer for title block.
- 15.4 Explain procedure of creating a title block.
- 15.5 Explain Zoom command.
- 15.6 Explain importance of saving a drawing.
- 15.7 Explain use of CAD (Autocad R-12 or latest).
- 15.8 Explain filling in the title block by writing drawing title, name etc.
- 15.9 Explain procedure of plotting drawing on a plotter or printer.
- 15.10 Explain Qsave command.

16. UNDERSTAND DRAWING LINES AND CIRCLES.

- 16.1 State beginning of a new drawing.
- 16.2 Explain Dedit command (autocad R-12 or latest).
- 16.3 Describe viewing the entire drawing.

- 16.4 Explain drawing of angled line.
- 16.5 Explain U-command.
- 16.6 Explain Redo command.
- 16.7 Explain drawing a circle with circle command.
- 16.8 Explain automatic work saving procedures.

A. BASIC ENGINEERING DRAWING:

1. Lettering 5mm height
2. Lettering 3mm height
3. Use of Tee Square and set squares for drawing horizontal, vertical and inclined lines.
4. Use of Tee square and for drawing centres, crossing of lines
5. Use of compass, circles, half circles, radius.
6. Draw round corners, figure inside and outside circle.
7. Plane geometry angles and triangles.
8. Plane Geometry quadrilateral square rhombus, rectangle and parallelogram
9. Plane geometry parallel-lines, perpendicular, bisect line and angle.
10. Plane geometry equal division of line and some ratio with the help of compass and set square.
11. Plane geometry inscribe and circumscribe square, triangle and hexagon.
12. Plane geometry of construction of polygon, five, six, seven and eight sides.
13. Plane geometry of inscribe pentagon in a circle and pentagon by general and different methods.
14. Plane geometry of tangent of circle inside and outside
15. Plane geometry of construction of ellipse with two methods.
16. Plane geometry of construction of ellipse with next two methods.
17. Plane geometry of construction of parabola curve 4 methods
18. Plane geometry of construction of hyperbola curve
19. Plane geometry of Spiral curve
20. Plane geometry of helix curve.
21. Plane geometry of construction of involute curve of square rectangle hexagon and circle
22. Different types of drawing lines.
23. Orthographic projection 1 and 3rd angle L block
24. Orthographic projection 1 and 3rd angle Step Block
25. Orthographic projection 1 and 3rd angle Vee block
26. Orthographic projection 1 and 3rd angle Given Block
27. Orthographic projection 1 and 3rd angle Additional Block
28. Orthographic projection and Isometric Drawing Given Block
29. Orthographic projection and Isometric Drawing Given Block next
30. Orthographic projection and Isometric Drawing Given Block next
31. Different types of sectioning
32. Different section lines for different material
33. Orthographic projection of Vee block sectional views.
34. Orthographic projection Gland sectional views
35. Orthographic projection Open bearing sectional views
36. Concept for different types of Drawings
37. Isometric and oblique drawings of cube with one hole.

38. Isometric and oblique drawings of another given block.
39. Missing lines and portions on given views
40. Missing lines and portions on given views next
41. Missing lines and portions on given views next
42. Missing lines and portions on given views next
43. Isometric scale and development of cube
44. Development of prism
45. Development of cylinder
46. Development of Cone
47. Development of Pyramid
48. Thread profile of square and vee threads.
49. Different types of threads
50. Sketch of hexagonal nut and bolt
51. Rivet heads
52. Single riveted lap joint
53. Single riveted butt joint

B. COMPUTER AIDED DESIGN (Auto cad Rel-12 or latest).

1. Practice loading CAD software into computer memory.
2. Practice unloading CAD software safely and come to Dos prompt.
3. Practice CAD abbreviations, auto CAD release 12 or latest (e.g A for Arc, C for circle, E for Erase etc).
4. Practice function keys for short cuts.
5. Practice to draw two points using cartesian Notation on graph paper
6. Practice to draw straight line using polar coordinates on graph paper
7. Set-up drawing area using CAD software
8. Practice for Turning GRID ON and OFF and SNAP on and OFF
9. Draw a line with line command
10. Widen Border lines with pedit
11. Save Border Template (QSAVE)
12. Create layers and move border to it's own layer
13. Create a layer for Title Block
14. Create Title Block
15. Practice for Zoom command
16. Practice for CAD Type faces (Auto CAD Rel-12 or latest)
17. Practice for filling Title Block
18. Practice for plotting the drawing on plotter or printer
19. Begin a New drawing
20. Practice with Dedit command to make changes in the drawing
21. Draw an Angled line
22. Practice with U-Command and Redo command
23. Draw a circle with circle command

2nd Year

Math 223APPLIED MATHEMATICS

Total Contact Hours		T	P	C
Theory	96 Hours	3	0	3

Pre-requisite: Must have completed Mathematics I.

AIMSThe students will be able to:

1. Solve problems of Calculus and Analytic Geometry.
2. Develop mathematical skill, attitudes and logical perception in the use of mathematical instruments.
3. Apply principles of Differential Calculus to work out rate measures, velocity, acceleration, maxima & minima values
4. Use Principles of Integral Calculus to compute areas & volumes.
5. Acquire proficiency in solving technological problems with mathematical clarity and insight.

COURSE CONTENTS

- 1. FUNCTIONS & LIMITS. 6 Hours**
 - 1.1 Constant & Variable Quantities
 - 1.2 Functions & their classification
 - 1.3 The concept of Limit
 - 1.4 Limit of a Function
 - 1.5 Fundamental Theorems on Limit
 - 1.6 Some important Limits
 - 1.7 Problems
- 2. DIFFERENTIATION 6 Hours**
 - 2.1 Increments
 - 2.2 Differential Coefficient or Derivative
 - 2.3 Differentiation ab-initio or by first Principle
 - 2.4 Geometrical Interpretation of Differential Coefficient
 - 2.5 Differential Coefficient of X^n , $(ax + b)^n$
 - 2.6 Three important rules
 - 2.7 Problems
- 3. DIFFERENTIATION OF ALGEBRAIC FUNCTIONS 9 Hours**

3.1	Explicit Functions	
3.2	Implicit Functions	
3.3	Parametric forms	
3.4	Problems	
4.	DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS	6 Hours
4.1	Differential Coefficient of Sin x, Cos x, Tan x from first principle.	
4.3	Differentiation of inverse Trigonometric functions.	
4.4	Problems.	
5.	DIFFERENTIATIONS OF LOGARITHMIC & EXPONENTIAL FUNCTIONS	6 Hours
5.1	Differentiation of ln x	
5.2	Differentiation of Log a ^x	
5.3	Differentiation of a ^x	
5.4	Differentiation of e ^x	
5.5	Problems	
6.	RATE OF CHANGE OF VARIABLES.	6 Hours
6.1	Increasing and decreasing functions	
6.2	Maxima and Minima values	
6.3	Criteria for maximum & minimum values	
6.4	Methods of finding maxima & minima	
6.5	Problems	
7.	INTEGRATION	9 Hours
7.1	Concept	
7.2	Fundamental Formulas	
7.3	Important Rules	
7.4	Problems	
8.	METHODS OF INTEGRATION	9 Hours
8.1	Integration by substitution	
8.2	Integration by parts	
8.3	Problems	
9.	DEFINITE INTEGRALS	6 Hours
9.1	Properties	
9.2	Application to area	
9.3	Problems	

10. DIFFERENTIAL EQUATIONS	6 Hours
10.1 Introduction	
10.2 Degree and Order	
10.3 First order differential equation	
10.4 Solution	
10.5 Problems	
11. PLANE ANALYTIC GEOMETRY & STRAIGHT LINE	6 Hours
11.1 Coordinate System	
11.2 Distance Formula	
11.3 The Ratio Formula	
11.4 Inclination and slope of a line	
11.5 The slope Formula	
11.6 Problems	
12. EQUATIONS OF STRAIGHT LINE	6 Hours
12.1 Some important Forms	
12.2 General Form	
12.3 Angle Formula	
12.4 Parallelism & Perpendicularity	
12.5 Problems	
13. EQUATIONS OF CIRCLE	6 Hours
13.1 Standard form of Equation	
13.2 Central form of Equation	
13.3 General form of Equation	
13.4 Radius & Coordinates of the centre	
13.5 Problems	
14. STATISTICS	9 Hours
14.1 Concept of mean, median and mode	
14.2 Standard deviation	
14.3 Laws of probability	
14.4 Problems	

REFERENCE BOOKS

1. Thomas Finny- Calculus and Analytic Geometry
2. Ghulam Yasin Minhas - Technical Mathematics Vol - II, Ilmi Kitab Khana, Lahore.
3. Prof. Riaz Ali Khan- Polytechnic Mathematic Series Vol I & II, Majeed Sons, Faisalabad
4. Prof. Sana Ullah Bhatti - Calculus and Analytic Geometry, Punjab Text Book Board, Lahore.

Math-223 APPLIED MATHEMATICS

INSTRUCTIONAL OBJECTIVES

1. USE THE CONCEPT OF FUNCTIONS AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS.

- 1.1 Define a function.
- 1.2 List all type of functions.
- 1.3 Explain the concept of limit and limit of a function.
- 1.4 Explain fundamental theorems on limits.
- 1.5 Derive some important limits.
- 1.6 solve problems on limits.

2. UNDERSTAND THE CONCEPT OF DIFFERENTIAL COEFFICIENT

- 2.1 Derive mathematical expression for a differential coefficient.
- 2.2 Explain geometrical interpretation of differential coefficient.
- 2.3 Differentiate a constant, a constant associated with a variable and the sum of finite number of functions.
- 2.4 Solve related problems.

3. USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS OF ALGEBRAIC FUNCTIONS.

- 3.1 Differentiate ab-initio x^n and $(ax+b)^n$.
- 3.2 Derive product, quotient and chain rules.
- 3.3 Find derivatives of implicit functions and explicit functions.
- 3.4 Differentiate parametric forms, functions w.r.t another function and by rationalization.
- 3.5 Solve problems using these formulas.

4. USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS INVOLVING TRIGONOMETRIC FUNCTIONS.

- 4.1 Differentiate from first principle $\sin x, \cos x, \tan x$.
- 4.2 Derive formula Derivatives of $\sec x, \operatorname{cosec} x, \cot x$.
- 4.3 Find differential coefficients of inverse trigonometric functions
- 4.3 Solve problems based on these formulas.

5. USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.

- 5.1 Derive formulas for differential coefficient of Logarithmic and exponential functions.
- 5.2 Solve problems using these formulas.

6. UNDERSTAND RATE OF CHANGE OF ONE VARIABLE WITH RESPECT TO ANOTHER.

- 6.1 Derive formula for velocity, acceleration and slope of a line.
- 6.2 Define an increasing and a decreasing function, maxima and minima values, point of inflexion.
- 6.3 Explain criteria for maxima and minima values of a function.
- 6.4 Solve problems involving rate of change of variables.

7. USE RULES OF INTEGRATION IN SOLVING RELEVANT PROBLEMS.

- 7.1 Explain the concept of integration.
- 7.2 State basic theorems of integration.
- 7.3 List some important rules of integration.
- 7.4 Derive fundamental formulas of integration.
- 7.5 Solve problems of integration based on these rules/formulas.

8. UNDERSTAND DIFFERENT METHODS OF INTEGRATION

- 8.1 List standard formulas of Integration.
- 8.2 Integrate a function by substitution method.
- 8.3 Find integrals by the method of integration by parts.
- 8.4 Solve problems using these methods.

9. UNDERSTAND METHODS OF SOLVING DEFINITE INTEGRALS.

- 9.1 Define definite integral.
- 9.2 List properties of definite integrals.
- 9.3 Find areas under the curves using definite integrals.
- 9.4 Solve problems of definite integrals.

10. USE DIFFERENT METHODS OF INTEGRATION TO SOLVE DIFFERENTIAL EQUATIONS

- 10.1 Define a differential equation, its degree and order
- 10.2 Explain method of separation of variables to solve differential equation of first order and first degree.
- 10.3 Solve differential equations of first order and first degree

11. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY.

- 11.1 Explain the rectangular coordinate system.
- 11.2 Locate points in different quadrants.
- 11.3 Derive distance formula.
- 11.4 Prove section formulas.
- 11.5 Derive Slope Formula
- 11.6 Solve problem using these formulas.

12. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.

- 12.1 Define a straight line.
- 12.2 Write general form of equation of a straight line.
- 12.3 Derive slope intercept and intercept forms of equations of a

straight line.

- 12.4 Derive expression for angle between two straight lines.
- 12.5 Derive conditions of perpendicularity and parallelism of two straight lines.
- 12.6 Solve problems involving these equations/formulas.

13. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE.

- 13.1 Define a circle.
- 13.2 Describe standard, central and general forms of the equation of a circle.
- 13.3 Convert general form to the central form of equation of a circle.
- 13.4 Derive formula for the radius and the coordinates of the center of a circle from the general form.
- 13.5 Derive equation of the circle passing through three given points.
- 13.6 Solve problems involving these equations.

14. UNDERSTAND THE BASIC CONCEPT OF STATISTICS.

- 14.1 Define mean, median and mode
- 14.2 Explain standard deviation
- 14.3 State laws of probability
- 14.4 Calculate the above mentioned quantities using the proper formula.

Mgm-211 BUSINESS COMMUNICATION

T	P	C
1	0	1

Total contact hours

Theory 32 Hrs.

Prerequisites:The students shall already be familiar with the language concerned.

AIMSThe course has been designed to enable the students to.

1. Develop communication skills.
2. Understand basic principles of good and effective business writing in commercial and industrial fields.
3. Develop knowledge and skill to write technical report with confidence and accuracy.

COURSE CONTENTS

- 1. COMMUNICATION PROCESS. 6 Hours**
 - 1.1 Purposes of communication
 - 1.2 Communication process
 - 1.3 Distortions in communication
 - 1.4 Consolidation of communique
 - 1.5 Communication flow
 - 1.6 Communication for self development

- 2. ORAL COMMUNICATION SKILLS. 6 Hours**
 - 2.1 Significance of speaking.
 - 2.2 Verbal and non-verbal messages.
 - 2.3 Strategic steps of speaking.
 - 2.4 Characteristics of effective oral messages.
 - 2.5 Communication Trafficking.
 - 2.6 Oral presentation.

- 3. QUESTIONING SKILLS. 3 Hours**
 - 3.1 Nature of question.
 - 3.2 Types of questions.
 - 3.3 Characteristics of a good question.
 - 3.4 Questioning strategy

- 4. LISTENING SKILLS. 5 Hours**
 - 4.1 Principles of active listening.

- 4.2 Skills of active listening.
- 4.3 Barriers to listening.
- 4.4 Reasons of poor listening.
- 4.5 Giving Feedback.

- 5. INTERVIEWING SKILLS. 3 Hours**
 - 5.1 Significance of interviews.
 - 5.2 Characteristics of interviews.
 - 5.3 Activities in an interviewing situation
 - 5.4 Types of interviews.
 - 5.5 Interviewing strategy.

- 6. REPORT WRITING. 3 Hours**
 - 6.1 Goals of report writing
 - 6.2 Report format.
 - 6.3 Types of reports.
 - 6.4 Report writing strategy.

- 7. READING COMPREHENSION. 2 Hours**
 - 7.1 Reading problems.
 - 7.2 Four Reading skills.

- 8. GROUP COMMUNICATION. 4 Hours**
 - 8.1 Purposes of conducting meetings.
 - 8.2 Planning a meeting.
 - 8.3 Types of meetings.
 - 8.4 Selection f a group for meeting.
 - 8.5 Group leadership skills.
 - 8.6 Running a successful meeting.
 - 8.7 Active participation techniques.

RECOMMENDED BOOKS

1. Sh. Ata-ur-Rehman Effective Business Communication & Report Writing.
2. Ulman J.N. Could JR. Technical Reporting.

Mgm-211 BUSINESS COMMUNICATION.

INSTRUCTIONAL OBJECTIVES

1.UNDERSTAND THE COMMUNICATION PROCESS.

- 1.1 State the benefits of two way communication.
- 1.2 Describe a model of communication process.
- 1.3 Explain the major communication methods used in organization.
- 1.4 Identify the barriers to communication and methods of overcoming these barriers.
- 1.5 Identify misconceptions about communication.

2. UNDERSTAND THE PROCESS OF ORAL.

- 2.1 Identify speaking situations with other peoples.
- 2.2 Identify the strategy steps of speaking.
- 2.3 Identify the characteristics of effective speaking.
- 2.4 State the principles of one-way communication.
- 2.5 State the principles of two-way communication.
- 2.6 Identify the elements of oral presentation skills.
- 2.7 Determine the impact of non-verbal communication on oral communication.

3.DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.

- 3.1 Identify different types of questions.
- 3.2 Determine the purpose of each type of question and its application.
- 3.3 Identify the hazards to be avoided when asking questions.
- 3.4 Demonstrate questioning skills.

4.DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.

- 4.1 State the principles of active listening.
- 4.2 Identify skills of active listening.
- 4.3 Identify barriers to active listening.
- 4.4 State the benefits of active listening.
- 4.5 Demonstrate listening skills.
- 4.6 Explain the importance of giving and receiving feed back.

5.Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.

- 5.1 State the significance of interviews.
- 5.2 State the characteristics of interviews.
- 5.3 Explain the activities in an interviewing situation.
- 5.4 Describe the types of interviews.

- 5.5 Explain the interviewing strategy.
- 5.6 Prepare instrument for a structured interview.

6. PREPARE A REPORT OUT-LINE, BASED ON SUBJECT MATTER AND AUDIENCE.

- 6.1 Identify the different types of reports.
- 6.2 Determine when to use an informal or formal report presentation.
- 6.3 Identify the stages of planning a report.
- 6.4 Identify the parts of a report and choose the parts appropriate for each type of report.
- 6.5 Draft a report outline.

7. DEMONSTRATE READING COMPREHENSION.

- 7.1 Identify major reading problems.
- 7.2 Identify basic reading skills.
- 7.3 State methods of previewing written material.
- 7.4 Identify methods of concentration when reading.
- 7.5 Demonstrate reading comprehension.

8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.

- 8.1 State the purpose and characteristics of major types of meeting.
- 8.2 Explain responsibilities of a meeting/committee.
- 8.3 Identify problems likely to be faced at meeting and means to overcome these problems.
- 8.4 Distinguish between content and process at meetings.
- 8.5 Explain the key characteristics of a good group facilitator.

Mgm 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

Total Contact Hours

Theory	32		T	P	C
Practical	0	1	0	1	

AIMS The students will be able to develop management skills, get acquainted the learner with the principles of management and economic relations and develop commercial/economic approach to solve the problems in the industrial set-up.

COURSE CONTENTS

- 1. ECONOMICS** **2 Hours**
 - 1.1 Definition: Adam Smith, Alfred Marshall, Prof. Robins.
 - 1.2 Nature and scope
 - 1.3 Importance for technicians.

- 2. BASIC CONCEPTS OF ECONOMICS** **1 Hour**
 - 2.1 Utility
 - 2.2 Income
 - 2.3 Wealth
 - 2.4 Saving
 - 2.5 Investment
 - 2.6 Value.

- 3. DEMAND AND SUPPLY.** **2 Hours**
 - 3.1 Definition of demand.
 - 3.2 Law of demand.
 - 3.3 Definition of supply.
 - 3.4 Law of supply.

- 4. FACTORS OF PRODUCTION.** **2 Hours**
 - 4.1 Land
 - 4.2 Labour
 - 4.3 Capital
 - 4.4 Organization.

- 5. BUSINESS ORGANIZATION.** **3 Hours**
 - 5.1 Sole proprietorship.
 - 5.2 Partnership
 - 5.3 Joint stock company.

6. ENTERPRENEURIAL SKILLS	4 Hours
6.1 Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.	
6.2 Business opportunities, goal setting.	
6.3 Organizing, evaluating and analyzing opportunity and risk tasks.	
7. SCALE OF PRODUCTION.	2 Hours
7.1 Meaning and its determination.	
7.2 Large scale production.	
7.3 Small scale production.	
8. ECONOMIC SYSTEM	3 Hours
8.1 Free economic system.	
8.2 Centrally planned economy.	
8.3 Mixed economic system.	
9. MONEY.	1 Hour
9.1 Barter system and its inconveniences.	
9.2 Definition of money and its functions.	
10. BANK.	1 Hour
10.1 Definition	
10.2 Functions of a commercial bank.	
10.3 Central bank and its functions.	
11. CHEQUE	1 Hour
11.1 Definition	
11.2 Characteristics and kinds of cheque.	
11.3 Dishonour of cheque.	
12. FINANCIAL INSTITUTIONS	2 Hours
12.1 IMF	
12.2 IDBP	
12.3 PIDC	
13. TRADE UNION	2 Hours
13.1 Introduction and brief history.	
13.2 Objectives, merits and demerits.	
13.3 Problems of industrial labour.	
14. INTERNATIONAL TRADE.	2 Hours
14.1 Introduction	

14.2	Advantages and disadvantages.	
15.	MANAGEMENT	1 Hour
15.1	Meaning	
15.2	Functions	
16.	ADVERTISEMENT	2 Hours
16.1	The concept, benefits and draw-backs.	
16.2	Principal media used in business world.	
17.	ECONOMY OF PAKISTAN	1 Hour
17.1	Introduction	
17.2	Economic problems and remedies.	

BOOKS RECOMMENDED

1. Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore
2. M. Saeed Nasir, Introduction to Business, Ilmi Kitab Khana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore.

INSTRUCTIONAL OBJECTIVES

1.UNDERSTAND THE IMPORTANCE OF ECONOMICS.

- 1.1 State definition of economics given by Adam Smith, Alfred Marshall and Professor Robins.
- 1.2 Explain nature and scope of economics.
- 1.3 Describe importance of study of economics for technicians.

2.UNDERSTAND BASIC TERMS USED IN ECONOMICS.

- 2.1 Define basic terms, utility, income, wealth, saving, investment and value.
- 2.2 Explain the basic terms with examples

3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.

- 3.1 Define Demand.
- 3.2 Explain law of demand with the help of schedule and diagram.
- 3.3 State assumptions and limitation of law of demand.
- 3.4 Define Supply.
- 3.5 Explain law of Supply with the help of schedule and diagram.
- 3.6 State assumptions and limitation of law of supply.

4.UNDERSTAND THE FACTORS OF PRODUCTION

- 4.1 Define the four factors of production.
- 4.2 Explain labour and its features.
- 4.3 Describe capital and its peculiarities.

5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.

- 5.1 Describe sole proprietorship, its merits and demerits.
- 5.2 Explain partnership, its advantages and disadvantages.
- 5.3 Describe joint stock company, its merits and demerits.
- 5.4 Distinguish public limited company and private limited company.

6.UNDERSTAND ENTREPRENEURIAL SKILLS

- 6.1 Explain preparing, planning, establishing and managing small business set up
- 6.2 Explain evaluating all relevant resources
- 6.3 Describe organizing analyzing and innovation of risk of task

7. UNDERSTAND SCALE OF PRODUCTION.

- 7.1 Explain scale of production and its determination.
- 7.2 Describe large scale production and its merits.
- 7.3 Explain small scale of production and its advantages and disadvantages.

8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.

- 8.1 Describe free economic system and its characteristics.
- 8.2 Explain centrally planned economic system, its merits and demerits.

- 8.3 State mixed economic system and its features.
- 9. UNDERSTAND WHAT IS MONEY**
- 9.1 Define money
- 9.2 Explain barter system and its inconveniences.
- 9.3 Explain functions of money.
- 10. UNDERSTAND BANK AND ITS FUNCTIONS.**
- 10.1 Define bank.
- 10.2 Describe commercial bank and its functions.
- 10.3 State central bank and its functions.
- 11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.**
- 11.1 Define cheque.
- 11.2 Enlist the characteristics of cheque.
- 11.3 Identify the kinds of cheque.
- 11.4 Describe the causes of dishonor of a cheque.
- 12. UNDERSTAND FINANCIAL INSTITUTIONS.**
- 12.1 Explain IMF and its objectives.
- 12.2 Explain organisational set up and objectives of IDBP.
- 12.3 Explain organisational set up and objectives of PIDC.
- 13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.**
- 13.1 Describe brief history of trade union.
- 13.2 State functions of trade union.
- 13.3 Explain objectives, merits and demerits of trade unions.
- 13.4 Enlist problems of industrial labour.
- 14. UNDERSTAND INTERNATIONAL TRADE.**
- 14.1 Explain international trade.
- 14.2 Enlist its merits and demerits.
- 15. UNDERSTAND MANAGEMENT**
- 15.1 Explain meaning of management.
- 15.2 Describe functions of management.
- 15.3 Identify the problems of business management.
- 16. UNDERSTAND ADVERTISEMENT.**
- 16.1 Explain the concept of advertisement.
- 16.2 Enlist benefits and drawbacks of advertisement.
- 16.3 Describe principal media of advertisement used in business world.
- 17. UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.**
- 17.1 Describe economy of Pakistan.

- 17.2 Explain economic problems of Pakistan
- 17.3 Explain remedial measures for economic problems of Pakistan.
measure.

Total contact hours:

Theory 64

Practical 192

OBJECTIVES.

1. Understand the basic principles of organic chemistry.
2. Apply basic principle of organic chemistry in the laboratory work.

COURSE CONTENTS.

1. DEFINITION OF ORGANIC CHEMISTRY AND DIFFERENCE BETWEEN ORGANIC AND IN-ORGANIC COMPOUNDS WITH EXAMPLES.

- 1.1 Source of organic compounds and applications
- 1.2 Classification of organic compounds with their general formula and functional groups.

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2. TYPES OF ORGANIC REACTION.

- 2.1
 - i) Substitution reactions with examples.
 - ii) Addition reaction with examples.
- 2.2 Elimination reaction with examples.
Rearrangements reactions with examples.

3. ISOMERISM DEFINITION AND TYPES.

- 3.1 Types of Isomerism with examples.
- 3.2 Hydrocarbons - Definition and classification with examples and general formula.
- 3.3 Homologous Series.
- 3.4 Nomenclature of organic compounds according to IUPAC system
- 3.5 Nomenclature of various organic compounds according to IUPAC system.

4. ALKANE, METHOD OF PREPARATION

- 4.1 General chemical properties (Reaction) of alkane.

5. ALKENES, METHODS OF PREPARATION.

- 5.1 General chemical properties of alkenes.

6. ALKYNES, METHODS OF PREPARATION.

- 6.1 General chemical properties of alkynes.

7. ALKYL HALIDES, TYPES OF ALKYL HALIDES.

- 7.1 Method of preparation.
- 7.2 General chemical properties of RX
- 7.3 Organometallic compounds, Definition preparation of Rmgx (Grignard reagent)
- 7.4 Properties (chemical & physical) of Rmgx
- 7.5 Properties of Rmgx.

- 8 ALCONALS, CLASSIFICATION, GENERAL METHODS OF**
8.1 Preparation of alcohol.
8.2 General reaction of alcohol.
- 9 ETHER, METHODS OF PREPARATION.**
9.1 Properties of Ether (chemical reaction).
- 10 ALDEHYDE, DEFINITION.**
10.1 Preparation of aldehyde.
10.2 Chemical properties of aldehyde.
- 11 KETONE, DEFINITION.**
11.1 Preparation of ketone.
11.2 Chemical properties of ketone.
- 12 CARBOXYLIC ACIDS, DEFINITION.**
12.1 Classification
12.2 Preparation of Carboxylic acid.
12.3 General Chemical properties of Carboxylic acid.
- 13. DERIVATIVES OF CARBOXYLIC ACIDS.**
13.1 Preparation of acid chlorides along with chemical properties.
13.2 General methods of preparation of acid an-hydrides.
13.3 Chemical properties of acid an-hydrides.
- 14 GENERAL METHODS OF PREPARATION OF AMIDE.**
14.1 Chemical properties.
- 15 GENERAL METHODS OF PREPARATION OF ESTER.**
15.1 Chemical properties of esters.
- 16 AMINES, DEFINITION AND CLASSIFICATION.**
16.1 Preparation of all types of amines.
16.2 General reaction of Amines.
- 17 AROMATIC HYDRO CARBONS, CLASSIFICATION.**
17.1 Methods of preparation of Benzene.
17.2 Chemical properties of Benzene.
- 18 PHENOLS, THEIR CLASSIFICATION.**
18.1 General methods of preparation.
18.2 General reaction of phenols.
- 19 CARBOHYDRATES, CLASSIFICATION.**
19.1 Preparation of glucose.

- 19.2 Reaction of glucose.
- 19.3 Fructose, methods of preparation and reaction of fructose.
- 19.4 Comparison between glucose and fructose.

20 PROTEINS AND THEIR CLASSIFICATION

- 20.1 Chemical composition, molecular shape.
- 20.2 Chemical properties and colour reaction of proteins.

21 NATURAL PRODUCTS LIKE "VITAMINS" A, B, C, D "ENZYMES"

22 ALKALOIDS LIKE "PIPERINE", "NICOTINE", "QUININE"

RECOMMENDED BOOKS

- 1 Manual on Organic Chemistry -I,II (Polytechnic manual series)
- 2 Chemistry part -II (for f.sc students) by Dr.KMibne Rasa, Dr M.A. Afzal
- 3 Organic Chemistry for B.Sc students by B.S Bahl

CHT 244 ORGANIC CHEMISTRY

INSTRUCTIONAL OBJECTIVES.

- 1. INTRODUCTION OF ORGANIC CHEMISTRY**
 - 1.1 Student will be able to understand organic chemistry. 2.HRS
 - 1.1.1 Define organic chemistry
 - 1.1.2 Differentiate between organic and inorganic compounds
 - 1.1.3 Give the application of organic chemistry daily life
 - 1.2 Understand the general formula and functional groups of organic compounds 2 Hrs
 - 1.2.1 Give general classification of organic compounds
 - 1.2.2 Write general formula for each class of organic compounds
 - 1.2.3 Write the functional group for each class of organic compounds
- 2. TYPES OF ORGANIC REACTIONS** 4. HRS
 - 2.1 Understand the types of organic reactions
 - 2.1.1 Enlist the types of organic reactions
 - 2.1.2 Explain substitution reaction
 - 2.1.3 Explain addition reaction
 - 2.1.4 Explain Elimination reaction
 - 2.1.5 Explain rearrangement reaction
 - 2.1.6 Give examples of different types of reaction
- 3. ISOMERISM** 2. HRS
 - 3.1 Understand isomerism
 - 3.1.1 Define isomerism
 - 3.1.2 Give types of isomerism in organic compounds
 - 3.1.3 Explain different isomeric forms
 - 3.1.4 Give examples of different isomeric forms
- 4. HYDROCARBONS** 4. HRS
 - 4.1 Understand the Hydrocarbons
 - 4.1.1 Define hydrocarbon
 - 4.1.2 Give classification of hydrocarbons
 - 4.1.3 Write general formula for hydrocarbons
 - 4.1.4 Explain homologous series
 - 4.2 Understand the Nomenclature of organic compounds 2. HRS
 - 4.2.1 Explain conventional method of naming organic compounds
 - 4.2.2 Explain IUPAC system for naming organic compounds
 - 4.2.3 Write names of organic compounds according IUPAC system
 - 4.3 Understand the concept of alkanes 3. HRS
 - 4.3.1 Define alkanes
 - 4.3.2 Write general formula for alkanes and alkyl Radicals
 - 4.3.3 Name alkanes and alkyl radicals
 - 4.3.4 Explain general methods of preparation of alkanes

- 4.3.5 Explain general properties of alkanes
- 4.4 Understand the concept of alkenes 3. HRS
- 4.4.1 Define alkenes
- 4.4.2 Name alkenes
- 4.4.3 Explain general methods of preparation of alkenes
- 4.4.5 Enlist the uses of ethere
- 4.5 Understand the concept of alkynes 3. HRS
- 4.5.1 Define alkynes
- 4.5.2 Enlist different types of alkynes
- 4.5.3 Explain the methods of preparation of acetylene
- 4.5.4 Explain the properties of acetylene
- 4.5.5 Give the uses of C_2H_2
- 5. ALKYL HALIDES**
- 5.1 Understand the concept of alkyl halides 2. HRS
- 5.1.1 Define alkyl halide
- 5.1.2 Give the type of alkyl halides
- 5.1.3 Name different alkyl halides
- 5.1.4 Explain general methods of preparation of Alkyl Halides
- 5.1.5 Explain general properties of Alkyl Halides
- 5.1.6 Enlist uses of Alkyl Halides
- 6. ORGANOMETALIC COMPOUNDS**
- 6.1 Understand the concept of organometallic compounds 2. HRS
- 6.1.1 Define organometallic compounds
- 6.1.2 Explain the methods of preparation of Grignard Reagent (R-Mg-X)
- 6.1.3 Explain the properties of R-MG-X
- 7. ALCOHOLS**
- 7.1 Understand the concept of alcohols 2. HRS
- 7.1.1 Define alcohol
- 7.1.2 Give classification of alcohols
- 7.1.3 Explain general methods of preparation of alcohols
- 7.1.4 Explain general properties of alcohols
- 7.1.5 Explain the methods of preparation of ethylalcohol
- 7.1.6 Enlist the uses of ethyl alcohol
- 8. ETHERS**
- 8.1 Understand the concept of ethers. 2. HRS
- 8.1.1 Define ether
- 8.1.2 Give general formula of ethers
- 8.1.3 Explain general methods of preparation of ethers.
- 8.1.4 Explain general properties of ethers.
- 9. ALDEHYDES.**
- 9.1 Understand the concept of aldehydes.
- 9.1.1 Define aldehyde
- 9.1.2 Name different aldehydes.

- 9.1.3 Explain general methods of preparation of aldehydes.
- 9.1.4 Explain general properties of aldehydes.
- 9.1.5 Enlist the uses of aldehydes.

- 10. KETONES** 2. HRS
- 10.1 Understand the concept of ketones.
 - 10.1.1 Define ketone
 - 10.1.2 Name different
 - 10.1.3 Explain methods of preparation of acetone
 - 10.1.4 Explain the properties of acetone
 - 10.1.5 Enlist the uses of acetone
- 11. CARBOXYLIC ACIDS** 3. HRS
- 11.1 Understand the concept of carboxylic acids
 - 11.1.2 Name different carboxylic acids
 - 11.1.3 Give the types of carboxylic acids
 - 11.1.4 Explain the general methods of preparation of mono carboxylic acids
 - 11.1.5 Explain the properties of mono carboxylic acids
 - 11.1.6 Enlist the uses of carboxylic acids
- 12. ACID DERIVATIVES** 3. HRS
- 12.1 Understand the concept acid chlorides
 - 12.1.1 Define acid chlorides
 - 12.1.2 Name acid chlorides
 - 12.1.3 Explain general methods of preparation of acid chlorides
 - 12.1.4 Explain general properties of acid chlorides
 - 12.2 Understand the concept of acid anhydrides 3. HRS
 - 12.2.1 Define acid anhydride
 - 12.2.2 Name acid anhydride
 - 12.2.3 Give general methods of preparation of acetic anhydride
 - 12.2.4 Give properties of acetic anhydride
 - 12.2.5 Enlist the uses of acetic anhydride
 - 12.3 Understand the concept of acid amide 2. HRS
 - 12.3.1 Define acid amide
 - 12.3.2 Name acid amides
 - 12.3.3 Explain general methods of preparation of acid amides
 - 12.3.4 Explain the properties of acid amides
- 13. ESTERS** 2. HRS
- 13.1 Understand the concept of esters
 - 13.1.1 Define esters
 - 13.1.2 Name esters
 - 13.1.3 Give general methods of preparation of esters
 - 13.1.4 Give general properties of esters
- 14. AMINES** 3. HRS
- 14.1 Understand the concept of amines
 - 14.1.1 Define amine
 - 14.1.2 Give classification of amines
 - 14.1.3 Name different types of amines

- 14.1.4 Explain the method of preparation of primary amines
- 14.1.5 Explain the method of preparation of secondary amine
 - Explain the method of preparation of tertiary amine
 - Explain the general properties of amines

15 AROMATIC HYDROCARBONS

- 15.1 Understand the concept of aromatic hydrocarbons 3. HRS
 - 15.1.1 Define aromatic hydrocarbons
 - 15.1.2 Differentiate between open chain (aliphatic) and close chain (aromatic) compounds
 - 15.1.3 Give classification of aromatic compounds
 - 15.1.4 Explain the nomenclature of aromatic compounds
 - 15.1.5 Explain the methods of preparation of benzene
 - 15.1.6 Explain the properties of benzene
- 15.2 Understand the concept of phenol 2. HRS
 - 15.2.1 Define phenol
 - 15.2.2 Explain the nomenclature of phenol
 - 15.2.3 Explain general methods of preparation of phenol
 - 15.2.4 Explain general properties of phenols

16 CARBOHYDRATES

- 16.1 Understand carbohydrates 3. HRS
 - 16.1.1 Define carbohydrate
 - 16.1.2 Give classification of carbohydrates
 - 16.1.3 Write structure formula of glucose and fructose
 - 16.1.4 Explain the method of preparation of glucose
 - 16.1.5 Explain the properties of glucose
 - 16.1.6 Explain the method of preparation of fructose
 - 16.1.7 Explain the properties of fructose
 - 16.1.8 Give comparison between glucose and fructose

17 PROTEINS

- 0 17.1 Understand the concept of proteins 3. HRS
 - 17.1.1 Define protein
 - Give classification of proteins
 - Explain general properties of proteins

CHT 244 ORGANIC CHEMISTRY.

LIST OF PRACTICALS.

1. Detection of Sulphur, Nitrogen and halogens in the organic compounds.
2. Preparation and properties of methane.
3. Preparation and properties of Acetylene.
4. Preparation of iodoform from alconal
5. Preparation and properties of Acetic acid.
6. Preparation of Acetamide.
7. Preparation of Ethyle ether.
8. Preparation of Nitrobenzene.
9. Preparation of Acetone.
10. Chemical test of aldehyde.
11. Chemical test of Ketone.
12. Preparation of Urea from Ammonium cyanate
13. Preparation of oxalic acid from cane sugar.
14. Preparation of Acetadehyde.
15. Preparation and properties of methyl orange.
16. Preparation of aqueous fermic acid.
17. Preparation of Acetic Anhydride.
18. Preparation of Acetylene chloride.
19. Preparation of Ethyl Amine
20. Preparation of Ethyle benzene
21. Color reactions of protiens
22. Preparation of Ethyl bromide
23. Preparation of Ethyl Acetate
24. Preparation of chloroform from Acetone.
25. Determination of Amino Acids in Proteins.
26. Preparation of Aniline
27. Purification of organic substance by Scxhlet appratus.
28. Reaction and test of Saccharide.

NOTE:- (Each experiment will be conducted in two consecutive periods)

OBJECTIVES.

1. Understand manufacturing procedure employed by modern chemical industries.
2. Understand the operation of the equipment necessary to carry out the chemical reaction on industrial scale.
3. Prepare the flow sheet diagram of chemical Industries.
4. To present each chemical industry from the view point of statistics of production, consumption and location in Pakistan.

COURSE CONTENTS.

1. INTRODUCTION (INDUSTRIAL CHEMICAL PROCESS)

- 1.1 Unit operation and unit process, examples Batch process, continuous process.
- 1.2 Flow charts.

2 SOFT WATER, HARD WATER, CHEMICALS RESPONSIBLE FOR THE HARDNESS OF WATER.

- 2.1 Water conditioning
Softening, purification and clarification (definition)
- 2.2 Ion method
- 2.3 Sodium cation exchange process
- 2.4 Mixed bed resins.
- 2.5 Hydrogen cation exchange process
- 2.6 Soda lime process (cold soda lime, Hot soda lime process)
- 2.7 Deaeration of water and its importance.
- 2.8 Demineralization and desalting of water.

3 CHLORO ALKALI INDUSTRIES.

- 3.1 Introduction
- 3.2 Manufacture of Soda ash, Raw material, Treatment of raw materials
- 3.3 Flow chart of solvay process
- 3.4 Unit operations and unit processes.
- 3.5 Manufacture of Sodium Bicarbonate.
- 3.6 Flow sheet, unit operations and processes.
- 3.7 Uses of Sodium carbonate and Sodium bicarbonate.
- 3.8 Manufacture of caustic soda by electrolysis of NaCl, Pretreatment of NaCl solution.
- 3.9 Diaphragm cell method.
- 3.10 Mercury cell method
- 3.11 Membrane cell method.
- 3.12 Comparison of the three cell methods.
- 3.13 By-products of caustic soda manufacture.
- 3.14 Uses of chlorine and Hydrogen.
- 3.15 Manufacture of bleaching Powder.

- 3.16 Manufacture of Calcium hypochlorite.
 - 3.17 Manufacture of Sodium hypochlorite
 - 3.18 Manufacture of HCl as the by-products of chlor-alkali industry
 - 3.19 Unit operation and unit process involved.
 - 3.20 Uses of HCl
- 4 **SULPHURIC ACID.****
- 4.1 Formula, uses and importance in industrial developments
 - 4.2 Raw materials
 - 4.3 Brief introduction of Lead Chamber Process.
 - 4.4 Manufacture by contact process. Flow sheet.
 - 4.5 Unit operation and unit process.
 - 4.6 Treatment of vent gas of contact process
 - 4.7 Energy requirements
- 5 **AMMONIA****
- 5.1 Ammonia, uses, economics.
 - 5.2 Manufacture of Ammonia from Natural gas.
 - 5.3 Steam natural gas reforming, Primary reforming, Secondary reforming.
 - 5.4 Shift conversion.
 - 5.5 CO₂ absorption and separation
 - 5.6 Removal of Carbon monoxide.
 - 5.7 Compression of N₂ and H₂
 - 5.8 Ammonia synthesis, Ammonia converter (equipment)
 - 5.9 Flow chart
 - 5.10 Unit operation and unit process.
 - 5.11 Liquifaction of Ammonia.
 - 5.12 Storage of Ammonia
 - 5.13 Manufacture of Nitric Acid from Ammonia, flow sheet
 - 5.14 Unit operation and unit process.
- 6 **AMMONIA NITRATE.****
- 6.1 Manufacture of Ammonium Nitrate, Raw material, Flow sheet
 - 6.2 Unit operation and unit processes
 - 6.3 Uses of Ammonium Nitrate, storage.
- 7 **MANUFACTURE OF UREA****
- 7.1 Formula uses, Raw material.
 - 7.2 Flow sheet, Multi-sheet compression.
 - 7.3 Unit operation and unit process.
 - 7.4 Prilling Tower and Prilling of Urea.
- 8 **MANUFACTURE OF AMMONIUM SULPHATE****
- 8.1 Uses, Raw material
 - 8.2 Flow sheet
 - 8.3 Unit operation and unit process.

- 9 PHOSPHATE FERTILIZERS.**
- 9.1 MAP, DAP formula, uses.
 - 9.2 Raw materials, Processing of phosphate rock
 - 9.3 Flow diagram
 - 9.4 Unit operation and unit process.
- 10 PORTLAND CEMENT**
- 10.1 Types of portland cement
 - 10.2 Raw material
 - 10.3 Manufacture method, Dry process, wet process
 - 10.4 Flow sheet (wet process)
 - 10.5 Unit operation and unit process.
 - 10.6 Kilra (living and heating zones) reactions.
 - 10.7 Setting and Harding of cement
 - 10.8 Energy requirement of wet and dry process
 - 10.9 Slag cement.
- 11 LIME**
- 11.1 Lime, formula, uses.
 - 11.2 Calculation of lime stone, unit operation and unit process.
 - 11.3 Slacked lime manufacture.
- 12 GYPSUM**
- 12.1 Formula, uses, processing of Rock
 - 12.2 Calculation of gypsum, chemical reaction.
 - 12.3 Uses of plaster of paris.
 - 12.4 Harding of plaster
- 13 PETROLEUM INDUSTRY, INTRODUCTION.**
- 13.1 Constituents of petroleum
 - 13.2 Natural gas.
 - 13.3 Liquified Petroleum gas (LPG)
- 14 REFINING OF PETROLEUM**
- 14.1 Products of refining
 - 14.2 Conversion process, cracking or pyrolysis
 - 14.3 Reforming, catalytic reforming
 - 14.4 Polymerization
 - 14.5 Alkylation.
 - 14.6 Isomenization.

RECOMMANDED BOOK

Chemical process Industries by Shreve

INSTRUCTIONAL OBJECTIVES.

1. INTRODUCTION

- 1.1 understand unit process
 - 1.1.1 Define unit process
 - 1.1.2 Give examples of nit process
 - 1.1.3 Distinguish unit operation and unit process
 - 1.1.4 Explain continuous process with examdples.
 - 1.1.5 Explain batch process with examples
- 1.2 Understand flow charts
 - 1.2.1 Name types of flow charts.
 - 1.2.2 Distinguish between block diagram and symbolic diagram.
 - 1.2.3 Read different flow charts.

2. WATER

- 2.1 Understand water conditioning
 - 2.1.1 Enlist impurities of water.
 - 2.1.2 Name salts responsible for water hardness
 - 8 2.1.3 Give water softening methods.
 - 2.1.4 Explain water purification
 - 2.1.5 Describe clarifications
- 2.2 Understand Ion exchange methods
 - 2.2.1 Enlist rasins used for ion exchange method
 - 2.2.2 Describe ion exchange method
 - 2.2.3 Explain regeneration of resirs
 - 2.2.4 Give reactions involved in ion exchange method.
- 2.3 Understand sodium cation exchange
 - 2.3.1 Enlist uses of soft water.
 - 2.3.2 Describe water softening by sodium cation exchange process
- 2.4 Understand mixed bad resins.
 - 2.4.1 Name mixed bed resins
 - 2.4.2 Explain mixed bed resins refining of water.
- 2.5 Understand hydrogen cation exchange process
 - 2.5.1 Give formula of hydrogen cation exchange
 - 2.5.2 Draw flow sheet diagram for hydrogen-cation exchange process.
 - 2.5.3 Explain hydrogen cation exchange process
- 2.6 Understand soda lime process and phosphate conditioning
 - 2.6.1 Describe soda line process
 - 2.6.2 Explain cold soda line process
 - 2.6.3 Explain phosphate conditioning.
- 2.7 Understand de-airation of water.
 - 2.7.1 Define term de-airation
 - 2.7.2 Give the importance of de-airation for boiler water
 - 2.7.3 Explain de-airation methods.
- 2.8 understand demineraization and de-slating
 - 2.8.1 Enlist minerals in water

- 2.8.2 Describe demineralization
- 2.8.3 Explain de-salting.

3. CHLORALKALI INDUSTRIES

- 3.1 Chloralkali industries.
 - 3.1.1 Define chloralkali
 - 3.1.2 Enlist the products of chloralkali industries.
 - 3.1.3 Enlist the chloralkali industries in Pakistan
- 3.2 understand soda ash manufacture
 - 3.2.1 Name the process of soda ash manufacture
 - 3.2.2 Give raw materials used for soda ash manufacture by solvay process
 - 3.2.3 Define brine solution
 - 3.2.4 Explain purification of brine solution
- 3.3 Draw flow sheet.
 - 3.3.1 Draw flow sheet of solvay process for manufacture of soda ash.
 - 3.3.2 Enlist unit operations of soda ash manufacture.
 - 3.3.3 Explain unit process of soda ash manufacture
 - 3.3.4 Give uses of soda ash.
- 3.4 Understand sodium bicarbonate manufacture
 - 3.4.1 Give commercial name of sodium bicarbonate
 - 3.4.2 Give raw material used for sodium bicarbonate manufacture
 - 3.4.3 Draw flow sheet of sodium bicarbonate manufacture
 - 3.4.4 Enlist unit operation and unit processes
 - 3.4.5 Explain unit process of sodium bicarbonate manufacture.
 - 3.4.6 Enlist uses of sodium bicarbonate
- 3.5 Caustic soda manufacture.
 - 3.5.1 Give chemical name of caustic soda
 - 3.5.2 name methods of caustic soda manufacture
 - 3.5.3 Name cells used for caustic soda manufacture
 - 3.5.4 Draw diagram of diaphragm cell
 - 3.5.5 Draw flow sheet for the manufacture of caustic soda using diaphragm cell
 - 3.5.6 Name unit operations for caustic soda manufacture by diaphragm cell
 - 3.5.7 Explain unit processes for caustic soda manufacture by diaphragm cell
 - 3.5.8 Draw diagram of mercury cell
 - 3.5.9 Draw flow sheet for the manufacture of caustic soda by mercury cell
 - 3.5.10 Enlist unit operation for manufacture of caustic soda by mercury cell
 - 3.5.11 Describe unit processes for manufacture of caustic soda by mercury cell
 - 3.5.12 Draw diagram of membrane cell
 - 3.5.13 Draw flow sheet for the manufacture of caustic soda by membrane cell
 - 3.5.14 Name unit operations for the manufacture of caustic soda by membrane cell
 - 3.5.15 Describe unit process for manufacture of caustic soda by mercury cell
 - 3.5.16 Give the comparison of the three cells used for caustic soda manufacture.
 - 3.5.17 Give the by products of caustic soda manufacture.
 - 3.5.18 Illustrate uses of chlorine
 - 3.5.19 Give uses of hydrogen
- 3.6 Understand bleaching powder manufacture
 - 3.6.1 Enlist raw materials for bleaching powder manufacture.
 - 3.6.2 Draw flow sheet for bleaching powder manufacture.
 - 3.6.3 Explain bleaching powder manufacture
 - 3.6.4 Name unit operations of bleaching powder manufacture

- 3.6.4 Name unit operations of bleaching powder manufacture.
- 3.6.5 Give uses of bleaching powder manufacture.
- 3.7 Understand calcium hypochlorite manufacture.
 - 3.7.1 Describe raw material for the calcium hypochlorite manufacture
 - 3.7.2 Draw flow sheet for calcium hypochlorite manufacture
 - 3.7.3 Explain calcium hypochlorite manufacture.
 - 3.7.4 Give unit operation for calcium hypochlorite manufacture.
 - 3.7.5 Enlist uses of calcium hypochlorite.
- 3.8 Understand sodium hypochlorite manufacture
 - 3.8.1 Give raw materials for soda hypochlorite manufacture.
 - 3.8.2 Draw flow sheet for the manufacture of sodium hypochlorite
 - 3.8.3 Enlist unit operations for soda hypochlorite manufacture.
 - 3.8.4 Enlist uses of soda hypochlorite.
- 3.9 Understand hydrochloric acid manufacture
 - 3.9.1 Define muriatic acid (HCl)
 - 3.9.2 Enlist methods of manufacture of hydrochloric acid
 - 3.9.3 Draw flow sheet for hydrochloric acid manufacture by synthesis process.
 - 3.9.4 Enlist unit operation for hydrochloric acid manufacture by synthesis
 - 3.9.5 Explain unit process for hydrochloric acid manufacture by synthesis
 - 3.9.6 Enlist uses of hydrochloric acid

4. **SULPHURIC ACID**

- 4.1 understand sulphuric acid manufacture.
 - 4.1.1 Define oil of vitriol (H_2SO_4)
 - 4.1.2 Give formula of Sulphuric Acid
 - 4.1.3 Give formula of Sulphuric Acid
 - 4.1.4 Enlist uses of sulphuric acid
 - 4.1.5 Illustrate importance of sulphuric acid in industrial development
 - 4.1.6 Enlist raw materials for sulphuric acid manufacture
 - 4.1.7 Name methods for sulphuric acid manufacture.
 - 4.1.8 Draw flow sheet diagram for sulphuric acid manufacture by lead chamber process.
 - 4.1.9 Enlist unit operations for lead chamber process
 - 4.1.10 Describe unit process of lead chamber process.
 - 4.1.11 Draw flow sheet for sulphuric acid manufacture by contact process
 - 4.1.12 Enlist unit operation for contact process
 - 4.1.13 Explain unit processes for contact process.
 - 4.1.14 Enlist vent gases of contact process
 - 4.1.15 Illustrate vent gas treatment of contact process.
 - 4.1.16 Give energy requirements for contact process.

5. **AMMONIA**

- 5.1 Understand ammonia and nitric acid manufacture.
 - 5.1.1 Enlist uses of ammonia
 - 5.1.2 Name method used for ammonia manufacture.
 - 5.1.3 Give raw materials for Ammonia manufacture by synthesis process.
 - 5.1.4 Enlist the steps involved in the manufacture of Ammonia from natural gas.
 - 5.1.5 Define reforming of natural gas.
 - 5.1.6 Describe primary reforming
 - 5.1.7 Explain secondary reforming

- 5.1.8 Explain shift conversion
- 5.1.9 Describe carbon di oxide absorption
- 5.1.10 Illustrate separation of carbon di oxide
- 5.1.11 Describe removal of carbon mono oxide before ammonia manufacture.
- 5.1.14 Draw diagram of Ammonia convertor
- 5.1.15 Describe unit process of Ammonia convertor
- 5.1.16 Draw flow sheet for Ammonia manufacture from natural process.
- 5.1.17 Describe unit processes involved in ammonia manufacture.
- 5.1.18 Illustrate liquification of ammonia
- 5.1.19 Describe storage of liquid ammonia
- 5.1.20 Name the method used for the manufacture of nitric acid from ammonia.
- 5.1.21 Draw flow sheet for manufacture of nitric acid from ammonia
- 5.1.22 Explain unit operation involved in nitric acid manufacture.
- 5.1.23 Explain unit processes involved in nitric acid manufacture.

6. AMONIUM NITRATE.

- 6.1 Understand ammonium nitrate manufacture
 - 6.1.1 Describe raw materials for ammonium nitrate manufacture.
 - 6.1.2 Draw flow sheet for ammonium nitrate manufacture.
 - 6.1.3 Enlist unit operations involved in ammonium nitrate manufacture.
 - 6.1.4 Explain unit processes involved in ammonium nitrate manufacture.
 - 6.1.5 Give uses of ammonium nitrate
 - 6.1.6 Explain storage of ammonium nitrate.

7. UREA.

- 7.1 Understand urea manufacture.
 - 7.1.1 Write formula of urea
 - 7.1.2 Enlist uses of urea
 - 7.1.3 Draw flow sheet for urea manufacture
 - 7.1.4 Describe unit operations involved in urea manufacture
 - 7.1.5 Explain unit processes involved in urea manufacture
 - 7.1.6 Explain prilling of urea

8 AMONIUM SULPHATE

- 8.1 Understand ammonium sulphate
 - 8.1.1 Enlist uses of ammonium sulphate
 - 8.1.2 Name raw materials for ammonium sulphate manufacture
 - 8.1.3 Draw flow sheet for ammonium sulphate manufacture
 - 8.1.4 Give unit operations involved in ammonium sulphate manufacture
 - 8.1.5 Describe unit processes involved in ammonium sulphate

9 PHOSPHATE FERTILIZER

- 9.1 Understand mono ammonium phosphate and di-ammonium phosphate
 - 9.1.1 Give formula of monoammonium phosphate
 - 9.1.2 Write formula of diammonium phosphate
 - 9.1.3 Enlist uses of ammonium phosphate
 - 9.1.4 Enlist raw materials of ammonium phosphate
 - 9.1.5 Describe beneficiation of phosphate rock
 - 9.1.6 Draw flow sheet for manufacture of ammonium phosphate
 - 9.1.7 Describe unit operations involved in ammonium phosphate manufacture

9.1.8 Explain unit process involved in ammonium phosphate manufacture

10 PORT LAND CEMENT

- 10.1 Understand portland cement manufacture
 - 10.1.1 Define portland cement
 - 10.1.2 Enlist uses of cement
 - 10.1.3 Enlist raw materials
 - 10.1.4 Name methods of cement manufacture
 - 10.1.5 Draw flow sheet for cement manufacture by dry process
 - 10.1.6 Describe unit operations involved in cement manufacture by dry process
 - 10.1.7 Give different zone in rotary kiln
 - 10.1.8 Enlist unit operation involved in cement manufacture by wet process
 - 10.1.9 Enlist unit operation involved in cement manufacture by semi wet process
 - 10.1.10 Distinguish between rotary kiln for dry process and wet process
 - 10.1.11 Illustrate physical properties of clinkers
 - 10.1.12 Explain briefly the function of gypsum in cement
 - 10.1.13 Describe hardening of cement
 - 10.1.14 Name various types of cement
 - 10.1.15 Describe various type of cement

11 LINE

- 11.1 Understand lime processing
 - 11.1.1 Write formula for lime
 - 11.1.2 Enlist uses of lime
 - 11.1.3 Enlist unit operation involved in lime processing
 - 11.1.4 Describe Unit processes involved in lime processing

12 GYPSUM.

- 12.1 Understand gypsum processing
 - 12.1.1 Write formula of gypsum
 - 12.1.2 Enlist uses of gypsum
 - 12.1.3 Describe calcination of gypsum
 - 12.1.4 Enlist uses of plaster
 - 12.1.5 Describe hardening of plaster

13 PETROLEUM INDUSTRY

- 13.1 Understand petroleum industry, ii) Understand L.P.G.
 - 13.1.1 Enlist constituents of petroleum
 - 13.1.2 Give composition of natural gas
 - 13.1.3 Describe unit operation and unit processes for processing of natural gas
 - 13.1.4 Define L.P.G.
 - 13.1.5 Draw flow sheet for L.P.G manufacture
 - 13.1.6 Explain steps involved in L.P.G. manufacture
 - 13.1.7 Enlist uses of natural gas
 - 13.1.8 Define refining
 - 13.1.9 Explain refining of petroleum
 - 13.1.10 Enlist petroleum refining products

14 UNIT PROCESSES IN PETROLEIUM

- 14.1 Understand unit processes involved in petroleum processing
 - 14.1.1 Explain cracking or pyrolysis
 - 14.1.2 Give examples of pyrolysis
 - 14.1.3 Explain reforming
 - 14.1.4 Explain catalytic reforming
 - 14.1.5 Explain polymerization
 - 14.1.6 Give examples of polymerization
 - 14.1.7 Give examples of alkylation
 - 14.1.8 Explain isomerization
 - 14.1.9 Give examples of isomerization

LIST OF PRACTICALS.

1. Detection of soft and hard water.
2. Determination of hardness of water.
3. Determination of dissolved oxygen in water.
4. Determination of total chlorides in water.
5. Determination of sulphates contents in water.
6. Determination of carbonates in water.
7. Determination of bicarbonates in water.
8. Determination of iron contents in water.
9. Determination of calcium contents in water.
10. Preparation of Ammonium Nitrate in lab.
11. Preparation of Amminium Sulphate in lab.
12. Purification by crystallization.
13. PH value determination.
14. Preparation of lime by the calcination of lime stone
- 15 Preparation of plaster of paris from gypsum.
- 16 Demineralization of water.

- 6.2 External indicator.
- 6.3 Universal indicator.
- 6.4 Behaviour of different indicators in acidic solutions and in basic solutions.
- 6.5 Preparation of indicator solution.
(phenolphthalein, methyl orange, methyl red, methyl blue, litmus solution, starch solution, diphenylamine).

7 **VOLUMETRIC ANALYSIS.**

- 7.1 Types of volumetric analysis (on the basis of reagent used).
- 7.2 Acidimetry - alkalimetry.
- 7.3 Redox - titration.
- 7.4 Iodometry.
- 7.5 Iodimetry
- 7.6 Argentometry.
- 7.7 Apparatus for volumetric analysis.
- 7.8 Mathematical calculations based on $N_1V_1 = N_2V_2$ and amount per litre = Normality * eq. wt.

8. **GRAVIMETRIC ANALYSIS.**

- 8.1 Apparatus for gravimetric analysis.
- 8.2 Free water contents, combined water contents (water of crystallization)
- 8.3 Determination of free and combined water gravimetrically.
- 8.4 Desiccants and use of desiccator.
- 8.5 Gravimetric determination of silver.
- 8.6 Gravimetric determination of magnesium.
- 8.7 Gravimetric determination of calcium.
- 8.8 Gravimetric determination of silica.
- 8.9 Gravimetric analysis of cement.

9 **REPORTING OF ANALYSIS RESULTS.**

- Percentage.
- Gram per liter.
- Parts per million (PPM)
- Parts per billion (PPM)

CHT 263 QUANTITATIVE ANALYSIS.

INSTRUCTIONAL OBJECTIVES.

1 INTRODUCTION.

- 1.1 Understand quantitative analysis.
 - 1.1.1 Define quantitative analysis.
 - 1.1.2 Illustrate importance of quantitative analysis.
 - 1.1.3 Distinguish qualitative analysis and quantitative analysis.
 - 1.1.4 Explain volumetric analysis.
 - 1.1.5 Describe gravimetric analysis.
 - 1.1.6 Define instrumental methods of analysis.

2. SOMPLING.

- 2.1 Understand sampling.
 - 2.1.1 Define sampling.
 - 2.1.2 Describe methods of sampling.
 - 2.1.3 Explain sampling of liquids for liquid, solid and gas liquids.
 - 2.1.4 Illustrate storage of samples.

3 ERRORS IN ANALYSIS.

- 3.1 Understand errors in analysis.
 - 3.1.1 Enlist errors in analysis.
 - 3.1.2 Explain personal error.
 - 3.1.3 Describe determinate error.
 - 3.1.4 Illustrate indeterminate error.
 - 3.1.5 Detect different errors.

4 ANALYSIS OPERATION.

- 4.1 Understand analysis operation.
 - 4.1.1 Describe working principle of electric balance.
 - 4.1.2 Explain weighing operation.
 - 4.1.3 illustrate measurement of volume using burette, pipette and measuring flask.
 - 4.1.4 Prepare sample solution.
 - 4.1.5 Explain Titration.
 - 4.1.6 Describe precipitation.
 - 4.1.7 Explain filtration.
 - 4.1.8 Illustrate drying.
 - 4.1.9 Explain ignition.

5 PREPARATION OF STANDARD SOLUTION.

- 5.1 Understand preparation of standard solution.
 - 5.1.1 Define primary standard.
 - 5.1.2 Define secondary standard.
 - 5.1.3 Define equivalent weight.

- 5.1.4 Describe standard solution.
- 5.1.5 Enlist methods of expression of solution concentration.
- 5.1.6 Calculate equivalent weight of different compounds.
- 5.1.7 Explain Normal solution.
- 5.1.8 Explain terms of solution concentration like normality, molarity and formality.
- 5.1.9 Prepare solution of different normalities.
- 5.1.10 Prepare solution of different molarities.
- 5.1.11 Calculate normality and molarity.

6 INDICATOR.

- 6.1 Understand indicator.
 - 6.1.1 Define indicator.
 - 6.1.2 Distinguish internal indicator.
 - 6.1.3 Describe universal indicator.
 - 6.1.4 Illustrate behaviour of different indicators in acidic/basic solutions.
 - 6.1.5 Prepare different indicators (like phenolphthalein, methyl orange, starch, litmus solution and diphenylamine).

7 VOLUMETRIC ANALYSIS.

- 7.1 Understand Volumetric analysis.
 - 7.1.1 Define volumetric analysis.
 - 7.1.2 Enlist type of reagent based volumetric analysis.
 - 7.1.3 Describe acidimetry, alkalimetry.
 - 7.1.4 Explain redox titrations.
 - 7.1.5 Distinguish Iodimetry and iodometry.
 - 7.1.6 Explain argentometry.
 - 7.1.7 Solve problems based on $N_1V_1 = N_2V_2$.
 - 7.1.8 Solve problems based on $\text{Amount/litre} = \text{Normality} \times \text{Equivalent weight}$.

8 GRAVIMETRIC ANALYSIS.

- 8.1 Understand gravimetric analysis.
 - 8.1.1 Define gravimetric analysis.
 - 8.1.2 Describe gravimetric analysis apparatus.
 - 8.1.3 Calculate free water content.
 - 8.1.4 Calculate water of crystallization.
 - 8.1.5 Explain desiccator.
 - 8.1.6 Enlist desiccants.
 - 8.1.7 Determine silver from given sample.
 - 8.1.8 Determine magnesium from given sample.

- 9.1.9 Determine calcium from given sample.
- 9.1.10 Determine silica from given sample.
- 8.1.11 Analyse cement.

9 REPORTING OF ANALYSIS RESULTS.

- 9.1 Know analysis results reporting.
 - 9.1.1 Define percentage.
 - 9.1.2 Define gram per liter.
 - 9.1.3 Describe parts per million.
 - 9.1.4 Tell parts per billion.

CHT 263 QUANTITATIVE ANALYSIS.

LIST OF PRACTICALS.

1. Calibration of
 - i. Burette
 - ii. Measuring cylinder.
 - iii. Measuring flask
 - iv. Pipette.
2. Weighing practice on analytical balance.
3. Weighing practice on digital balance.
4. Preparation of N/10 solution of primary standard Na_2CO_3 , Oxalic Acid)
5. Calculation method for preparation of N/10 (approximate) solution of secondary standard (NaOH , H_2SO_4).
6. Determination of normality of approximately prepared solution by titrating against some standard solution. HCl , H_2SO_4 and Normal solution.
7. Preparation of indicator solution.
 - i. Phenolphthalein solution.
 - ii. Methyl orange solution.
 - iii. Litmus solution.
 - iv. Starch solution.
 - v. Diphenylamine.
8. Determination of equivalent weight of an organic acid (oxalic acid)
9. Determination of acetic acid in vinegar.
10. Determination of alkaline value of soda ash.
11. Determination of percentage of NaOH and Na_2CO_3 in the mixture of two bases.
12. Preparation of (approx) M/20 KMnO_4 solution.
13. Standardizing the M/20 KMnO_4 solution
14. Determination of iron content in iron wire.
15. Determination of Fe^{+2} and Fe^{+3} in the iron salt.
16. Redox titration using external indicator.
17. Redox titration using internal indicator.
18. Standardization of 0.1 N iodine solution with $\text{Na}_2\text{S}_2\text{O}_3$ solution.
19. Standardization of BaS_2O_3 solution versus a known iodine solution.

20. Determination of antimony in antimony salt.
21. Determination of available chlorine in bleaching powder.
22. Determination of chlorine in soluble salt by volhards, method.
23. Estimation of chloride in a given sample of NaCl by AgNO₃ by using Mohr's methods.
24. Gravimetric determination of free water (moisture contents) and combined water (water crystallization)
25. Analysis of cement.
 - i. Determination of percentage loss on ignition.
 - ii. Determination of percentage of total silica.
 - iii. Determination of percentage of insoluble residue.
 - iv. Determination of percentage of moisture contents.
 - v. Determination of percentage of calcium contents.
 - vi. Determination of percentage magnesium contents.
26. Analysis of copper.
27. Analysis of tin
28. Analysis of lead.

CHT 271 SAFETY PRACTICE AND PROCEDURE.

T P C
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OBJECTIVES.

- 1.To acquaint students with causes of accidents in industry and instruct them how to eliminate hazards.
- 2.To train students in a fundamentals of fire protection.
- 3.To introduce students to the fundamentals of first aid.
- 4.To promote in students and understanding of value of plants layout for safe performance.
- 5.To provide the students ready reference of outstanding accepted safe standards, codes and technical aids.

COURSE CONTENTS.

1. Introduction to safety and its place in industry.
2. Accidents and accident costs.
3. Analyzing causes of accidents.
4. Fundamentals of accident prevention.
- 5.Industrial noise nad its controll, illumination for safety and comfort.
6. Industrial negieneand planad sanitation.
7. Personnel protective equipment.
8. Types of firehazards and causes.
9. Fire fighting equipments with identification symbols.
10. Plant layout for fire safety
11. Importance of plant maintenance and house keeping safety.
12. Plant inspection and safety inventory.
13. Accidents and their prevention in:
 - i. Mines Coal and salt mines.
 - ii. Petrolium industry.
 - iii. Paint industry and paint shops.
 - iv. Paper and board mills.
 - v. Prining industry.
 - vi. Food processing industry.
 - vii. Vegitable oil and soap industry.
 - viii Acid industry. (H_2SO_4 , HNO_3 , HCl)
 - ix. Caustic alkali industry.
 - x. Fertilizers (Ammonia, Urea, Nitrate) industry.
14. Plastic and fiber industry.
15. Power plants.
16. Antidotes od different chemicals.
17. First aid, Extended medical services.
18. Employees training in safe practices, methods of promoting safety. With special attention on women and employees.
19. Accident investigation, Record and report.

BOOKS RECOMMENDED.

1. Industrial Accident prevention.

2. Pakistan Labour.

CHT 271 SAFETY PRACTICE AND PROCEDURE

INSTRUCTIONAL OBJECTIVES

1. INTRODUCTION

- 1.1 Understand safety in chemical industry.
- 1.2 Understand philosophy of accidents.
 - 1.1.1 Define accident
 - 1.1.2 Enlist various types of accidents.
 - 1.1.3 Explain accident analysis
 - 1.1.4 Explain master sheet and work sheet of accident analysis.
 - 1.1.5 Name remedial/prevention measures.
 - 1.1.6 Explain facts in selection preventions
 - 1.1.7 Describe causes of attach
 - 1.1.8 Explain preventive measures in chemical industries, like
 - petroleum, paints, paper and board printing industries.
 - Food processing
 - Vegetable oils and Ghee
 - Acid and ackali industry
 - Fertilizers urea, Ammonia Ammonium Nitrate
 - Plastics and Fibre Industry
 - Power plants

2. ACCIDENT COST

- 2.1 Understand Accident cost.
 - 4 Various types of accidents in various chemical industry.
 - 2.1.3 Explain laws of the cost of accidents
 - 2.1.4 Describe location where accident has occurred, like
 - At work place
 - Running machinery
 - Reaction vessab/Roactors
 - 2.1.5 Explain management role of reliance
 - 2.1.6 Differentiate the responsibility of safety engineer and supervisor.
 - 2.1.7 Explain degree of responsibility.
 - 2.1.8 Explain the use of Gloves, Apron, Goggles and masks in health hazardous atmosphere (Antidotes of chemical)
 - 2.1.9 Calculate cost of lost of time of (n) used employee.
 - 2.1.10 Commute in terms of money cost of time lost by other employees who stop work
 - 2.1.11 Calculate the cost of time spent by first aid attendant and hospital department staff.
 - 2.1.12 Explain Insurance rules for various injuries like
 - Loss of nail of a finger
 - Cuts on hands and face
 - Slips and falls
 - Handling of toxic material
 - Miscellaneous operations and calculate compensation medical cost on the vasis of set formula

3. EMPLOYEES TRAINING

- 3.1 Understand training of employees.
 - 3.1.1 Define training and education of an employee.

- 3.2.2 Explain safety educational method
- 3.3.3 Enlist various methods of training and education.
- 3.4.4 Describe planned training with examples.
- 3.5.5 Differentiate between, education training and supervision of an employee.
- 3.6.6 Explain safety organization (Industry) as educational medium to avoid accidents for women workers.

4 ACCIDENT INVESTIGATION RECORD AND REPORT

- 4.1 Understand Accident Investigation terminology and maintain record of reports.
 - 4.1.1 Define accident investigation.
 - 4.1.2 Describe the accident fully, whether the injured person fell or was struck
 - 4.1.3 Narrate various factors of accident
 - 4.1.4 Name the machine, tool, appliance, gas, liquid involved in accident
 - 4.1.5 State of motors, pulley's gears etc.
 - 4.1.6 Enlist total number of such accidents occurred in an year.
 - 4.1.7 Specify remedial measures in the form of a report such as
 - Better illumination needed.
 - Better ventilation.
 - Providing goggles.
 - Enforcing instruction especially to women/men who work on plant operations.
 - 4.1.8 Explain the importance of training of an employee.

5 INDUSTRIAL NOISE AND CONTROL

- 5.1 Understand Industrial noise and control.
 - 5.1.1 Define Industrial noise.
 - 5.1.2 Enlist types of noise with frequency.
 - 5.1.3 Explain the complexity of noise on worker in a chemical industry.
 - 5.1.4 Describe causes of noise.
 - 5.1.5 Explain the relationship of noise to accident and prevention.
 - 5.1.6 Explain noise standards.
 - 5.1.7 Describe medical view point on noise and its control.
 - 5.1.8 Explain control medium of noise.

6 INDUSTRIAL HYGIENE AND PLANT SANITATION

- 6.1 Understand Industrial Hygiene and sanitation.
 - 6.1.1 Define Industrial Hygiene and sanitation.
 - 6.1.2 Name various Hygiene and sanitation methods.
 - 6.1.3 Explain all methods and its effect upon accident prevention.

7 FIRE PREVENTION HAZARDS

- 7.1 Understand fire hazards and prevention.
 - 7.1.1 Define fire hazards.
 - 7.2.2 Enlist types of fires in a chemical Industry.
 - 7.2.3 Name fire fighting and extinguishing equipments.
 - 7.2.4 Explain origin of the fire.
 - 7.2.5 Describe fire resistive designs and construction/equipments.
 - 7.2.6 Explain method of fire prevention.
 - 7.2.7 Explain the use of fire extinguish and the chemicals it contains.
 - 7.2.8 Describe the use of chemical to avoid accidents due to fire.

OBJECTIVES.

1. Understand the scientific methods as applied to the development of the laws of chemistry and physics.
2. Techniques for the control of chemical phenomenon from the study of laws of chemistry and physics.
3. Acquire the techniques used in analytical methods.

COURSE CONTENTS.**1. THERMOCHEMISTRY.**

- 1.1 Introduction.
- 1.2 Exothermic and endothermic reaction.
- 1.3 Heat of Reaction.
- 1.4 Factor affecting heat of reaction
- 1.5 Heat of formation.
- 1.6 Heat of combustion.
- 1.7 Application of heat of combustion.
- 1.8 Heat of Neutralization.
- 1.9 Hess's law of constant heat summation.

2. THERMODYNAMICS.

- 2.1 First law of thermodynamics.
- 2.2 Heat changes at constant pressure and at constant volume.

3. SOLUTION.

- 3.1 Solution, types of solutions.
- 3.2 Concentration.
- 3.3 Normality, Normal solution.
- 3.4 Molarity, Molar solution Molality.
- 3.5 Percentage composition.
- 3.6 Properties of solution.
- 3.7 Electrolytes.
- 3.8 Definition of solubility.
- 3.9 Effect of temperature and pressure on solubility.
- 3.10 Elevation of boiling point and its applications.
- 3.11 Depression of freezing point and its applications.

4. COLLOIDAL STATE.

- 4.1 Preparation of colloidal solutions.
- 4.2 Properties of colloidal solutions.
- 4.3 Application of colloidal chemistry in industry.

5. PHOTOCHEMISTRY.

- 5.1 Sources of photochemical reactions.
- 5.2 Photochemical reaction.

- 5.3 Laws of photochemistry.
- 5.4 Measurement of intensity of Radiation.
- 5.5 Photosensitisation.
- 5.6 Photosynthesis.
- 5.7 Photophysical phenomena.
Luminescence

Phosphorescence.

- 5.8 Application of photochemistry.

6. ELECTROCHEMISTRY.

- 6.1 Electrolytes and electrolysis.
- 6.2 Electrolytes and Ohm's Law.
- 6.3 Conductivity of electrolytes.
- 6.4 Faraday's Law of electrolytes.
- 6.5 Effect of dilution on conductivity.
- 6.6 Measurement of conductivity.

7. RADIOACTIVITY.

- 7.1 Natural radioactivity.
- 7.2 Artificial radioactivity.
- 7.3 Properties of A-ray.
- 7.4 Properties of B-rays.
- 7.5 Properties of R-rays.
- 7.6 Protons, neutrons and alpha emission
- 7.7 Positrons and other particles discovered.
- 7.8 Detection and measurement of Radioactivity.
- 7.9 Nuclear fission and its application.
- 7.10 Nuclear fusion and its applications.
- 7.11 Radioactive disintegration series.
- 7.12 Isotopes with examples.
- 7.13 Isobars with examples.

8. CHEMICAL KINETICS.

- 8.1 Velocity of a chemical reaction.
- 8.2 Reaction rate and velocity constant.
- 8.3 Factors which affect reaction rate

9. CHEMICAL EQUILIBRIUM.

- 9.1 Law of mass action.
- 9.2 Equilibrium mixtures and measurement of equilibrium constant.
- 9.3 Hydrolysis of bicarbonates.
- 9.4 Reaction between an organic acid and an alcohol reaction between hydrogen and iodine.
- 9.5 Application of equilibrium constant.
- 9.6 Effect of temperature, pressure, concentration and catalyst.

RECOMMENDED BOOKS.

- 1. Chemistry for Class XI
Published by Punjab Text Book Board, Lahore.
- 2. Essentials of Physical Chemistry by B.S. Bhal, G.D. Tuli.

INSTRUCTIONAL OBJECTIVES.**1. PHYSICAL CHEMISTRY**

- 1.1 Understand chemistry
 - 1.1.1 Define thermo chemistry
 - 1.1.2 Distinguish exothermic and endothermic reactions.
 - 1.1.3 Give examples of exothermic and endothermic reactions.
 - 1.1.4 Explain heat of reaction
 - 1.1.5 Enlist factors affecting heat of reaction
 - 1.1.6 Describe heat of formation
 - 1.1.7 Illustrate heat of combustion
 - 1.1.8 Enlist heat of combustion application
 - 1.1.9 Describe heat of neutralization
 - 1.1.10 State Hess's law of constant heat summation
 - 1.1.11 Solve problems based on Hess's law

2 THERMODYNAMICS

- 2.1 Understand thermodynamics
 - 2.1.1 State first law of thermodynamics
 - 2.1.2 Calculate heat changes at constant volume
 - 2.1.3 Calculate heat change at constant pressure

3 SOLUTION

- 3.1 Understand solution
 - 3.1.1 Define solution
 - 3.1.2 Give examples of types of solution
 - 3.1.3 Define concentration
 - 3.1.4 Explain normality
 - 3.1.5 Describe molarity
 - 3.1.6 Explain percentage composition
 - 3.1.7 Illustrate properties of solution
 - 3.1.8 Explain electrolysis
 - 3.1.9 Define solubility
 - 3.1.10 Describe effect of temperature and pressure on solubility
 - 3.1.11 Explain elevation of boiling point
 - 3.1.12 Enlist elevation of boiling point application
 - 3.1.13 Explain depression of freezing point
 - 3.1.14 Enlist depression of freezing point applications

4 COLLOIDAL STATE

- 4.1 Understand colloidal state
 - 4.1.1 Explain colloidal state
 - 4.1.2 Prepare different colloidal solutions
 - 4.1.3 Describe properties of colloidal solutions
 - 4.1.4 Enlist colloidal chemistry application in industry

5 PHOTO CHEMISTRY

- 5.1 Understand photo chemistry

- 5.1.1 Enlist sources of photo chemical radiations
- 5.1.2 Describe photo chemical reactions
- 5.1.3 State different laws of photo chemistry
- 5.1.4 Enlist different instruments used to measure intensity of radiations
- 5.1.5 Describe photosensitisation
- 5.1.6 Define photo synthesis
- 5.1.7 Define luminescence
- 5.1.8 Explain briefly fluorescence
- 5.1.9 Define phosphorescence
- 5.1.10 Enlist applications of photo chemistry

6 UNDERSTAND ELECTRO CHEMISTRY

- 6.1 Describe electrolytes
- 6.2 State ohm's law
- 6.3 Describe conductivity of electrolytes
- 6.4 State faraday's laws of electrolysis
- 6.5 Explain effect of dilution on conductivity
- 6.6 Enlist instruments used to measure the conductivity

7 UNDERSTAND RADIOACTIVITY

- 7.1 Define natural radioactivity
- 7.2 Define artificial radioactivity
- 7.3 Enlist properties of alpha rays, Beta rays, gamma rays
- 7.4 Describe particles of atom like proton, neutron, positron
- 7.5 Explain the method, for radio activity measurement
- 7.6 Define nuclear fission and nuclear fusion
- 7.7 Enlist nuclear fission and nuclear fusion application
- 7.8 Explain radioactive disintegration series
- 7.9 Give examples of Isobars and Isotopes

8 UNDERSTAND CHEMICAL KINETICS

- 8.1 Calculate velocity of chemical kinetics
- 8.2 Explain reaction rate
- 8.3 Describe velocity constant
- 8.4 Enlist factors which effect reaction rate

9 UNDERSTAND CHEMICAL EQUILIBRIUM

- 9.1.1 State law of mass action
- 9.1.2 Define equilibrium mixtures
- 9.1.3 Measure equilibrium constant
- 9.1.4 Explain hydrolysis of $BiCl_3$
- 9.1.5 Describe reaction between an organic acid and an alcohol
- 9.1.6 Illustrate reaction between hydrogen and Iodine
- 9.1.7 Enlist equilibrium constant application
- 9.1.8 Describe effect of temperature, pressure, concentration and catalyst on equilibrium constant

LIST OF PRACTICALS.

	No. of Practicals.
1. To weigh the chemicals on an analytical balance (use of sensitive analytical balance)	03
2. To determine the melting point of a given organic compounds.	01
3. To determine the boiling point of a given liquid.	01
4. Determine the specific gravity of the given liquid.	02
5. Determine the viscosity by viscometer (ostwalds viscometer)	02
6. Determine of solubility of common salt at room temperature.	01
7. To separate the mixture by sublimation.	02
8. To obtain alcohol from a mixture of alcohol and water by distillation.	02
9. To determine the equivalent weight of magnesium (To verify the law of constant composition)	02
10. Preparation of standard solution of alkalies and acids e.g NaOH, KOH, oxalic acid and succinic acid.	04
11. Prepare approximate solution of H ₂ SO ₄ and determine its exact molarity by titrating it against standard N/10 NaOH.	02
12. Determination of surface tension by stalgo meter.	02
-Determination of surface tension of liquid by using torsion balance.	
-Preparation of colloidal solution and study the properties of colloidal solution.	
-Determination of equilibrium constant and rate of reaction (1st degree reaction and 2nd degree reaction).	
- Preparation of Neon signs.	

OBJECTIVES.

1. Apply the principles of unit operation in chemical engineering.
2. To apply principles of unit operation in the laboratory work.
3. Know the construction and working of chemical process equipment related to different industrial operations, its uses and applications.

COURSE CONTENTS.

1 UNIT OPERATIONS OF CHEMICAL ENGINEERING

- 1.1 Flow of fluids, types of fluids.
 - 1.2 Fluids statics, fluids dynamics.
 - 1.3 Mechanism of fluids flow.
 - 1.4 Reynold's number, significance of Reynold number
 - 1.5 Manometers, types
 - 1.6 'U' tube manometers.
 - 1.7 Inclined and well type manometers.
 - 1.8 Viscosity, units of viscosity.
 - 1.9 Bernouli's theorem.
 - 1.10 Fluids Heads, friction losses
 - 1.11 Friction in pipes, sudden enlargement and contraction losses in fittings
- Module

2. MEASUREMENT OF FLUIDS;

- 2.1 Venturi-meter, orificemeter.
- 2.2 Rotameters, Pitot tubes & weirs.
- 2.3 Displacement meters. (i) Disc meter
- 2.4 (ii) Current meter

3. PUMPS

- 3.1 Pumps types of pumps.
- 3.2 Pump's terminology i.e. capacity velocity head, suction heads and net positive suction Head, cavitation
- 3.3 Centrifugal pumps, types, construction and working
- 3.4 Construction and working of rotary pumps.
- 3.5 Construction and operation of reciprocating pumps i.e. Piston pumps
- 3.6 Plunger Pump, Simplex type, their construction and working principles..
- 3.7 Theory of compression, compressor selection.
- 3.8 Construction and working of reciprocating compressor.
- 3.9 Construction and working of centrifugal compressor.

4. HEAT TRANSFER

- 4.1 Modes of Heat transfer, Fourier law.
- 4.2 Thermal conductivity, pipe insulation.

- 4.3 Film Coefficient
- 4.4 Overall heat transfer coefficient.
- 4.5 Factors affecting heat transfer coefficient.
- 4.6 Classification of heat exchange equipments.
- 4.7 Double pipe heat exchanger, shell and tube heat exchanger.
- 4.8 Floating head heat exchangers
- 4.9 Extended surface heat exchangers and condensers.

5. EVAPORATION.

- 5.1 Basic principles of evaporation.
- 5.2 Types of evaporators.
- 5.3 Construction and operation of
 - i) Short tube evaporator
 - ii) Long tube vertical evaporator.
- 5.4 Forced circulation upward flow (climbing film) evaporator.
- 5.6 Constriction and working of.
 - i) Falling film evaporators.
 - ii) Agitated film evaporator.
- 5.7 Evaporator accessories.
- 5.8 Surface condenser, contact condensers.
- 5.9 Multiple evaporators.
- 5.10 Principle economy and capacity.
- 5.11 Effect of boiling point elevation.
- 5.12 Methods of feeding.
- 5.13 Removal of non-condensed gases
- 5.14 Removal of condensates, salt removal

6. EVAPORATOR PROBLEMS

- 6.1 Scale formation and its removal
- 6.2 Steam table and their use, choice of steam pressure
- 6.3 Trouble shootings in operation of evaporators, remedies

RECOMMENDED BOOKS.

- 1. I. M. Coulson and J. H. Richardson Introduction to Chemical Engineering
- 2. A. H. Perry Chemical Engineering Hand Book

INSTRUCTIONAL OBJECTIVES.

1.1 THE STUDENT WILL BE ABLE TO UNDERSTAND THE UNIT OPERATIONS

- 1.1.1 Define unit operation and unit process
- 1.1.2 Give examples of unit operations
- 1.1.3 Give examples of unit process
- 1.1.4 Explain basic laws (law of material balance law of energy balance) of chemical energy
- 1.1.5 Differentiate between steady state and non steady state systems

2.1 UNDERSTAND THE FLUID

- 2.1.1 Define fluid
- 2.1.2 Give types of fluid
- 2.1.3 differentiate between newtonian and non newtonian fluids
- 2.1.4 Give examples of the two types of fluids

2.2 UNDERSTAND THE FLUID PRESSURE

- 2.2.1 Define fluid statics
- 2.2.2 Develop a relationship to calculate the pressure exerted by liquid column

2.3 UNDERSTAND THE MANOMETER

- 2.3.1 Define manometer
- 2.3.2 Give the types of manometers
- 2.3.3 Explain the construction and working of simple manometer(u-tube manometer)
- 2.3.4 Explain the construction and working of differential manometer
- 2.3.5 Explain the construction and working of inclined tube manometer
- 2.3.6 Calculate pressure drop from manometer readings

2.4 UNDERSTAND THE FLUID DYNAMICS

- 2.4.1 Define fluid dynamics
- 2.4.2 Explain the mechanism of fluid flow by Reynold experiment
- 2.4.3 Differentiate between laminar flow and turbulent flow
- 2.4.4 Explain Reynolds number
- 2.4.6 Differentiate between point velocity, maximum velocity and mean velocity of the flowing fluid

2.5 UNDERSTAND THE VISCOSITY

- 2.5.1 Define viscosity
- 2.5.2 Explain the units of viscosity
- 2.5.3 Calculate the viscosity of fluids by using hagen poiseuille equation

2.6 UNDERSTAND BERNOULLI'S THEOREM

- 2.6.1 Explain Bernoulli's theorem

- 2.6.2 Develop a mathematical equation for bernoulli's theorem
- 2.6.3 Explain fluid heads
- 2.6.4 Calculate the H.P of the pump required to pump the liquid from station A & B , by using bernoulli's equatoin

2.7 UNDERSTAND FIRCTION LOSSES

- 2.7.1 Enlist different kinds of fiction losses
- 2.7.2 Calculate the head loss due firction in pipes
- 2.7.3 Calculate the head loss due to sudden enlengement
- 2.7.4 Calculate the head loss due to sudden contraction
- 2.7.5 Explain the losses in fittings in terms of equivalent pipe length

2.8 UNDERSTAND THE MEASUREMENT OF DISCHARGE OF FLUIDS

- 2.8.1 Enlist the equipments used for the measurement of flow rate of fluids
- 2.8.2 Explain the construction and working of orifice meter
- 2.8.3 Explain the methods of installation of an orificie meter
- 2.8.4 Explain athe construction and working of venturimeter
- 2.8.5 Give comparison between orifice meter and venturimeter
- 2.8.6 Explain the construction and working of pilot take
- 2.8.7 Explain the construction and working of rotameter
- 2.8.8 Explain the construcion and working of weirs

3.1 UNDERSTAND THE TERMINOLOGY OF PUMPS

- 3.1.1 Define pump
- 3.1.2 Define pump capacity
- 3.1.3 Explain suction head
- 3.1.4 Explain net positive suction head
- 3.1.5 Explain discharge head
- 3.1.6 Explain velocity head
- 3.1.7 Explain pump efficiency

3.2 UNDERSTAND THE TYPES OF POSITIVE DISPLACEMENT PUMPS

- 3.2.1 Define positive displacement pump
- 3.2.2 Explain the classification of positive displacement pumps
- 3.2.3 Explain the construcion and working of a reciprocating pump (piston pump)
- 3.2.4 Explain the constructon and working of a plunger pump
- 3.2.5 Explain the construction and working of diaphragm pump
- 3.2.6 Explain the construction and working of a gear pump
- 3.2.7 Explain the construction and working of cycloidal pump

3.3 UNDERSTAND THE CONSTRUCTION AND WORKING OF DIFFERENT TYPES OF CENTIFUGAL PUMPS

- 3.3.1 Define centifugal pump
- 3.3.2 Give the classification of centifugal pumps
- 3.3.3 Explain the construcion and working of a volute pump
- 3.3.4 Explain consitation in a c.f pump

- 3.3.5 Explain priming of a c. f pump
- 3.3.6 Explain and thrust in a c. f pump
- 3.3.7 Explain the construction of a turbine pump
- 3.4 UNDERSTAND THE SELECTION METHOD OF A PUMP**
- 3.4.1 Enlist the factors that are to be considered in the selection of a pump
- 3.4.2 Give comparison between centrifugal pump and reciprocating pump
- 3.4.3 Enlist the pump losses
- 4.1 UNDERSTAND THE BLOWERS**
- 4.1.1 Define blower
- 4.1.2 Explain the construction and working of cycloidal blower
- 4.1.3 Explain the construction and working of Nash-Hytor
- 4.1.4 Explain the construction and working of centrifugal blower
- 4.2 UNDERSTAND THE COMPRESSORS**
- 4.2.1 Define compressor
- 4.2.2 Explain the working principle of reciprocating compressor
- 4.2.3 Explain the working principle of centrifugal compressor
- 4.2.4 Enlist the factors one should consider while selecting a compressor
- 5.1 UNDERSTAND MODES OF HEAT TRANSFER**
- 5.1.1 Define heat
- 5.1.2 Enlist modes of heat transfer
- 5.1.3 Explain conduction
- 5.1.4 Explain convection
- 5.1.5 Explain radiation
- 5.1.6 Give examples of the three modes of heat transfer
- 5.2 MAKE CALCULATIONS RELATED TO CONDUCTION**
- 5.2.1 State Fourier's law of heat conduction
- 5.2.2 Give mathematical form of Fourier's law
- 5.2.3 Explain thermal conductivity
- 5.2.4 Give units of thermal conductivity
- 5.2.5 Explain the effect of thermal conductivity
- 5.2.6 Develop a formula to calculate heat flow through compound resistance in flat wall
- 5.2.7 Develop a formula to calculate heat flow through cylindrical wall
- 5.2.8 Calculate heat loss through a flat furnace wall
- 5.2.9 Calculate heat loss through a cylindrical furnace wall
- 5.2.10 Calculate the thickness of insulation layer on a hot pipe
- 5.3 MAKE CALCULATIONS RELATED TO CONVECTION**
- 5.3.1 State Newton's law of heat convection
- 5.3.2 Explain film coefficients
- 5.3.3 Develop an equation for overall heat transfer coefficient by combining film coefficients

- 5.3.4 Give the factors effecting overall heat transfer co-efficient
- 5.3.5 Calculate the overall heat transfer co-efficient when film co-efficients are given

5.4 UNDERSTAND TEMPERATURE DROP IN FLOWING FLUIDS

- 5.4.1 Differentiate between co-current flow and counter current flow
- 5.4.2 Calculate temperature in parallel flow
- 5.4.3 Calculate temperature drop in counter current flows
- 5.4.4 Calculate mean temperature difference
- 5.4.5 Calculate log mean temperature difference

5.5 MAKE CALCULATIONS RELATED TO CONDUCTION

- 5.5.1 State stefan boltzman law of heat radiation
- 5.5.2 Explain black body
- 5.5.3 Explain grey body
- 5.5.4 calculate the heat transere by radiation

5.6 UNDERSTAND HEAT TRANSFER EQUIPMENTS

- 5.6.1 Define heater
- 5.6.2 Define heat exchanger
- 5.6.3 Give the classification of heat exchangers
- 5.6.4 Explain the construction and working of pipe heat exchanger
- 5.6.5 Explain the construction and working of tubular (shell and tube) heat exchanger
- 5.6.6 Explain the constuction and working of floating head heat exchanger
- 5.6.7 Explain the finned tubes heater

6.1 UNDERSTAND DIFFERENT TYPES OF EVAPORATORS

- 6.1.1 Define evaporation
- 6.1.2 Enlist types of evaporators
- 6.1.3 Explain construction and working of horizontal tube evaporator
- 6.1.4 Explain construction and working of short tubesevaporator
- 6.1.5 Explain construction and working of long tubes evaporator
- 6.1.6 Explain construction and working of climbing film evoporator
- 6.1.7 Explain consturcion and working of falling film evaporator

6.2 UNDERSTAND EVAPORATOR ACCESSORIES

- 6.2.1 Define evaporator accessories
- 6.2.2 Enlist evaporator accessories
- 6.2.3 Enlist different types of condenser
- 6.2.4 Explain the working of a contact condenser
- 6.2.5 Explain the construction and working of a steam ejector
- 6.2.6 Explain the construction and working of an entrainment separator

6.3 UNDERSTAND MULTIPLE EFFECT EVAPORATOR

- 6.3.1 Explain basic principle of multiple effect evaporation
- Explain construction and working of a triple effect evaporator
- Enlist the methods of feeding
- Explain forward feeding method
- Explain backward feeding method
- Explain mixed feeding method
- Explain economy and capacity of a multiple effect evaporator

6.4 MAKE CALCULATIONS RELATED TO EVAPORATOR

- 6.4.1 Explain the use of steam table
- 6.4.2 Calculate the amount of steam required for evaporating a given feed to a desired concentration in a single effect evaporator

6.5 UNDERSTAND THE PROBLEMS OF EVAPORATORS

- 6.5.1 Explain the effect of noncondensed gases and their removal
- Explain scale formation, its effects and removal
- Explain trouble shootings in the operation of evaporator and their remedies

LIST OF PRACTICALS.

1. Introduction to the unit operation laboratory.
2. Study the operating characteristics and performance of a centrifugal type pump. Dismantle and assemble centrifugal pump.
3. Calibrate a storage tank to obtain weight and volume relationship per unit height and study of important values used in chemical industry.
4. Prepare a graph of co-efficient of discharge of an orifice vs Reynold number.
5. Make flow measurement by venturimeter.
6. Measurement of friction in pipes.
7. Determine the efficiency of a boiler.
8. Determine overall heat transfer co-efficient from hot gases and to note the effect of stirring on overall heat transfer co-efficient.
9. Determine the heat losses from a steam pipe and observe the effect of lagging.
9. To determine the overall heat transfer and efficiency of equipment exemplified by the preheater and condenser of a climbing and falling film type evaporator when
 - a) Feed rate is constant.
 - b) Steam pressure is constant.

Mgm-311 INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS.

Total Contact Hours	T	P	C
Theory 32	1	0	1

AIMSThe study of this subject will enable the student to develop the management skill, acquaint him with the principles of management and human relations and develop psychological approach to solve the labour problems.

COURSE CONTENTS

- 1. INDUSTRIAL PSYCHOLOGY. 2 Hours**
 - 1.1 History and definition.
 - 1.2 Nature and scope.

- 2. LEADERSHIP 1 Hour**
 - 2.1 Definition and types.
 - 2.3 Qualities of a good leader.

- 3. MOTIVATION 2 Hours**
 - 3.1 Definition.
 - 3.2 Types (Financial and non financial motives).
 - 3.3 Conflict of motives.

- 4. MORALE 1 Hour**
 - 4.1 Importance.
 - 4.2 Development.
 - 4.3 Measurement.

- 5. HUMAN ENGINEERING. 1 Hour**
 - 5.1 Importance of human factor in industry.
 - 5.2 Man-machine system.
 - 5.3 Strategy for making allocation decisions.

- 6. INDUSTRIAL FATIGUE AND BOREDOM. 2 Hours**
 - 6.1 Definition and distinction.
 - 6.2 Psychological causes.
 - 6.3 Objective causes.
 - 6.4 Prevention

7.	INDUSTRIAL ACCIDENTS	2 Hours
	7.1 Psychological causes.	
	7.2 Objective causes.	
	7.3 Prevention	
8.	INDUSTRIAL PREJUDICE	2 Hours
	8.1 Causes	
	8.2 Remedies	
9.	PUBLIC RELATIONS.	2 Hours
	9.1 Importance	
	9.2 Functions	
10.	GUIDANCE AND COUNSELLING	2 Hours
	10.1 Importance	
	10.2 Choice of job.	
	10.3 During service.	
11.	JOB EVALUATION	2 Hours
	11.1 Importance	
	11.2 Methods	
	11.3 Job satisfaction	
	11.4 Work simplification.	
12.	INDUSTRIAL MANAGEMENT	2 Hours
	12.1 Introduction	
	12.2 Functions of management.	
	12.3 Subdivisions of management	
	12.4 Objectives of industrial management.	
13.	PERSONNEL SELECTION.	2 Hours
	13.1 Recruitment of employees.	
	13.2 Training.	
	13.3 Effects of training on production and product cost.	
14.	WORKING CONDITIONS.	2 Hours
	14.1 Importance and consideration.	
	14.2 Effects on efficiency and per unit cost.	
15.	TIME AND MOTION STUDY.	3 Hours
	15.1 Concept and importance.	
	15.2 Sequence of motion study.	

- 15.3 Principles of motion study.
- 15.4 Steps to time study.
- 15.5 Determination of operations time.

16. QUALITY CONTROL.

2 Hours

- 16.1 Concept and advantages
- 16.2 Methods.

17. ROLE OF FOREMAN IN MANAGEMENT.

2 Hours

- 17.1 Foreman's abilities.
- 17.2 Duties and functions.

BOOKS RECOMMENDED:

- 1. C.S. Meyers, Industrial Psychology, Oxford University Press, London.
- 2. Smith Wakley, Psychology of Industrial Behaviors, Mc-Graw Hill, New York.
- 3. Ghulam Hussain, Nizamat-e-Sanaat Aur Insani Rawabat, Ilmi Kitab Khana, Urdu Bazar, Lahore.
- 4. Andrew R. Megill, The Process of Management William M New Man.
- 5. Richard N Omen, Management of Industrial Enterprises.

Mgm-311 INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS.

INSTRUCTIONAL OBJECTIVES

At the completion of this course, the students will be able to:

- 1. KNOW INDUSTRIAL PSYCHOLOGY.**
 - 1.1 Describe brief history of industrial psychology.
 - 1.2 Describe in detail definition of industrial psychology.
 - 1.3 State nature and scope of industrial psychology.

- 2. KNOW LEADERSHIP.**
 - 2.1 Define leadership.
 - 2.2 Describe types of leadership.
 - 2.3 State qualities of a good leader.

- 3. UNDERSTAND MOTIVATION.**
 - 3.1 Define motivation.
 - 3.2 Describe financial and non financial motives.
 - 3.3 Explain conflict of motives.

- 4. KNOW MORALE.**
 - 4.1 State importance of morale.
 - 4.2 Describe development of morale.
 - 4.3 State the method of measurement of morale.

- 5. UNDERSTAND HUMAN ENGINEERING.**
 - 5.1 Explain importance of human engineering in the industry.
 - 5.2 Explain man-machine system.
 - 5.3 Explain strategy for making allocation decisions.

- 6. UNDERSTAND INDUSTRIAL FATIGUE AND BOREDOM.**
 - 6.1 Define fatigue and boredom.
 - 6.2 Describe psychological causes of fatigue and boredom.
 - 6.3 Describe objective causes of fatigue and boredom.
 - 6.4 Explain measures to prevent fatigue and boredom.

- 7. UNDERSTAND INDUSTRIAL ACCIDENTS.**
 - 7.1 Explain psychological causes of industrial accidents.
 - 7.2 Explain objective causes of industrial accidents.
 - 7.3 Explain measures to prevent industrial accidents.

- 8. UNDERSTAND INDUSTRIAL PREJUDICE.**
 - 8.1 Define prejudice
 - 8.2 Explain causes of industrial prejudice.
 - 8.3 Explain remedies of industrial prejudice.

- 9. UNDERSTAND THE SIGNIFICANCE OF PUBLIC RELATIONS.**
 - 9.1 Explain importance of public relations.
 - 9.2 Explain functions of public relations.

- 10. UNDERSTAND THE NEED FOR GUIDANCE AND COUNSELLING.**
 - 10.1 State importance of guidance and counselling.
 - 10.2 Explain the role of guidance and counselling in choosing the job.
 - 10.3 Describe help of guidance and counselling during service.

- 11. UNDERSTAND JOB EVALUATION.**
 - 11.1 Explain importance of job evaluation.
 - 11.2 Explain methods of job evaluation.
 - 11.3 Explain job satisfaction.
 - 11.4 Explain work simplification.

- 12. UNDERSTAND INDUSTRIAL MANAGEMENT.**
 - 12.1 Define management.
 - 12.2 State functions of management.
 - 12.3 Enlist subdivision of management.
 - 12.4 Explain objectives of industrial management.

- 13. UNDERSTAND TRAINING AND ITS EFFECTS.**
 - 13.1 Describe the recruitment procedure of employees in an industrial concern.
 - 13.2 Explain training.
 - 13.3 Identify the kinds of training.
 - 13.4 Explain the effects of training on production and product cost.

- 14. UNDERSTAND THE EFFECT OF WORKING CONDITION ON EFFICIENCY.**
 - 15.1 Explain importance of working condition.
 - 15.2 Describe air-conditioning, ventilation, lighting and noise.
 - 15.3 State the effects of good working conditions on efficiency and per unit cost.

- 15. UNDERSTAND TIME AND MOTION STUDY.**
 - 15.1 Explain the concept.
 - 15.2 Describe the importance of work study.
 - 15.3 Explain the sequence of motion study.

- 15.4 State the principles of motion study.
- 15.5 Describe the steps for carrying out time study.
- 15.6 Explain the method of determination of operations time.

16. UNDERSTAND THE METHODS OF QUALITY CONTROL.

16.1 Define quality control

16.2 State the advantages of quality control.

16.2 Explain methods of quality control.

17. UNDERSTAND THE ROLE OF FOREMAN IN AN INDUSTRIAL UNDERTAKING.

17.1 Explain ability of the foreman.

17.2 Enlist duties of foreman.

17.3 Describe functions of foreman as middle management.

CHT 314 INSTRUMENTAL METHODS OF ANALYSIS.

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COURSE CONTENTS.

1. INTRODUCTION. INSTRUMENTAL METHODS OF ANALYSIS.

- 1.1 Light and its properties.
- 1.2 Radiant energy.
- 1.3 Mathematical calculation by $E=Lc/t$
- 1.4 Numerical.

2. COLORIMETRY.

- 2.1 Fundamental law of colorimetry.
- 2.2 Bouger's Law , Bear's Law.
- 2.3 Failures of Bouger, Bear's Law.
- 2.4 Photo electric colorimetry.
- 2.5 Barrier layer cell construction and working.
- 2.6 Photo emissive tube construction and working.
- 2.7 Photo meter.
- 2.8 Single beam photo meter. Construction and working.
- 2.9 Double beam photo meter. Construction and working.
- 2.10 Bouger, Bear's law applied to photo electric calorimetry.

3. FLORESCENCE, PHOTO SCENES (DEFINITION, APPLICATION.)

- 3.1 Fluorescence methods for the Fluorescence development.
- 3.2 Relationship between florescent intensity and concentration.
- 3.3 Filter flourometer.
- 3.4 Construction, operating parts and working.

4. TURBIDIMETRY AND NEPHELOMETRY.

- 4.1 Application.
- 4.2 Nephelometer
- 4.3 Construction and working.
- 4.4 Tubidimeter, its construction and working.

5. SPECTOR PHOTO METRY.

- 5.1 Spectrum of light, visible spectra.
- 5.2 Ultra violet spectra.
- 5.3 Infrared spectra.
- 5.4 Absorption spectra, emission spectra.
- 5.5 Molecular structure, origin of spectra.
- 5.6 Specto photo meter.

- 5.7 Construction and working of a spectro photo meter.
 - 5.8 Ultra violet spectro photo meter.
 - 5.9 Construction and working parts.
 - 5.10 Infrared spectro photo meter.
 - 5.11 Construction and working parts.
- 6. FLAME PHOTO METRY.**
- 6.1 Definition, application.
 - 6.2 Flame photo meter.
 - 6.3 Parts of flame photo meter.
 - 6.4 Flow meter.
 - 6.5 Atomise Burner.
 - 6.6 Parts of flame photo meter (continued).
 - 6.7 Optical system.
 - 6.8 Photo sensitive detector.
 - 6.9 Recording equipment.
 - 6.10 Commercial flame photo meter.
 - 6.11 Construction and working.
- 7. REFRACTIVE INDEX AND REFRACTOMETRY.**
- 7.1 Effect of temperature.
 - 7.2 Application.
 - 7.3 Refractometer.
 - 7.4 Abbe's refracto meter, construction and working.
 - 7.5 Fishen refractometer, construction and working.
- 8. POLARIMETRY.**
- 8.1 Optical active material, optical activity.
 - 8.2 Phase polarized light.
 - 8.3 Low rotatory dextro rotatory.
 - 8.4 Calculation of optical rotation.
 - 8.5 Specific rotation.
 - 8.6 Polarimeter, construction and working.
 - 8.7 Construction of analyzer and polarizer prisms.
- 9. ANEMOMETER: METHODOLOGY:**
- 9.1 Amperometer, construction and working.
 - 9.2 Metal Micro Electrode.
- 10. GAS CHROMATOGRAPHY.**
- 10.1 Definition.
 - 10.2 Principle of gas chromatography.

10.3 Study of gas Chromatography instrument (gas chromatography) essential parts.

11. POTENTIOMETRY: ELECTRODE POTENTIAL

- 11.1 E.M.F. of a cell.
- 11.2 Indicating electrodes, reference.
- 11.3 Electrode calomel, electrode.
- 11.4 Glass electrode, hydrogen electrode.

12. PH VALUE: P,OH VALUE.

- 12.1 Application of PH measurement
- 12.2 PH meter.
- 12.3 Construction working.
- 12.4 Buffer solution.
- 12.5 Properties of buffer solution.
- 12.6 Buffer capacity, Dilution value.
- 12.7 Standard Buffer solution.
- 12.8 Preparation of standard buffer solution.s
- 12.9 Measurement of PH value.
- 12.10 Colorimetric determination of PH value.
- 12.11 Ph paper methods, indicator method.
- 12.13 By direct reading PH meter.

13. ELECTROLYSIS, APPLICATIONS.

- 13.1 Equipment for electrolysis.
- 13.2 Electrolysis, analyzer and its parts.
- 13.3 Reactions on anode and cathode.
- 13.4 Separation of metals by electrolysis (Procedure).
- 13.5 Faraday's Laws of electrolysis.
- 13.6 Numericals.

14. CONDUCTIVITY AND CONDUCTOMETRY.

- 14.1 Conductivity cell, cell constant.
- 14.2 Conductivity bridge.
- 14.3 Measurement of sp.cond equivalent cond.
- 14.4 Mol. conductivity.

RECOMMENDED BOOK:

- 1. Instrumental Methods of Analysis by, Willand, H.N. Merit and Dean J.A.

CHT 314 INSTRUMENTAL METHODS OF ANALYSIS

INSTRUCTIONAL OBJECTIVES.

1 INTRODUCTION

- 1.1 Student will be able to understand the instrumental method of analysis
 - 1.1.1 Define instrumental method of analysis
 - 1.1.2 give 4 merits of I.M.A.
 - 1.1.3 Enlist the demerits of I.M.A.
 - 1.1.4 Name different I.M.A.

2 LIGHT

- 2.1 Understand light
 - 2.1.1 Define light
 - 2.1.2 Enlist different properties of light
 - 2.1.3 Explain different properties of light
- 2.2 Understand radiant energy
 - 2.2.1 Define radiant energy
 - 2.2.2 Give different units for the measurement of wave length
 - 2.2.3 Calculate radiant energy by using the formula $E=hc$

3 COLORIMETRY

- 3.1 Understand colorimetry
 - 3.1.1 Define colorimetry
 - 3.1.2 Define transmittance and absorbance
 - Enlist photometric laws
 - Define bouge's law
 - Define beer's law
 - Give conditions for which bouger-Beer's law hold
- conditions in which bough beer's law fail
- 3.2 Understand photo electric coloumetry
 - 3.2.1 Define photo electric coloumetry
 - Enlist different photo dectectors
 - Explain the construction and working of photo call (Barrier layer cell)
 - Explain the construction and working of photo tube
- 3.3 Understand photo meter
 - 3.3.1 Define photometer
 - Explain the working of single beam photometer
 - Explain the working of double beam photometer
 - Give compansion of the two photometers
 - Calculate the concentration of sample sol from photometer readings by using bouger-Beer's law equation

4 PHOTO LUMINISEENCE

- 4.1 Understand photo lumini sence
 - 4.1.1 Define photo luminiseence
 - 4.1.2 Give examples of photo luminisence

- 4.1.3 Differentiate between Fluorescence and luminescence.
- 4.1.4 Explain the methods of making Fluorescence spectrum
- 4.1.5 Develop a relationship between Fluorescence intensity and concentration
- 4.2 Understand Fluorometer
 - 4.2.1 Define Fluorometer
 - 4.2.2 Draw working diagram of filter Fluorometer
 - 4.2.3 Draw working diagram of spectro fluorometer
 - 4.2.4 Explain the function of operating parts of fluorometer
- 5 TURBIDIMETRY AND NEPHLOMETRY**
 - 5.1 Understand turbidimetry and Nephelometry
 - 5.1.1 Define turbidimetry
 - 5.1.2 Define Nephelometry
 - 5.1.3 Give industrial applications of turbidimetry
 - 5.1.4 Explain the construction and working of turbidimeter
 - 5.1.5 Explain the construction and working of Nephelometer
- 6 SPECTRO PHOTOMETRY**
 - 6.1 Understand spectro photometry
 - 6.1.1 Define spectrophotometry
 - 6.1.2 Define dispersion of light
 - 6.1.3 Explain spectrum of light
 - 6.1.4 Explain visible spectra UV-spectra IR-spectra
 - 6.1.5 Explain Absorption spectra, emission spectra, molecular spectra and origin of spectra
 - 6.2 Understand spectro photometer
 - 6.2.1 Enlist essential parts of spectro photometer
 - 6.2.2 Draw working diagram of spectro-photometer
 - 6.2.3 Explain the working of spectro-photometer
 - 6.2.4 Explain construction and working of UV-spectro photometer
 - 6.2.5 Explain construction and working of IR-spectro photometer
- 7 FLAME PHOTOMETRY**
 - 7.1 Understand flame photometry
 - 7.1.1 Define flame photometry
 - 7.1.2 Give applications of flame photometry
 - 7.1.3 Enlist essential parts of flame photometer
 - 7.1.4 Explain construction and working of a commercial flame photometer
- 8 REFRACTOMETRY**
 - 8.1 Understand refractometry
 - 8.1E.1 Explain refraction of light
 - Explain refractive index
 - Explain the effect of temperature on refractive index
 - Define refractometry
 - Give applications of refractometry
 - Explain the construction and working of Abbe's refractometer
 - Explain the construction and working of Fisher refractometer
- 9 POLARIMETRY**

- 9.1 Understand polarimetry
 - 9.1.1 define plane polarised light
 - 9.1.2 Define optical active material and optical activity
 - 9.1.3 Define levo rotatory material and dextro rotatory material
 - 9.1.4 Give examples of optical active materials
 - 9.1.5 Calculate specific rotation by using the formula $[\alpha] = 100\alpha$
 - 9.1.6 Draw working diagram of polarimeter
 - 9.1.7 Enlist parts of a polarimeter
 - 9.1.8 Explain the function of different parts of polarimeter

10 AMPEROMETRY

- 10.1 Understand amperometry
 - 10.1.1 Define amperometry
 - 10.1.2 Explain methodology of amperometry
 - 10.1.3 Explain the construction and working of amperometer
 - 10.1.4 Explain the construction and working of metal micro electrode

11 GAS CHROMATOGRAPHY

- 11.1 Understand gas chromatography
 - 11.1.1 Define gas chromatography
 - 11.1.2 Explain principle of gas chromatography
 - 11.1.3 Draw working diagram of gas chromatograph
 - 11.1.4 Chromatograph
 - 11.1.5 Enlist essential parts of gas chromatograph
 - 11.1.6 Enlist different detectors used
 - 11.1.7 Explain the construction and working of detectors
 - (a) Conductivity detector
 - (b) Thermal conductivity detector
 - (c) Flame ionization detector
 - (d) Density box detector

12 POTENTIOMETRY

- 12.1 Understand potentiometry
 - 12.1.1 Define potentiometry
 - Explain electrode potential
 - Explain e.m.f. of a cell
 - Calculate e.m.f. of a cell
 - Differentiate between indicating electrode and reference electrode
 - Enlist different reference electrodes
 - Explain the construction and working of
 - (a) hydrogen electrode
 - (b) Glass electrode
 - (c) Calomel electrode
 - (d) Antimony electrode

13 PH-VALUE AND BUFFER SOLUTION

- 13.1 Understand PH-Value
 - 13.1.1 Define PH-Value
 - Define POH-Value
 - Enlist applications of PH-measurement

- 13.2 Understand Buffer solution
 - 13.2.1 Define Buffer solution
 - 13.2.2 Give properties of Buffer solution
 - 13.2.3 Explain Buffer capacity Buffering valve
 - 13.2.4 Explain dilution valve
 - 13.2.5 Explain the preparation of standard Buffer solution
- 13.3 Understand measurement of PH-Valve
 - 13.3.1 Explain colorimetric determination of PH-Valve
 - (a) PH-paper method
 - (b) Indicator method
 - (c) Pocket comparator method
 - 13.3.2 Explain the construction and working of direct reading PH-metric

14 UNDERSTAND ELECTROLYSIS

- 14.1 Define electrolyte
 - Define Electrolysis
 - Give applications of electrolysis
 - Draw a sketch to show the essential parts of electrolytic analyzer
 - Explain the reaction at anode
 - Explain the reaction at cathode
- Explain the procedure of separation of metals by electrolysis
 - Explain faradays laws of electrolysis
- Calculate the amount of material deposited by electrolysis(1st law based calculations)
- Calculate the chemical equivalent of given material by electrolytic method(2nd law based calculations)

15 UNDERSTAND CONDUCTOMETRY

- 15.1.1 Define Resistance and conductivity
 - Define specific resistance
- Define specific cond, equivalent cond and molar conductance
 - Give the units of resistance and of conductance
 - Explain the construction of conductivity cell
 - Calculate cell constant
- Explain the construction and working of conductivity bridge
 - Describe the measurement of conductivity

CHT 314 INSTRUMENTAL METHODS OF ANALYSIS.

LIST OF PRACTICALS.

1. Study of reflection, refraction, dispersion of light.
2. Determination of Ammonia in water by Nessler reagent in colorimetry.
3. Determination of chlorine in water by visual colorimeter.
4. Determination of concentration of CuSO_4 sample by visual colorimeter.
5. Determination the absorbance of transmittance for different concentration of coloured solution.
6. Study the effect of wave length on the absorption of light by coloured solution.
7. Draw a concentration and absorption curve for colored solutions.
8. Colorimetric determination of Nickel with Dimethyloxime (Nephelometry).
9. Determination of PO_4 and SO_4 contents by using Nephelometer.
10. Determination of Manganese in steel by using spectronic 21 (auto-recording).
11. Study and operation of flame photometer.
12. Setting of flame by using controlling instruments.
13. Measurement of refractive index of various liquid by using Abbe Refractometer and Fisher Refractometer.
14. Determination of calcium, sodium Potassium by using Photometer.
16. Determination of specific rotation of optical active materials.
17. Determination of concentration of source solution by using polarimeter.
18. Determination of Ph value of industrial samples by:
 - i. Indicating method.
 - ii. PH paper method.
 - iii. Pocket comparator method.
 - iv. PH meter (Direct reading).
19. Electroplating.
20. Verification of Faraday law.
21. Measurement of cell constant, sp. conductivity, equivalent conductivity, molecular conductivity by using conductivity bridge.
22. Analysis of flue gases by using Orsat apparatus.
23. Study of gas chromatography.
24. Study of U-V spectro photometer.

Note: Class teacher can change the Practicals in accordance with the National and Industrial need and the availability of instruments . In this connection he will get guidance from head of department.

CHT 324 INDUSTRIAL CHEMICAL PROCESS II

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OBJECTIVES

1. Understand important manufacturing procedure employed by modern chemical Industries.
2. Use the equipments necessary to carry out chemical reaction on industrial scale.
3. To give to the students of the flow sheet diagram.
4. Understanding Chemical industry from the viewpoint of statistics of production consumption and location in Pakistan

COURSE CONTENTS.

1. OILS FATS AND WAXAS.

- 1.1 Vegetable oils. (name origion and uses)
- 1.2 Linseed oil, coconut oil, corn oil, palm oil, Peanut oil, tung oil, castor oil, sunflower oil, cotton seed oil, soybean oil.
- 1.3 Extraction of oils.
- 1.4 Compression method for cotton seed oil. (Introduction only)
- 1.5 solvent extraction method for soybean oil/sun flower oil
- 1.6 Flow sheet. unit operations involved
- 1.7 Energy requirements by products of solvent extraction. their uses.
- 1.8 Processing of vegetable oils
- 1.9 Refining, Bleaching.
- 1.10 Hydrogenation
- 1.11 Deodorization, Vitaminization.
- 1.12 Flowsheet
- 1.13 Unit operations and unit process involved

2. WAXES NAME, ORIGIN AND USES.

- 2.1 Bees wax, carnaube wax, spermacet.
- 2.2 Ozocerite, Paraffin wax, mortion wax. condellilla wax, synthetic wax.

3. SOAP.

- 3.1 Soap chemical formul. raw materials.
- 3.2 Manufacture of soap by kettle process.
- 3.3 Manufacture of soap and fatty acid by continuous process.
- 3.4 Flow sheets.
- 3.5 unit operations and unit processes by products.
- 3.6 By products.
- 3.7 Typical soaps.

- 3.8 Toilet soap industrial soap.
- 3.9 shaving soap millad toilet soap.
- 3.10 Medicated soap transparent soap.

4. GLYCERIN USES FORMULA.

- 4.1 Manufacture of glycerine as by product of soap plant.
- 4.2 Flowsheet.
- 4.3. Unit operations and unit process involved.
- 4.4 Energy requirements
- 4.5 synthetic glycerine.
- 4.6 Raw materials.
- 4.7 Chemical reaction.
- 4.8 Manufacture of glycerine by the Hydrolysis of oil/fat.
- 4.9 Flow sheet
- 4.10 Unit operations and unit process.

5. DETERGEN, SURFACTANTS.

- 5.1 Classification of detergent.
- 5.2 Anionics, Cationics, Non ionic, Amphoteric.
- 5.3 suds regulators.
- 5.4 Builders and Additives.
- 5.5 Biodegradability.
- 5.6 Manufacture of detergent (ABS)
- 5.7 Flow sheet.
- 5.8 Unit operations and unit processes.
- 5.9 Detergent action.

6. PULP AND PAPER INDUSTRIAL

- 6.1 Raw materials. Preparation of Raw materials (cleaning)
- 6.2 Types of pulps (mechanical, semi chemical, chemical pulp)
- 6.3 kraft pulping
- 6.4 Flow sheet
- 6.5 Unit operations and energy requirements.
- 6.6 Recovery of Black liquor (kraft Pulping)
- 6.7 Soda pulping.
- 6.8 Sulphite pulping.
- 6.9 Flow sheet.
- 6.10 unit operations and energy requirements.
- 6.11 Recovery of Black liquor.
- 6.12 comparison of the three pulps.
- 6.13 Manufacture of paper.
- 6.14 Beating and refining of pulp. fillers.

- 6.15 Conical refiner of a Jordan engine.
 - 6.16 Emerson Claflin refiner.
 - 6.17 Fourdrier machine for paper manufacture.
 - 6.18 Cylinder machine for heavy paper/card board manufacture
 - 6.19 Structural Boards.
- 7. SUGAR INDUSTRY.**
- 7.1 Raw materials.
 - 7.2 Manufacture of cane sugar.
 - 7.3 flow sheet.
 - 7.4 unit operations and unit processes.
 - 7.5 Manufacture of Beet sugar
 - 7.6 unit operations and unit processes.
 - 7.7 By products of sugar industries/their uses.
- 8. FERMENTATION INDUSTRIES.**
- 8.1 Industrial Alcohol uses.
 - 8.2 Manufacture of industrial alcohol by fermentation.
 - 8.3 Flow sheet.
 - 8.4 unit operations and unit processes involved.
 - 8.5 Preparation of Absolute alcohol from industrial alcohol.
 - 8.6 Preparation of Acetone and Butanol from molasses/corn.
 - 8.7 Flow sheet unit operations and unit processes.
 - 8.8 Preparation of citric acid from molasses.
- 9. SYNTHETIC FIBER.**
- 9.1 Classification, uses.
 - 9.2 Manufacture of polyester fiber. Flow sheet.
 - 9.3 Chemical process and unit operations.
 - 9.4 Manufacture of Nylon-6 fiber. Flow sheet.
 - 9.5 Unit operations
 - 9.6 Unit processes.
- 10. Nuclear industries**
- 10.1 Introduction, nuclear reactions (Fusion and Fission)
 - 10.2 Uranium and thorium fission
 - 10.3 Uranium as energy source.
 - 10.4 Sources and reserves of nuclear fuels in Pakistan
 - 10.5 Mining and milling ore
 - 10.6 Refining of ore.
 - 10.7 Refining of ore.
 - 10.8 flow sheet.
 - 10.9 Iso tops enrichment.

- 10.10 Conversion of UF_6 to UO_2 flow sheet.
- 10.11 Unit operations and unit processes.
- 10.12 Nuclear fuels selection.
- 10.13 Isotopes and isotope separation.
- 10.14 Protection from radioactivity.
- 10.15 Waste disposal of nuclear waste.

TEXT BOOK

Shseves chemical process industries fifth edition george T. Austia

CHT-324 INDUSTRIAL CHEMICAL PROCESS - II

INSTRUCTIONAL OBJECTIVES.

1. UNDERSTAND OILS AND FATS.

- 1.1 Define oils and Fats.
- 1.2 Enlist various types of oils.
- 1.3 Distinguish between oils and fats.
- 1.4 Explain solvent extraction method for cotton seed, and soy-been.
- 1.5 Describe expression method for cotton seed.
- 1.6 Explain refining, Bleaching and hydrogenation.
- 1.7 Name catalyst and explain its validity.
- 1.8 Draw a neat flowsheet diagram for solvent extraction method.

2. UNDERSTAND WAXES.

- 2.1 Define waxes.
- 2.2 Enlist various types of waxes.
- 2.3 Differentiate between natural and synthetic waxes with examples.
- 2.4 Explain uses of both types of waxes.

3. UNDERSTAND SOAPS

- 3.1 Define soaps.
- 3.2 Name Raw-materials
- 3.3 Write formula.
- 3.4 Explain continuous process for soap manufacturing.
- 3.5 Draw a neat and labelled diagram of continuous process.
- 3.6 Explain unit process and operations involved in soap manufacturing.
- 3.7 Describe typical soaps and their By-products.
- 3.8 Explain energy requirements.

4. UNDERSTAND GLYCERIN.

- 4.1 Define Glycerin.
- 4.2 Name Raw materials.
- 4.3 Differentiate between synthetic and natural glycerin.
- 4.4 Write chemical reaction.
- 4.5 Explain manufacture of glycerin by the hydrolysis of oil and fats.
- 4.6 Draw a neat flow diagram.
- 4.7 Explain unit operation and unit process
- 4.8 Enlist uses.

5. UNDERSTAND DETERGENTS/SURFACTANTS.

- 5.1 Define detergent.

- 5.2 Identify soaps and detergents.
 - 5.3 Explain manufacture of different (Alkyl - Benzene) sulphates.
 - 5.4 Draw a neat flow sheet diagram.
 - 5.5 Explain detergents action.
 - 5.6 Enlist various types of detergents.
 - 5.7 Name Builders and additives.
 - 5.8 Enlist uses.
- 6. UNDERSTAND PULP AND PAPER.**
- 6.1 Enlist Raw material
 - 6.2 Name various types of pulps.
 - 6.3 Explain the manufacture of Mechanical, pulp, kraft and chemical pulp, sulphate/sulphite pulp.
 - 6.4 Draw flow sheet diagram for each of above types.
 - 6.5 Explain manufacture of paper by jordan engine.
 - 6.6 Enlist fillers and sizing elements.
 - 6.7 Explain manufacturing methods for heavy paper/car-board and structural boards.
- 7. UNDERSTAND SUGAR INDUSTRY.**
- 7.1 Name Raw materials.
 - 7.2 Explain the manufacture of sugar from cane.
 - 7.3 Explain the Unit process and operation involved i sugar manufacturing.
 - 7.4 Explain manufacture of sugar from beet.
 - 7.5 Enlist by-products of sugar industry.
 - 7.6 Describe the uses of By-products of sugar industry.
- 8. UNDERSTAND FERMENTATION.**
- 8.1 Define fermentation.
 - 8.2 Enlist fermenting agents.
 - 8.3 Name the products of "Mollasses" after fermentation.
 - 8.4 Explain the manufacture of industrial alcohol by fermentation.
 - 8.5 Describe the manufacture of absolute alcohol from industrial alcohol
 - 8.6 Explain the manufacture of acetic acid, citric acid and acetone.
 - 8.7 Draw a flow sheet diagram for each one of the above.
 - 8.8 Enlist the unit operation and process involved in the manufacture of acetic acid, citric acid.
 - 8.9 Explain the energy requirement for 8.8
 - 8.10 Explain the uses of industrial alcohol, acetic and citric acid.
- 9. UNDERSTAND SYNTHATIC FIBER.**
- 9.1 Define synthatic fiber.
 - 9.2 Enlist various types of fibre.

- 9.3 Explain the manufacture of polyester fiber with flow sheet diagram.
- 9.4 Explain the manufacturing procedures of Nylon-6
- 9.5 Draw a neat flow diagram for 9.4
- 9.6 Explain the unit process and operation involved in nylon-6
- 9.7 Name the uses of polyester.

10. NUCLEAR INDUSTRIES.

- 10.1 Define nuclear and fission reaction.
- 10.2 Enlist various radio active elements.
- 10.3 Explain the characteristic of alpha, beta and gama rays.
- 10.4 Distiguish between nuclear and fission reaction.
- 10.5 Locate the position of nuclear fuels and sourse in Pakistan.
- 10.6 Describe mining operations of the Uranium ore.
- 10.7 Explain the refining of Uranium ore.
- 10.8 Draw a flowsheet diagram for 10.7
- 10.9 Enlsit uses of radio-active elements.
- 10.10 Explain enrichment techniques of radio-active elements.
- 10.11 Identify nuclear fuels according to their uses.
- 10.12 Describe isotope seperation techniques.
- 10.13 Name protective devices from radio active elements.
- 10.14 Explain the use of waste disposal of nuclear waste.

CHT 324 INDUSTRIAL CHEMICAL PROCESS - II

LIST OF PRACTICALS

(One Practical Period Per Week)

- | | | |
|-----|---|---|
| 1. | Determination of F.F.A of vegetable oils/Fats. | 3 |
| 2. | Determination of colour index of oil/fats by
tintometer. | 3 |
| 3. | Determination of Acid-value of oil/Fats. | 2 |
| 4. | Determination of iodine-value of oil/Fats. | 2 |
| 5. | Determination of melting point of Fats. (ghee) | 4 |
| 6. | Determination of saponification value of oil/Fat. | 2 |
| 7. | Vitamin test for ghee. | 2 |
| 8. | Extraction of oil by Soxhlet apparatus. | 4 |
| 9. | Preparation of soybean oil in the laboratory.
Preparation of soap from Acid (stearic Acid) in the
laboratory. | 2 |
| 10. | Preparation of Medicated Soap.
F.F.A = Free fatty acids. | 2 |

**CHT 335 CHEMICAL ENGINEERING -II
(UNIT OPERATION-II)**

T	P	C
3	6	5

OBJECTIVES

1. To apply principles of unit operations in the laboratory work
2. Chemical production equipment related to these operations.

CONTENTS.

1. CRYSTALLIZATION, IMPORTANCE, TYPES OF CRYSTALS, CRYSTAL FORMS

- 1.1 Principle of crystallization
- 1.2 Supersaturation, Nucleation
- 1.3 Miscellaneous crystallization techniques
- 1.4 Classification of crystallization
- 1.5 Crystallization, Agitated batch crystallization
- 1.6 Swenson walker crystallizer
- 1.7 Vacuum crystallizer, vacuum crystallizer with recirculation, crystal crystallizer
- 1.8 Crystallizer produce large crystals

2. FILTRATION, CLASSIFICATION OF FILTERS

- 2.1 Filter media, filter aids
- 2.2 sand filter, chamber press
- 2.3 Plate and frame press, leaf filter, pressure filter
- 2.4 Rotary drum filter
- 2.5 washing of filter cakes

3. CENTRIFUGES

- 3.1 Batch top driven centrifuges
- 3.2 Batch under driven centrifuges

4. INTRODUCTION TO DRYING

- 4.1 Bound unbound and free water, equilibrium moisture content
- 4.2 Classification of dryers
- 4.3 Compartment and tunnel dryers
- 4.4 Rotary dryer (construction and working)
- 4.5 Feston dryer
- 4.6 Factors affecting rate of drying
- 4.7 Drying rate curve

5. SIZE REDUCTION

- 5.1 Classification of crushing and grinding machinery
- 5.2 Jaw crusher
- 5.3 Gyratory crusher

- 5.4 Roll crushers
- 5.5 Single roll crusher
- 5.6 Fine grinders
- 5.7 Roller mills
- 5.8 Ball and tube mill
- 5.9 ultra fine grinders
- 5.10 Closed circuit grinder

6. **DISTILLATION**

- 6.1 Theory of Distillation
- 6.2 Raoult,s Law, Relative volatility
- 6.3 Henry's Law, constant boiling mixtures
- 6.4 Differential distillation
- 6.5 Equilibrium distillation
- 6.6 Rectification and vacuum distillation
- 6.7 Construction of rectifying columns
- 6.8 Sieve plate and packed columns
- 6.9 Bubble cap fractionating columns
- 6.10 Fractionating column calculations
- 6.11 Heat and material balances
- 6.12 Plate to plate calculations
- 6.13 McCabe Thiele method
- 6.14 Types of trays Bubble cap
- 6.15 Sieve trays, flexitrays, disc and daughnut trays
- 6.16 Types of down comers
- 6.17 Towers operating conditions
- 6.18 Pressure vacuum tower top temperature reboiler temperature temperature gradient
- 6.19 Types of feed effect of feed temperature, reflux ratio
- 6.20 Tower operating troubles
- 6.21 Overloading, flooding, entrainment
- 6.22 Coring, weeping, improper reflux rate
- 6.23 Steam distillation, extractive distillation
- 6.24 Azeotropic distillation, petroleum distillation

7. **EXTRACTION**

- 7.1 Extraction, classification of extraction equipments
- 7.2 Oil seed extraction plant
- 7.3 Continuous diffusion batteries
- 7.4 the Dorr agitator, dorr thickner
- 7.5 Counter current decantation system
- 7.6 Counter current extraction with filters
- 7.7 Liquid liquid extraction towers
- 7.8 Baffle plate towers spray towers, pulse towers Agitated operation towers
- 7.9 Centrifugal type extractors

8. **ABSORPTION**

- 8.1 Theory of Gas absorption
- 8.2 Construction and working of Gas absorber
- 8.3 Types and properties of packings

9. HUMIDITY

- 9.1 Air water vapour contact theory
- 9.2 Humidity, Relative and % age humidity
- 9.3 Humid heat, saturated of humid volume
- 9.4 Dew point, wet bulb temperature
- 9.5 Use of humidity chart
- 9.6 Humidification methods
- 9.7 Construction and operating principles of cooling towers
- 9.8 Atmosphere draft cooling towers
- 9.9 Mechanical draft cooling towers

TEXT AND REFERENCE BOOKS:

- 1. Introduction to chemical engineering By Wall.L.Badger & Julius T.Banchero Mc Graw Hill book co New york
- 2. Chemical Engineering Hand Book By J.H Perry (Editor) Mc Graw Hill Book co. in New York

CHT 335 CHEMICAL ENGINEERING II

LIST OF PRACTICALS

1. Study the working and construction of bubble cap fractionating column.
2. Separation of binary mixture by fractional distillation in a bubble cap distillation tower
3. To study the principle of extraction by using solvent extractor
4. Determination of Humidity of air water vapour system by using dew point method
5. To determine the humidity, % age humidity humid heat specific and saturated volume of an air water vapour system by psychometric method
6. To study the Construction and working principle of an air conditioner
7. To study the construction and working principle of an absorption column
8. To study the effect of the rate of distillation
9. The practicals in unit operation should include a considerable amount of installing and dismantling the equipments whichever is feasible

LIST OF PRACTICALS

UNIT OPERATION-11

1. Study the effect of temperature, concentration and agitation on crystallization
2. Study the theory and operation of filter press, filtering, washing, cleaning of press, by filtering various industrially important slurries
3. Study the effect of flow rate on the efficiency of a filter press
4. Study the operation of a portable mixer by use of various industrially important materials
5. Determination of horse power required and rate of mixing for the mixing of definite quantity, of materials (such as salt and sand) in dry and wet states
6. Determination of the number of revolutions and time required for mixing of two materials per unit weight and calculation of the efficiency of the mixer
7. Determination of rate of drying for a fibrous, and granular material.
8. Study the operation of a sieve shaker through the use of a variety of crushed solids (Alternately, a manual sieve screen analysis may be carried out)
9. Study the operation of a pulverizer by using a variety of materials analyse the efficiency and purpose of the machine by sieve screen analysis
10. Study the operation of various mills by grinding several materials analysis of efficiency and purpose of the machines by sieve screen analysis
11. Study the operation of jaw crusher
12. Determine the horse power required for crushing a definite material e.g red bricks
13. Determine the horse power required for grinding a definite quantity of a material to 100 mesh in a mill. Also calculate the work index for such a grinding operation.
14. Prepare a graph relating particle diameter to time in sample grinder

**CHT 335:- CHEMICAL ENGINEERING-II
(UNIT OPERATION-II)**

INSTRUCTIONAL OBJECTIVES.

1 CRYSTALLIZATION

- 1.1 Understand crystallization
 - 1.1.1 Define crystallization
 - 1.1.2 Give the importance of crystallization
 - 1.1.3 Enlist the types of crystals
 - 1.1.4 Give the crystal forms
 - 1.1.5 Explain the principle of crystallization
 - 1.1.6 Explain super-saturation
 - 1.1.7 Explain Nucleation
 - 1.1.8 Enlist crystallization techniques
 - 1.1.9 Explain different crystallization techniques
- 1.2 Understand crystallizers
 - 1.2.1 Give classification of crystallizers
 - 1.2.2 Explain construction and working of
 - (a) Tank crystallizer
 - (b) Agitated batch crystallizer
 - (c) Swenson walker crystallizer
 - (d) Vacuum crystallizer
 - (e) Vacuum crystallizer with recirculation
 - (f) Krystal crystallizer
 - (g) Crystallizer to produce large crystal

2 FILTRATION

- 2.1 Understand filtration
 - 2.1.1 Define filtration
 - 2.1.2 Enlist filter medias
 - 2.1.3 Define filter aid
 - 2.1.4 Give examples of filter aid
- 2.2 Understand filters
 - 2.2.1 Give classification of filters
 - 2.2.2 Explain construction and working of
 - (a) Sand filter
 - (b) Chamber filter
 - (c) Plate and frame filter
 - (d) Leaf filter
 - (e) Pressure filter
 - (f) Rotary drum filter
 - 2.2.3 Explain the washing of filter cake

3 CENTRIFUGE

- 3.1 Understand centrifuge
 - 3.1.1 Explain the working principle of centrifuge
 - 3.1.2 Give types of centrifuges
 - 3.1.3 Explain the working of batch type top driven centrifuge
 - 3.1.4 Explain the working of batch under driven centrifuge

4 DRYING

- 4.1 Understand drying
 - 4.1.1 define drying
 - 4.1.2 Define bound, unbound and free water
 - 4.1.3 Explain equilibrium moisture content
 - 4.1.4 Explain drying rate
 - 4.1.5 Enlist factors affecting rate of drying
 - 4.1.6 Draw drying rate curve
- 4.2 Understand dryers
 - 4.2.1 Define dryer
 - 4.2.2. Give the classification of dryers
 - 4.2.3 Explain the construction and working of
 - (a) Compartment dryer
 - (b) Tunnel dryer
 - (c) Rotary dryer
 - (d) Festoon dryer

5 SIZE REDUCTION

- 5.1 Understand size reduction
 - 5.1.1 Define size reduction(crushing and grinding)
 - 5.1.2 Give classification of crushing and grinding machinery
 - 5.1.3 Differentiate between inter mediate grinding, fine grinding and ultra fine grinding.
 - 5.1.4 Explain construction and working of
 - (a) Jaw crusher
 - Gyratory crusher
 - Roll crusher
 - Ball mill
 - Tube mill
 - 5.1.5 Explain the construction and working of ultrafine grinder(pulvenizer)
Explain closed circuit grinding

6 DISTILLATION

- 6.1 Understand distillation
 - 6.1.1 Define distillation
 - 6.1.2 Explain theory of distillation
 - 6.1.3 Explain raoults law
 - 6.1.4 Explain Henevy's law
 - 6.1.5 Explain relative volatility
 - 6.1.6 Give examples of constant boiling mixtures
- 6.2 Understand types of distillation
 - 6.2.1 Enlist types of distillation
 - 6.2.2 Define differential distillation
 - 6.2.3 Define equiliberium distillation
 - 6.2.4 Define ractification
 - 6.2.5 Define vaccum distillation
 - 6.2.6 Explain steam distillation

- 6.2.7 Explain extractive distillation
- 6.2.8 Explain Azeotropic distillation
- 6.2.9 Explain petroleum distillation
- 6.3 Understand the Rectifying Columns
 - 6.3.1 Explain the construction and working of
 - (a) Packed column
 - (b) Sieve plate column
 - (c) Bubble cap column
 - 6.3.2 Enlist the types of trays
 - Explain the merits of each type of tray
 - Explain the types of down comers
- 6.4 Understand fractionating column calculation
 - 6.4.1 Make heat balance
 - Make material balance
 - Make plate to plate calculations by using McCabe-Thiele method
- 6.5 Understand tower's operating conditions
 - 6.5.1 Enlist the factors which affect the tower's operating conditions
 - 6.5.2 Explain the effect of pressure and vacuum
 - 6.5.3 Explain the effect of tower top temp
 - 6.5.4 Explain the effect of reboiler temp
 - 6.5.5 Explain the effect of feed temp
 - 6.5.6 Explain the effect of reflux ratio
- 6.6 Understand tower operating troubles
 - 6.6.1 Explain over loading and flooding
 - Explain entrainment coning
 - Explain weeping
 - Explain the effect of improper reflux rate

7 **EXTRACTION**

- 7.1 Understand extraction
 - 7.1.1 Define extraction
 - 7.1.2 Give the examples of solid liquid extraction
 - 7.1.3 Give the examples of liquid-liquid extraction
- 7.2 Understand the extraction equipments
 - 7.2.1 Give the classification of extraction equipments
 - 7.2.2 Explain the oil seed extraction plant
 - 7.2.3 Explain the construction and working of
 - (a) Continuous diffusion batteries.
 - (b) Dorr agitator
 - (c) Dorr thickener
 - 7.2.4 Explain counter current decantation system
 - 7.2.5 Explain counter current extraction with filters
 - 7.2.6 Explain the construction and working of liquid liquid extraction towers like:
 - (a) Baffle plate tower
 - (b) Spray tower
 - (c) Pulse tower
 - (d) Agitated extraction tower

7.2.7 Explain the construction and working of the centrifuge type extractor

8 ABSORPTION

- 8.1 Understand absorption
 - 8.1.1 Explain theory of gas absorption
 - 8.1.2 Explain the construction and working of gas absorber
 - 8.1.3 Give the types of packing materials
 - 8.1.4 Enlist the properties of packing materials

9 HUMIDITY

- 9.1 Understand humidity
 - 9.1.1 State air-water vapour contact theory
 - Define humidity
 - Give mathematical form of relative humidity
 - Give formula for percentage humidity
 - Define humid heat and humid volume
 - Explain dew point
 - Differentiate between dry bulb and wet bulb temperature
 - Use humidity chart to calculate different terms
- 9.2 Understand humidification methods
 - 9.2.1 Define humidification
 - 9.2.2 Enlist humidification methods
 - 9.2.3 Explain humidification methods
- 9.3 Understand cooling towers
 - 9.3.1 Enlist types of cooling towers
 - Explain construction and working of atmospheric draft cooling tower
 - Explain construction and working of mechanical draft cooling towers

CHT 342 PROCESS INSTRUMENTATION AND CONTROL.

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OBJECTIVES:-

- 1 Understand the mechanism of various control instruments used in various chemical industries.
- 2 Explain the function and working of control instruments used for different process variables. after going through the curriculum.

1. INTRODUCTION.

- 1.1 Importance of process instrumentation in Chemical industry.
- 1.2 How measurement are made.
- 1.3 Introduction to important process variables.
- 1.4 Temperature : Pressure
- 1.5 Flow : Level

2 BASIC PRINCIPLES INVOLVED IN PROCESS INSTRUMENTATION.

- 2.1 Pascal's law.
- 2.2 Bernaulli's theorem.
- 2.3 Hook's law.
- 2.4 Thermoelectric effects.
- 2.5 Whetstone Bridge circuit
- 2.6 Capacitance, Resistance, Inductance imperence.

3 TEMPERATURE MEASURING INSTRUMENTS

- 3.1 Thermometers.
- 3.2 Liquid-filled thermometer.
- 3.3 Hg-filled thermometer.
- 3.4 Bi-metallic thermometers.
- 3.5 Pressure spring thermometers.
- 3.6 Thermocouples.
- 3.7 Resistance thermometers
- 3.8 Pyrometers (Optical radiation)
- 3.9 Pneumatic Temperature transmitters.

4 PRESSURE MEASURING INSTRUMENTS

- 4.1 U -tube manometer.
- 4.2 Inclined manometer
- 4.3 Well type manometer
- 4.4 Inverted bell type manometer
- 4.5 Bourdon tube
- 4.6 (a) Spiral
- 4.7 (b) Helix
- 4.8 Bellows
- 4.9 Pneumatic Pressure transmitters.
- 4.10 Transducer
- 4.11 Definition of transducer

- 4.12 Electrical transducer
- 4.13 Mechanical transducer
- 4.14 The Pirani gage.

5 INTRODUCTION TO DIFFERENTIAL PRESSURE

- 5.1 Differential pressure measuring instruments.
- 5.2 U-tube manometer
- 5.3 Well-type manometer
- 5.4 Inclined tube manometer
- 5.5 Differential pressure bellows
- 5.6 Bell differential pressure gauge
- 5.7 Differential pressure transmitter

6 FLOW MEASURING INSTRUMENTS

- 6.1 Head meters
- 6.2 (a) Orifice meter
- 6.3 (b) Venturi meter
- 6.4 (c) Flow nozzles
- 6.5 Variable area meters (Rotameters)
- 6.6 Magnetic flow meters
- 6.7 Open channel flow measuring instruments

7 LIQUID LEVEL MEASURING INSTRUMENTS

- 7.1 Direct liquid level measuring instruments.
- 7.2 Bob and tape
- 7.3 Sight glass
- 7.4 Floats
- 7.5 Probe type level detector.
- 7.6 Indirect liquid level measuring instruments
- 7.7 Pressure gage.
- 7.8 Purge or bubbler systems.
- 7.9 Control loop
- 7.10 Pneumatic control valve
- 7.11 On-Off control.
- 7.12 Proportional control.
- 7.13 Proportional derivative control
- 7.14 Proportional integral derivative control.

REFERENCES

- 1Industrial Instrumentation fundamentals by Austin E Fribance McGraw-Hill Book company
- 2Instrumentation by Franklyn .W Kirk and Nicholas.Rinbo American Technical society Chicago, Illinois

CHT-342 PROCESS INSTRUMENTATION AND CONTROL

INSTRUCTIONAL OBJECTIVES.

1. UNDERSTAND IMPORTANCE OF CONTROL INSTRUMENTS

- 1.1 Name various process variable used in chemical industry
- 1.2 Explain each variable
 - a-Temperature
 - b-Pressure
 - c-Flow
 - d-Level
- 1.3 Explain the basic principles involved in process instrumentation
- 1.4 Define pascal's Law
- 1.5 Explain pascal law with examples
- 1.6 Explain bernauli's theorm
- 1.7 Enlist uses of bernaulis' theorm
- 1.8 Define thermoelectric effect
- 1.9 Draw neat sketch of wheat stone bridge circuit and explain it
- 1.10 Define each one of the followings
 - a-Capacitance
 - b-Resistance
 - c-Inductance
 - d-Impedence
- 1.11 Explain each one of no 10

2. KNOW TEMPRATURE

- 2.1 Define temprature
- 2.2 Distinguish between heat and temprature
- 2.3 Enlist various temprature scale
- 2.4 Read temprature on celscious scale
- 2.5 Read temprature on fahrenheit scale

3 KNOWS THERMAMETRY

- 3.1 Describes liquid filled thermo-meter
- 3.2 Explain mercury filled thermometer(with diagram)
- 3.3 Explain bi mctallic thermameter.
- 3.4 Explain pressure spring therma meter

4 UNDERSTAND THERMOCOUPLES

- 4.1 Define thermocouple
- 4.2 Explain the primer of thermocouple
- 4.3 Enlist various types of thermocouples
- 4.4 Explain iron constanton thermocouple
- 4.5 Explain chromicum/Al thermo couples
- 4.6 Describe pt/rh-pt thermocouple
- 4.7 Identify the use of each thermocouples for different temprature ranges

5 UNDERSTAND RESISTANCE THERMOMETER

- 5.1 Define resistance thermometer
- 5.2 Explain the principle of resistance thermometer

5.3 Draw the diagram of wheat stone bridge circuit and label its parts.

5.4 Describe the operation of the resistance thermometer

6 UNDERSTAND PYROMETRY AND PYROMETERS

6.1 Define pyrometer.

6.2 Enlist types of pyrometers

6.3 Draw a neat sketch of the radiation pyrometer

6.4 Describe the functioning of radiation pyrometer.

6.5 Draw the diagram of optical pyrometer

6.6 Explain the function and operation of the pyrometers

6.7 Identify the pyrometer on the basis of temperature range and electrical circuit

7 UNDERSTAND TEMPERATURE TRANSMITTER

7.1 Define temperature transmitter

7.2 Enlist types of temperature transmitters

7.3 Explain the principle of temperature transmitter.

7.4 Draw the diagram

7.5 Explain the electrical operation of the transmitter

7.6 Identify the transmitters electronic on the basis of their operation and temperature change

8 UNDERSTAND PRESSURE

8.1 Define pressure

8.2 Enlist various pressure measuring instrument

8.3 Describe U-tube manometer

8.4 Explain well type manometer

8.5 Explain well type meter

8.6 Draw the neat sketch of a
a-Bourdon gauge
b-bellows

8.7 Explain Bourdon gauge

8.8 Explain the principle of differential pressure instruments

8.9 Describe differential pressure instruments

8.10 Differentiate between differential pressure and direct pressure measuring instruments

8.11 List the uses of d/p measuring instrument

8.12 Differentiate between pneumatic and electronic pressure transmitters

9 UNDERSTAND TRANSDUCERS

9.1 Define transducers

9.2 Enlist types of transducers

9.3 Draw diagrams of transducers.

9.4 Explain the mechanical/electrical transducer

9.5 Differentiate between mechanical and electrical transducer

9.6 Enlist five advantages of electrical transducer and their disadvantages of mechanical transducer

9.7 Explain Pirani gauge

10 UNDERSTAND FLOW MEASURING INSTRUMENTS

10.1 Describe flow of the fluid

- 10.2 Name type of flow
- 10.3 Enlist flow measuring instruments
- 10.4 Describe orifice meter
- 10.5 Explain venturi-meter
- 10.6 Explain flow nozzle
- 10.7 Explain Rota meter
- 10.8 Explain magnetic flow meter
- 10.9 Explain pitot tube
- 10.10 Draw diagram of flow meter
- 10.11 Differentiate between
 - a-orifice meter & venturimeter
 - b-Rotameter and pitot tube
- 10.12 Enlist characteristics of each flow meter

11 UNDERSTAND LEVEL MEASURING INSTRUMENTS

- 11.1 Define level of the fluids
- 11.2 Name type of level meter.
- 11.3 Enlist level measuring instruments
- 11.4 Explain the principle of electrical level measuring instruments
- 11.5 Draw diagram of the level measuring instrument
- 11.6 Describe sight glass
- 11.7 Describe float method
- 11.8 Explain the use of pressure gauge for indirect level measurement
- 11.9 Explain radio active system of level measurement
- 11.10 Explain the sonic principle
- 11.11 Explain the ultra sonic method for liquid level measurement
- 11.12 Explain liquid level measurement by load cell
- 11.13 Enlist four uses of electrical level measuring instrument

12 UNDERSTAND CONTROL SYSTEM

- 12.1 Define control system
- 12.2 Explain control loop with its working principle
- 12.3 Name various type of controllers
- 12.4 Explain proportional controller
- 12.5 Describe proportional derivative controller
- 12.6 Explain proportional integral derivative controller
- 12.7 Explain pneumatic control valve
- 12.8 Explain on-off control system
- 12.9 List uses of each controller

CH. 352	CHEMICAL TECHNOLOGY PRACTICE.	T	P
C		0	6
		2	

Total contact hours:

Theory:- Nil.
Practical 192

OBJECTIVES

- 1.To acquaint the students with all the practicals skill, they need to develop/use in heavy light chemical Industries.
- 2.A project to a group of students will be allocated which will be completely the co-ordination of industry.
- 3.A close liaison will be established between the institution and industry to achieve the institutional objectives.
- 4.Objective No. 3 will help in facilitating the placement of the students in industries.

The time allocation will depend on the Project assigned, by the working teacher and the Industrial Management.

CONTENTS

1. INTRODUCTION, SIGNIFICANCE IN INDUSTRIES

- 1.1Preparation of flow diagram of typical chemical industries showing process conditions and products at different sections e.g Fertilizers, Sugar, Cement, Petroleum and petrochemicals, acid alkali industries
- 1.2Preparation of standard solutions of various normalities of different chemicals.
- 1.3Sampling, precipitation, digestion, ignition, filtration and distillation techniques

2. VOLUMETRIC ANALYSIS

- 2.1 Neutralization titration, Redox titration
- 2.2 Iodometry, Iodimetry and argentometry

3. GRAVIMETRIC ANALYSIS

- 3.1 Use of oven, furnaces, dissectors etc.

4.DETAILED DESCRIPTION REPORT ABOUT THE FOLLOWING CHEMICAL INDUSTRIES, BY DEPUTING DIFFERENT GROUPS OF STUDENTS (6 NO) AT DIFFERENT SECTIONS OF INDUSTRIAL UNITS. THE STUDENTS WILL GET TRAINING AT THEIR RESPECTIVE SECTIONS ONCE A WEEK.

FERTILIZER INDUSTRIES

- 4.1 Reforming Section

- 4.2 NH₃ Synthesis
 - 4.3 Compressor Section
 - 4.4 NH₃ Storage
 - 4.5 HNO₃ manufacturing unit
 - 4.6 Urea plant
 - 4.7 Utility section
 - 4.8 Laboratory
- 5. VEGETABLE GHEE INDUSTRIES**
- 5.1 H₂ gas plant
 - 5.2 Refining Section
 - 5.3 Hardening and Filling Section
 - 5.4 Laboratory/lab techniques
- 6. SOAP AND SODIUM**
- 6.1 Soap and Silicate manufacturing units
 - 6.2 Solvent extraction plant
- 7. INDUSTRIAL GASES**
- 7.1 CO₂ plants
 - 7.2 O₂ plants
- 8. BEVERAGES**
- 8.1 Water Softening and water treatment
 - 8.2 Beverage manufacturing unit
 - 8.3 Laboratory
- 9. CERAMICS AND BLUE POTTERY**
- 9.1 Raw materials and flow diagram
- 10. LABORATORY TESTS PERTAINING TO DIFFERENT CHEMICAL INDUSTRIES.**
- 10.1 Water Analysis (Municipal and Boiler water)
 - 10.2 Vegetable Ghee analysis
 - 10.3 Sugar tests
 - i) Sucrose percentage test using a) Indicator
 - b) Polarimeter
 - ii) Determination of specific gravity by Hydrometer
 - 10.4 Ferrous, non ferrous alloys analysis

CHT 362 ENERGY CONSERVATION & ENVIRONMENTAL POLLUTION.

T	P	C
1	3	2

OBJECTIVES

1. Know about energy and energy conservation in industry.
2. Know the uses of basic instruments to measure Energy
3. To apply his knowledge to conserve energy in chemical industries. Calculate energy losses.

CONTENTS.

ENERGY CONSERVATION.

1. Introduction to energy & energy conservation, sources of energy
 - 1.1 Types of energy
 - Heat energy. Mechanical energy
 - Potential energy Kinetic energy
 - Electrical energy Chemical energy.
2. First and 2nd Laws of thermodynamics and application
3. Heat recovery in internal combustion engines and steam turbines
4. Types of fuels, primary fuels
 - 4.1 (solid fuels) Secondary fuels
 - 4.2 (liquid fuels) Tertiary fuels
 - 4.3 (Gaseous fuels) Incomplete combustion and its effects on energy recovery
5. Selection of equipment for process energy recovery such as. Hydraulic Turbines, wheel or runner gas expansion units etc
6. Energy Management systems
 - 6.1 energy monitoring
 - 6.2 Measuring instruments and techniques
7. Heat recovery in process plants
 - 7.1 Steam generation
 - 7.2 Pre-heating boiler's feed water
 - 7.3 Application for heat recovery, economics of heat recovery
8. Energy recovery in petro-chemical industry
 - 8.1 Process and equipments
 - 8.2 Steam and electric energy generation
 - 8.3 Refrigeration, heat gain.

9. Emerging energy saving trends in sugar industry

Reference:

1. Process energy conservation by Richard Green & Staff of chemical Engineering Published by Mc Graw Hill publishing co, New York
2. Energy education for Pakistan enercon 86-11 Ministry of planning and development Govt of Pakistan March 1987

ENVIRONMENTAL POLLUTION.**1. INTRODUCTION.**

Definition, types of pollution, atmospheric pollution, land pollution, noise pollution, and waste water pollution.

2. ATMOSPHERIC POLLUTION.

- 2.1 Definition.
- 2.2 Methods of control
- 2.3 Its effects on human health.

3. WATER POLLUTION

- 3.1 Definition, methods of control.

4. NOISE POLLUTION.

- 4.1 Definition, sources of pollution, sound characteristics, controlling measures.

5. LAND POLLUTION.

- 5.1 Types, controlling techniques.

6. POLLUTION CONTROL IN FERTILIZERS.

- 6.1 Ammonia, Urea pollution, bllled gases, effect on human health, use of gas masks, controlling techniques.

7. PAPER AND PULP POLLUTION.

- 7.1 Chemicals used, elimination of poisonous gases, controlling methods.

8. A. PETROLEUM POLLUTION.**B. SUGAR POLLUTION.**

- 8.1 Poisonous chemicals in petroleum
- 8.2 Their effects upon human health.
- 8.3 Bleaching chemicals used in sugar industry.
- 8.4 Pollution controlling techniques.

REFERENCES BOOKS.

1. Environmental pollution Atmosphere, Land, Water and Noise by H.M. Dix published by John Wiley and Sons.
2. Pollution control in process industries by S.P. Mahajan Tata Mc Graw Hill publishing company.

CHT 362- ENERGY CONSERVATION & ENVIRONMENTAL POLLUTION.

INSTRUCTIONAL OBJECTIVES.

ENERGY CONSERVATION.

1. UNDERSTAND ENERGY AND ENERGY CONSERVATION.

- 1.1 Define Energy and Energy conservation.
- 1.2 Enlist sources of Energy.
- 1.3 Name various types of Energy.
- 1.4 Explain all types of Energy.
- 1.5 Differentiate different Energy on the basis of their heat contents.

2. UNDERSTAND LAWS OF THERMODYNAMICS.

- 2.1 Define first-Law of thermodynamics.
- 2.2 Define second Law of thermodynamics.
- 2.3 Derive relationships for kinetic and potential Energy.
- 2.4 Prove $K.E = 1/2 MV^2$.
- 2.5 Prove $P.E. = mZ$.
- 2.6 Explain their application in conserving Energy.

3. UNDERSTAND INTERNAL COMBUSTION ENGINES AND TURBINES.

- 3.1 Define internal combustion engines.
- 3.2 Name various types of turbines.
- 3.3 Explain the merits of rotary turbine over reciprocating Engines.
- 3.4 Explain methods of heat recovery from internal combustion Engine and rotary turbines.

4 UNDERSTAND FUELS AND COMBUSTION PROCESS.

- 4.1 Define solid Liquid and gaseous Fuels.
- 4.2 Enlist types of solid Fuels.
- 4.3 Enlist types of Liquid and gaseous Fuels.
- 4.4 Explain merits of gaseous Fuels over solid and Liquid Fuels.
- 4.5 Define combustion.
- 4.6 Explain the methods of heat recovery by the combustion of Liquid and gaseous Fuels.
- 4.7 Calculate waste heat.
- 4.8 Describe an effective and efficient method of heat recovery and its re-cycle.

5. SELECTION OF EQUIPMENT FOR PROCESS ENERGY RECOVERY.

- 5.1 Enlist equipment
- 5.2 Describe working and use of equipment for energy recovery.

6. ENERGY MANAGEMENT SYSTEMS.

- 6.1 Definition

- 6.2 List of types of systems.
- 6.3 Explain different energy management systems.

7 HEAT RECOVERY IN PROCESS PLANTS.

- 7.1 Steam turbine
- 7.2 Gas Expansion unit.
- 7.3 Explain managing energy techniques.
- 7.4 Describe Energy monitoring system.
- 7.5 Name the process variables required for energy measurement and control.
- 7.6 Explain the process variable relevant for energy conservation.

8 UNDERSTAND PETRO-CHEMICAL PROCESS PLANTS.

- 8.1 Define process plants.
- 8.2 Enlist various process plants such as glass-plastics, petroleum-sugar etc.
- 8.3 Name methods for heat recovery from such plants.
- 8.4 Describe pre-heating system in steam power plant.
- 8.5 Explain the method of steam production.
- 8.6 Describe per-heating system in steam power plant.
- 8.7 Describe method how heats conserved in such a plant.
- 8.8 Explain the use of heat recovered in others as an energy sources.
- 8.9 Explain economic impact, of heat recovery in terms of saving money
- 8.10 Explain the heat recovery system in petrochemical plant.
- 8.11 Describe fractianating column and recovery of heat as waste heat from the vapour-Liquid phase.
- 8.12 Calculate heat recovered mathematically and the amount saved in Pakistani Rupees.
- 8.13 Name the equipment used for heat recovery in the plant.
- 8.14 Describe heat generation system from water, both as a steam power plant and Electricity generation plant.
- 8.15 Explain the use of low pressure and light pressure steam in refrigeration system thought sudden enlargement and T.

9: UNDERSTAND SUGAR MANUFACTURING TRENDS .

- 9.1 Explain cane crushing process
- 9.2 Name the tallest type of sharp knife edge crushers.
- 9.3 Calculate energy used and conserve in the above system

- 9.4 Define evaporation.
- 9.5 Enlist various types of evaporators.
- 9.6 Explain the use of multiple effect evaporator and heat saved.
- 9.7 Calculate the energy saved in terms of money.
- 9.8 Identify between various types of evaporators on the basis of
 - 9.8.1 Heat conserved
 - 9.8.2 Re-use both from cane sugar and beet sugar juice.

POLLUTION

1 UNDERSTAND POLLUTION.

- 1.1 Define pollution
- 1.2 Enlist types of pollution such as atmospheric pollution, land pollution, noise and waste water pollution.
- 1.3 Define noise pollution.
- 1.4 Describes its effect upon human health.
- 1.5 Explain damages caused by above types of pollution.
- 1.6 Identify various types of pollution on the basis of their damages caused, effect on environment and human health.
- 1.7 Explain control methods.

2. UNDERSTAND AIR/ATMOSPHERIC POLLUTION

- 2.1 Define atmospheric pollution
- 2.2 Enlist various types of gases present in atmosphere.
- 2.3 Explain methods to control air pollution.
- 2.4 Explain the effects of atmospheric pollution on human health.
- 2.5 Explain physical and chemical treatment to control.
- 2.6 Explain neutralisation and precipitation, oxidation-reduction method to control.

3 UNDERSTAND WATER POLLUTION

- 3.1 Define water pollution.
- 3.2 Name water pollutants.
- 3.3 Explain the oxidation effect on bacteria's present in water.
- 3.4 Define chemical nutrients.
- 3.5 Explain ion exchange method to control waste water disposal.
- 3.6 Explain filtration techniques to control and check water affluent in sewage and industrial waste water.

4 UNDERSTAND NOISE POLLUTION

- 4.1 Define noise pollution.

- 4.2 Name sources of noise pollution.
- 4.3 Define sound characteristics of high pitch which affects worker health and public health.
- 4.4 Name units of intensity of sound.
- 4.5 Explain the effect of sound of 80-150 db on human ear.
- 4.6 Explain ear plug system to control.

5 UNDERSTAND LAND POLLUTION.

- 5.1 Define land pollution.
- 5.2 Enlist types of land pollution.
- 5.3 Explain control methods
 - (i) Precipitation
 - (ii) adsorption
 - (iii) Ion exchange

6 UNDERSTAND AMMONIA/UREA MANUFACTURING

- 6.1 Define ammonia equilibrium.
- 6.2 Define equilibrium Constant
- 6.3 Enlist bleed gases
- 6.4 Explain the effect of gases upon human health
- 6.5 Name quality catalyst
- 6.6 Explain the absorption system of gases.
- 6.7 Explain the use of gas mask on ammonia plant/urea plant
- 6.8 Explain reaction between CO_2 & NH_3
- 6.9 Explain the damage caused by bi-uret on the plant
- 6.10 Explain how pollution can be controlled by latest stripping techniques.

7 UNDERSTAND PULP AND PAPER MANUFACTURING TECHNIQUES.

- 7.1 Enlist chemicals used
- 7.1 Explain the toxicity of chemicals
- 7.2 Describe the elimination techniques of SO_2 and NO_2 's by chemical methods
- 7.3 Name method of removal by ordination
- 7.4 Explain the meeting process for the removal of organic compound which produce harmful gases.

**8 UNDERSTAND PETROLEUM REFINING
UNDERSTAND SUGAR MANUFACTURING**

- 8.1 Enlist various abnoscious chemicals present in petroleum
- 8.2 Explain tetra-ethyle lead use and its effect upon engine and human healths
- 8.3 Explain the method of removal of sulphur from gasoline
- 8.4 Explain the use of additives in petroleum product
- 8.5 Explain the formation of alkylates and re-formations to overcome pollution.
- 8.6 Enlist various refining and decolourising agents
- 8.7 Explain the use of SO_2 in bleaching

- 8.8 Describe method to eliminate sulphur
- 8.9 Explain the use of diocta-decyl dimethyle ammonium chloride
- 8.10 Name in-organic salt which are problematic for environment
- 8.11 Explain Ion-exchange method to overcome environmental pollution
- 8.12 Explain method to eliminate formation of CO₂ during burning of baggasse as a fuel.

CHT. 372 INDUSTRIAL STOICHIOMETRY

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COURSE CONTENTS.

1. UNITS AND DIMENSIONS

- 1.1 Definition
- 1.2 Conversion of units in English/metric system
- 1.3 Calculation based on unit conversion

2. BEHAVIOUR OF GAS

- 2.1 Ideal gas laws
- 2.2 Boyle's law
- 2.3 Charles's law
- 2.4 Gas equation
- 2.5 Absolute Temperature
- 2.6 Absolute Zero
- 2.7 Absolute temperature scales
- 2.8 Standard conditions
- 2.9 Value of gas constant 'R' in different systems
- 2.10 Calculation based on gas equation
- 2.11 Dalton's law of partial pressure
- 2.12 Amagats law of partial volume
- 2.13 Avogadro's number
- 2.14 Mole fraction and percent
- 2.15 Pressure fraction and percent
- 2.16 Mass fraction and percent
- 2.17 Volume fraction and percent
- 2.18 Mole percent and percent
- 2.19 Prove Mole percent = volume percent = pressure percent
- 2.20 Calculation based on percentage and fractions for gaseous mixtures
- 2.21 Vander Waal's equation

3. CHEMICAL EQUATION

- 3.1 Limiting reactant
- 3.2 Excess reactant
- 3.3 Theoretically required amount of reactant
- 3.4 Percent excess of reactant
- 3.5 Degree of completion of reaction
- 3.6 Percent conversion of reactant
- 3.7 Percent yield
- 3.8 Calculation based on chemical equation

4. MATERIAL BALANCE

- 4.1 Law of material balance
- 4.2 Steps involved in making material balance calculation
- 4.3 Tie component
- 4.4 Material balance without chemical change
- 4.5 Material balance involving chemical change

- 4.6 Calculation based on simultaneous equation
- 4.7 Calculation based on combustion problems

5. ENERGY BALANCE

- 5.1 Energy unit
- 5.2 Law of Energy Balance
- 5.3 Specific heat at constant volume
- 5.4 Specific heat at constant pressure
- 5.5 Latent heat
- 5.6 Enthalpy

6. THERMO CHEMISTRY

- 6.1 Heat of Reaction
- 6.2 Heat of Formation
- 6.3 Heat of Combustion
- 6.4 Hess law of Heat Submission

7. THERMODYNAMICS

- 7.1 First law of Thermodynamics
- 7.2 Heating at constant volume
- 7.3 Heating at constant pressure

TEXT BOOKS

- 1. Manual on Stoichiometry (Chemical Technology) Polytechnic Manual pens
- 2. An Introduction to Chemical Engg. by Charles E. Little

John

CHT 372 INDUSTRIAL STOICHIOMETRY

INSTRUCTIONAL OBJECTIVES.

1 UNIT AND DIMENSION

- 1.1 Understand unit and dimension
 - 1.1.1 Explain unit and dimension
 - 1.1.2 Enumerate the system of units
 - 1.1.3 Define English system, metric system and S.I system
 - 1.1.4 Explain derived units

2 BEHAVIOUR OF GAS

- 2.1 Understand behaviour of gases
 - 2.1.1 Explain facts and observation about gases
 - 2.1.2 Enlist the gas laws
 - 2.1.3 Define ideal gas law
 - 2.1.4 State boyle's law
 - 2.1.5 State charle's law
 - 2.1.6 Derive general gas equation
 - 2.1.7 Describe Absolute temperature
 - 2.1.8 Define Absolute Zero
 - 2.1.9 Define Absolute temperature scale
 - 2.1.10 Define the standard conditions of temp pressure(STP or NTP)
 - 2.1.11 Calculate value of R in different system
 - 2.1.12 Solve problems based on gas equation
 - 2.1.13 Explain dalton's law of partial pressure
 - 2.1.14 Define amagats law
 - 2.1.15 Explain the Application of problems
 - 2.1.16 Describe avogadro's number
 - 2.1.17 Explain mole fraction and percent
 - 2.1.18 Illustrate pressure fraction, mass fraction, volume fraction
 - 2.1.19 Prove mole percent=volume percent=pressure percent
 - 2.1.20 Solve problems of gaseous mixture based on %age and fraction
 - 2.1.21 Derive vander wall's equation
 - 2.1.22 Solve problems based on vanders wall's equation

3 CHEMICAL EQUATION

- 3.1 Understand chemical equation
 - 3.1.1 Define limiting reactant
 - 3.1.2 Define excess reactant
 - 3.1.3 Calculate theoretical required amount of reactant
 - 3.1.4 Calculate excess of reactant
 - 3.1.5 Define degree of competition reaction

- 3.1.6 Describe percent conversion of reaction
- 3.1.7 Describe percent field
- 3.1.8 Solve problems based on chemical equation

4 MATERIAL BALANCE

- 4.1 Understand material balance
 - 4.1.1 Enlist the steps involved in making material balance calculation
 - 4.1.2 Define the components
 - 4.1.3 Describe material balance with out chemical change
 - 4.1.4 Explain material balance involving chemical change
 - 4.1.5 Solve problems based on simultaneous equation
 - 4.1.6 Solve problems based on combustion process

5 ENERGY BALANCE

- 5.1 Understand energy balance
 - 5.1.1 Define energy unit
 - 5.1.2 State law of energy balance
 - 5.1.3 Explain specific heat at constant volume and constant pressure
 - 5.1.4 Define latent heat
 - 5.1.5 Explain enthalpy

6 THERMO CHEMISTRY

- 6.1 Understand thermo chemistry
 - 6.1.1 Define heat of reaction, heat of formation and heat of combustion
 - 6.1.2 State Hess's law of heat summation
 - 6.1.3 Calculate heat of combustion of gases/ fuels
 - 6.1.4 Calculate heat of reaction applying Hess's law

7 THERMODYNAMICS

- 7.1 Understand thermodynamics
 - 7.1.1 State first law of thermodynamics
 - 7.1.2 Calculate specific heat at constant volume and at constant pressure