

BRANCH CODE 05 DIPLOMA PROGRAMME IN CHEMICAL ENGINEERING										
SEMESTER - I										
COURSE CODE	COURSE TITLE	TEACHING SCHEME/WEEK			CREDITS (T+P)	EXAMINATION SCHEME				GRAND TOTAL
		T	P			THEORY MARKS		PRACTICAL		
		T	P		ESE	PA	ESE	PA		
330001	BASIC MATHEMATICS	2	2	0	4	70	30	0	0	100
330002	ENGLISH	3	2	0	5	70	30	20	30	150
330011	BASIC CHEMISTRY(GROUP-4)	3	0	2	5	70	30	20	30	150
3310501	PHYSICAL ANALYTICAL & INORGANIC CHEMISTRY	3	0	2	5	70	30	20	30	150
3310502	CHEMICAL ENGINEERING DRAWING	0	0	4	4	0	0	40	60	100
330012	COMPUTER APPLICATION & GRAPHICS	0	0	4	4	0	0	40	60	100
		11	4	12						
TOTAL					27	280	120	140	210	750

Course Title: Basics Mathematics
(Code: 3300001)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Biomedical Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Electronics & Communication Engineering, Environment Engineering, Fabrication Technology, Information Technology, Instrumentation & Control Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Plastic Engineering, Power Electronics Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing Technology, Transportation Engineering	First Semester

1. RATIONALE

The subject is classified under Basic Sciences and students are intended to know about the basic concepts and principles of Mathematics as a tool to analyze the Engineering problems. Mathematics has the potential to understand the Core Technological studies.

2. LIST OF COMPETENCIES

The course content should be taught so as to understand and perform the Engineering concepts and computations. Aim to develop the different types of Mathematical skills leading to the achievement of the following competencies:

- i. **Apply the concepts and principles of mathematics to solve simple engineering problems**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	100
2	2	0	4	70	30	0	0	

Legends:

L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical;C – Credit;
ESE -End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Logarithm	1.1 Solve simple problems using concepts of Logarithms	Concept ,Rules and related Examples
Unit– II Determinants and Matrices	2.1 Solve simultaneous equations using concepts of Determinants and Matrices	Idea of Determinant and Matrix, Addition/Subtraction, Product, Inverse up to 3X3 matrix, Solution of Simultaneous Equations(up to three variables)
Unit– III Trigonometry	3.1 Solve simple problems using concepts of Trigonometry	Units of Angles(degree and radian), Allied & Compound Angles, Multiple –Submultiples angles, Graph of Sine and Cosine, Periodic function, sum and factor formulae, Inverse trigonometric function
Unit– IV Vectors	4.1 Solve simple problems using concepts of Vectors	Basic concept of Vector and Scalar, addition & subtraction, Product of Vectors, Geometric meaning of Scalar and Vector Product. Angle between two vectors, Applications of Dot (scalar) and Cross (vector) Product, Work Done and Moment of Force.
Unit-V Mensuration	5.1 Calculate the surface area and volume of different shapes and bodies.	Area of Triangle, Square, Rectangle, Trapezium, Parallelogram, Rhombus and Circle Surface & Volume of Cuboids, Cone, Cylinder and Sphere.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Logarithms	03	4	4	2	10
2.	Determinants and Matrices	08	6	8	4	18
3.	Trigonometry	08	8	6	4	18
4.	Vectors	06	5	5	4	14
5.	Mensuration	03	3	3	4	10
Total		28	26	26	18	70

Legends:

R = Remembrance; U= Understanding; A= Application and above levels (Revised Bloom's Taxonomy)

6. SUGGESTED LIST OF EXERCISES (During tutorial hours)

The exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency.

S. No.	Unit No.	Exercises/Tutorial
1	1	Logarithms-Simple Examples related Definition and Rules
2		Examples on various types and Graphs
3	2	Determinants, Simple Examples on Matrix Addition/Subtraction and Product
4		Co-factors, Adjoint and Inverse of Matrix
5	2	Solution of Simultaneous Equation using 3X3 Matrix and its Applications
6	3	Practice Examples: Allied & Compound Angles
7		Practice Examples: Periodic functions, Sum/Diff and factor formulae, Inverse Trigonometric function etc.
8		Simple Graphs of Sine and Cosine Functions(Explain Spherical Trigonometry, if possible, for Applications)
9	4	Practice Simple Examples Vectors
10		Example related to Dot and Cross Products and Applications
11	5	Examples on Area
12		Surface Area & Volume and its Applications

Note: The above Tutor sessions are for guideline only. The remaining Tutorial hours are for revision and practice.

7. SUGGESTED LIST OF STUENT ACTIVITIES

Following is the list of proposed student activities like: course/topic based seminars, internet based assignments, teacher guided self learning activities, course/library/internet/lab based Mini-Projects etc. These could be individual or group-based.

1. Applications to solve identified Engineering problems and use of Internet.
2. Learn MathCAD to use Mathematical Tools and solve the problems of Calculus.
3. .Learn MATLAB and use to solve the identified problems.

8. SUGGESTED LEARNING**RESOURCES A. List of Books**

S.No.	Author	Title of Books	Publication
1	Anthony croft and others	Engineering Mathematics (third edition)	Pearson Education
2	W R Neelkanth	Applied Mathematics-I	Sapna Publication
3	S P Deshpande	Polytechnic Mathematics	Pune Vidyarthi Gruh Prakashan
4	Rudra Pratap	Getting Started with MATLAB-7	OXFORD University Press

B. List of Major Equipment/ Instrument

1. Simple Calculator
2. Computer System with Printer, Internet
3. LCD Projector

C. List of Software/Learning Websites

1. Excel
2. DPlot
3. MathCAD
4. MATLAB

You may use other Software like Mathematica and other Graph Plotting software. Use wikipedia.org, mathworld.wolfram.com Etc...

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE:**Faculty Members from Polytechnics**

Dr.N.R.Pandya, HOD-General Dept. Govt. Polytechnic, Ahmedabad

Dr N. A. Dani, Lecturer, Govt. Polytechnic, Junagadh.

Smt R. L. Wadhwa, Lecturer, Govt. Polytechnic, Ahmedabad
Shri H. C. Suthar, Lecturer, BPTI, Bhavnagar

Shri P. N. Joshi, Lecturer, Govt. Polytechnic, Rajkot

Shri P. T. Polara, Lecturer, Om Institute of Engg. And Tech, Junagadh,
Smt Ami C. Shah, Lecturer, BBIT, V. V. Nagar.

Coordinator and Faculty Member From NITTTR Bhopal

Dr. P. K. Purohit, Associate Professor, Dept. of Science, NITTTR, Bhopal

Course Title: English
(Code: 3300002)

Diploma Programmes in which this course is offered	Semester in which offered
Architectural Assistanship, Automobile Engineering, Biomedical Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Computer Aided Costume Design & Dress Making, Computer Engineering, Electrical Engineering, Electronics & Communication Engineering, Environment Engineering, Fabrication Technology, Information Technology, Instrumentation & Control Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Plastic Engineering, Power Elctronics Engineering, Printing Technology, Textile Designing, Textile Manufacturing Technology, Textile Processing Technology, Transportation Engineering	First Semester

2. RATIONALE

English language has become a dire need to deal successfully in the globalized and competitive market and hence this curriculum aims at developing the functional and communicative abilities of the students in English. Proficiency in English is one of the basic needs of technical students. A technician has to communicate all the time with peers, superiors, subordinates and clients in his professional life. Hence this course is being offered.

3. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

- 2 Communicate verbally and in writing in English.**
- 3 Comprehend the given passages and summarize them.**

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Tutorial Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	2	0	5	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes		Topics and Sub-topics
	Writing Skills	Speaking Skills	
Unit – I Grammar	1.1 Apply correct verb in the given sentence	1b. Use grammatically correct sentence in day to day communication	1.1 Tenses - Present Tense (Simple, Continuous, Perfect, Perfect Continuous) - Past Tense (Simple, Continuous, Perfect) - Future Tense (Simple)
	1.2 Distinguish among various Determiners	1d. Distinguish among determiners and apply correctly in communicative usage.	1.2 Determiners - Articles (A, An, The) Some, Any, Much, Many, All, Both, Few, A few, The few, Little, A little, The little, Each, Every.
	1.3 Use appropriate modal auxiliaries in a given expression	1f. Choose appropriate modals in situations where different modes of expressions are used.	1.3 Modal Auxiliaries Can, Could, May, Might, Shall, Should, Will, Would, Must, Have to, Need, Ought to
	1.4 Choose the correct verb for the given subject	1h. Use the correct verb depending on the subject in a sentence.	1.4 Subject- Verb Agreement
	1.5 Distinguish between Active and Passive structures. Apply correct model auxiliary in the given sentence.	1j. Apply the correct voice in formal communication	1.5 The Passive Voice Simple Tenses, Perfect Tenses And Modal Auxiliary Verbs
	1.6 Use appropriate preposition in a sentence	1l. Usage of correct preposition as per time, place and direction.	1.6 Prepositions: Time, Place and Direction
	1.7 Identify different connectors and their usage.	1n. Join words or sentences using connectors and bring out the desired meaning.	1.7 Connectors: And, But, Or, Nor, Though, Although, If, Unless, Otherwise, Because, as, Therefore, So, Who, Whom, Whose, Which, Where, When, Why.

Unit	Major Learning Outcomes		Topics and Sub-topics
	Writing Skills	Speaking Skills	
Unit – II Comprehension Passages	2.1 Formulate sentences using new words. 2.2 Enrich vocabulary through reading. 2.3 Write short as well as long answers to questions. 2.4 Express ideas in English in written form effectively	2e. Discuss the content of the passage/story in the class. 2f. Ask appropriate questions as well to answer them. 2g. Follow oral instructions and interpret them to others. 2h. Present topics effectively and clearly. 2i. Use dictionary, thesaurus and other reference books. 2j. Describe an object or product. 2k. Use correct pronunciations and intonations. 2l. Give instructions orally	2.1 Comprehension Passages Lincoln's Letter to His Son's Teacher (Abraham Lincoln) What we must Learn from the West (Narayana Murthy) Dabbawallas: Mumbai's Best Managed Business (Amberish K. Diwanji) Internet (Jagdish Joshi) 2.2 Vocabulary Items: - Matching items (word and its Meaning) - One word Substitution - Phrases and idioms - Synonyms and Antonyms from given MCQs
Unit – III Short Stories		3a Express ideas and views on given topics. 3b. Speak briefly on a given topic fluently and clearly. 3c. Participate in formal and informal conversations 3d. Recapitulate orally the facts or ideas presented by the speaker	My Lost Dollar by Stephen Leacock The Snake in the Grass by R K Narayan A Day's Wait by Earnest Hemingway
Unit – IV Writing Skills	4.1 Write letters and dialogues on given topics / situations.	4b. Face oral examinations and interviews	4.1 Dialogue Writing 4.2 Samples for Practice: - Meeting and Parting - Introducing and Influencing - Requests - Agreeing and Disagreeing - Inquiries and Information 4.3 Letter: - Placing an order - Letter to Inquiry - Letter of Complaint - Letter of Adjustment - Letter seeking permission
Unit – V Speaking Skills		5a. Follow correct pronunciation, stress and intonation in everyday conversation.	For 28 hours of practical periods , digital language laboratory is recommended to be established in every polytechnic. But as polytechnics currently do not have digital language laboratories practical periods will be engaged encouraging the students to speak as per the text taught in the class.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit Title	Teaching Hours 42+28	Distribution of Theory Marks			
		R Level	U Level	A Level	Total
Unit – I Grammar	14	8	8	9	25
Unit – II Comprehension Passages	07	4	6	5	15
Unit – III Short Stories	07	4	5	5	14
Unit – IV Writing Skills	14	3	6	6	15
Unit – V Speaking Skills	28	1			01
Total	70	20	25	25	70

Legends: R = Remembrance; U = Understanding; A = Application and above levels
(Revised Bloom's taxonomy)

6. SUGGESTED LIST OF TUTORIAL EXERCISES

The tutorial exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned competencies.

S. No.	Unit No.	Experiment
1	I	Conversation <ol style="list-style-type: none"> 1. Introducing oneself 2. Introduction about family 3. Discussion about the weather 4. Seeking Permission to do something 5. Description about hobbies 6. Seeking Information at Railway Station/ Airport 7. Taking Appointments from superiors and industry personnel 8. Conversation with the Cashier- College/ bank 9. Discussing holiday plans 10. Asking about products in a shopping mall 11. Talking on the Telephonic 12. Wishing Birthday to a Friend 13. Talking about Favourite Sports
2	II	Presentation Skills General Presentations pertaining to Unit I, II, III

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- course/topic based seminars,
- internet based assignments,
- teacher guided self learning activities,
- course/library/internet/lab based mini-projects
- etc. These could be individual or group-based.

8. SUGGESTED LEARNING RESOURCES

A. Text Book

Sr. No.	Author/s	Title of Books	Publication
1	Juneja & Qureshi	Active English	Macmillan

B. List of Reference Books

Sr. No.	Author/s	Title of Books	Publication
1	Wren & Martin	High School English Grammar	S. Chand & Co. Ltd
2	M. Gnanamurali	English Grammar at Glance	S. Chand & Co. Ltd.
3	E. Suresh Kumar & Others	Effective English	Pearson
4	S. Chandrashekhar & Others	English Communication for Polytechnics	Orient BlackSwan
5	-	English Fluency Step 1 & 2	Macmillan
6	-	Active English Dictionary	Longman

C. List of Major Equipment/ Instrument

- i. Digital English Language Laboratory
- ii. Computers for language laboratory software
- iii. Headphones with microphone
- iv. Computer furniture

D. List of Software/Learning Websites

- i. <http://www.free-english-study.com/>
- ii. <http://www.english-online.org.uk/course.htm>
- iii. <http://www.english-online.org.uk/>
- iv. <http://www.talkenglish.com/>
- v. <http://www.learnenglish.de/>

B COURSE CURRICULUM DEVELOPMENT COMMITTEE**Polytechnic Faculty Members**

Prof. K. H. Talati, Govt. Polytechnic, Gandhinagar (Convener)

Ms. Almas Juneja, Gujarat Technological University, Ahmedabad. **Shri. D. M. Patel**, Govt. Polytechnic, Ahmedabad.

Dr. Sonal K. Mehta, Govt. Girls Polytechnic, Ahmedabad.

Shri. Bhadresh J. Dave, Govt. Polytechnic, Rajkot.

Dr. Peena Thanki, Govt. Polytechnic, Jamnagar.

Dr. Chetan Trivedi, Govt. Engineering College, Bhavnagar.

Dr. Raviraj Raval, Govt. Polytechnic, Rajkot.

Shri Vaseem Qureshi, Vishwakarma Govt. Engineering College, Chandkheda, Ahmedabad.

NITTTR Bhopal Faculty and Co-ordinator

Dr. Joshua Earnest, , NITTTR, Bhopal

Prof.(Mrs.) Susan S. Mathew, NITTTR, Bhopal

Course Title: Basics Chemistry (Group-4)
(Code: 3300011)

Diploma Programmes in which this course is offered	Semester in which offered
Chemical Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing Technology	First Semester

3. RATIONALE

Science is the foundation for all technician courses. The basic aim of teaching science is to develop in the students the habit of scientific inquiry, ability to establish the cause and effect, relationship. Chemistry forms the part of applied science. The study of basic concepts of chemistry like chemical bonding, corrosion, water treatment, Organic chemistry and different engineering materials like polymers, adhesives, paints, lubricants, etc. will help the students understanding engineering subjects where the emphasis is laid on the application of these concepts. Chemistry is concerned with the changes in structure and properties of matter. Many of the process which are involved to bring out this changes forms the basis of engineering activities. Teaching of chemistry should be aimed at developing the right type of aptitude in the students and the ability to predict the result under given condition

Thus good foundation in basic science will help the students in their self development to cope up with continuous flow of innovations.

4. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency.

- i. Apply the basic concepts and principals of Chemistry in various engineering applications.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit; ESE - End Semester Examination; PA - Progressive Assessment.

6. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Chemical Bandings and Catalysis	1.1 Explain various properties of material depending upon bond formation 1.2 Describe the molecular structure of solid, liquid and gases 1.3 Comprehend the crystal structure of metal and properties reflected by packing of atoms 1.4 Explain the various types of catalysis and catalyst	Introduction 1.1 Theory Of Valency 1.2 Types of chemical bonds 1.2.1 Electrovalent bond,& its characteristics 1.2.2 Covalent bond & its characteristics 1.2.3 Co- ordinate bond 1.2.4 Hydrogen bond, its types and Significance 1.2.5 Metallic bond, Explanation of Metallic properties. 1.3 Intermolecular force of attraction 1.4 Molecular arrangement in solid, liquid and gases. 1.5 Structure of solids. 1.5.1 Metallic solids- Unit cell- bcc, fcc and hcp packing of metals –examples and properties reflected by the packing of atoms. 1.6 Catalysis, 1.6.1 Types of catalysis 1.6.2 Theory of Catalysis 1.7 Types of Catalyst 1.7.1 Positive Catalyst 1.7.2 Negative Catalyst 1.7.3 Auto-catalyst 1.8 Catalytic Promoter and Catalytic inhibitor 1.9 Industrial Application of Catalyst

Unit– II Concepts of Electro Chemistry	2.1 Describe theory of ionization and factors affecting it. 2.2 Describe the importance of pH & and its industrial application. 2.3 Describe difference between electrolytes and non- electrolytes. 2.4 Describe construction and working of electrochemical cell. 2.5 Describe the term: electrode potential and standard condition for its measurement. 2.6 Appreciate the application of electrolysis	2.1 Introduction 2.2 Arrhenius theory of ionization. 2.3 Degree of ionization 2.3.1 Factors affecting the degree of ionization 2.4 Definition of pH 2.4.1 pH of acid, base and neutral solution 2.4.2 pH calculations of acid, base and salt solution at different concentration 2.4.3 Importance of pH in various fields. 2.5 Definition of buffer solution. 2.5.1 Buffer Action & Types of buffer Solution. 2.5.2 Application of buffer solutions. 2.6 Electrolytes and Non-electrolytes 2.6.1 Types of electrolytes 2.7 Construction and working of electrochemical cell 2.8 Standard conditions 2.9 Standard hydrogen electrodes 2.10 Nernst theory of single electrode potential & Nernst equation 2.11 Electrochemical series, galvanic series 2.12 Electrolysis, Faradays laws of electrolysis 2.13 Industrial application of Electrolysis 2.14 conductance of solution (a) Conductivity (b) Specific Conductivity
---	---	--

Unit	Major Learning Outcomes	Topics and Sub-topics
	process for surface coating	(c) Equivalent conductivity (d) Molar conductivity
Unit– III Corrosion of metals & its prevention	3.1 Describe the different types of corrosion 3.2 Comprehend the different factors affecting rate of corrosion 3.3 Appreciate the different protective measures to prevent the corrosion	3.1. Definition of corrosion 3.2 Types of corrosion 3.2.1 Dry corrosion: Oxidation corrosion mechanism corrosion-mechanism , Nature of oxide film 3.2.2 Wet corrosion-mechanism 3.2.3 Concentration cell corrosion 3.3 Pitting corrosion 3.4 Waterline corrosion 3.5 Crevice corrosion 3.6 Factors affecting the rate of corrosion,- Nature of film, Nature of Environment, PH of Solution, Area of cathode anode and, Temperature, Moisture, Purity of metal 3.7 . Methods of prevention of corrosion- Modification of environment , Modification of the properties of metal , Use of protective coatings. Anodic and cathodic protection, Modification in design and choice of material

<p>Unit– IV</p> <p>Water Treatment</p>	<p>4.1 Differentiate between hard water & soft water</p> <p>4.2 Describe the ill effect of hard water in boiler operation</p> <p>4.3 Explain the different methods for removal of hardness in water</p> <p>4.4 Appreciate the water quality and treatment of drinking water</p>	<p>4.1. Hard water and soft water.</p> <p>4.2 Types of hardness of water</p> <p>4.2.1 Salts producing hardness of water.</p> <p>4.2.2 Method to express the hardness of water.</p> <p>4.3 Estimation of total hardness by EDTA Method</p> <p>4.3.1 Examples to calculate the hardness</p> <p>4.4 Effect of hard water in Boiler operation</p> <p>4.4.1 Scale and sludge formation and it's Prevention</p> <p>4.4.2 Priming and foaming and it's prevention.</p> <p>4.4.3. Caustic embrittlement and it's prevention.</p> <p>4.4.4 Corrosion and it's prevention.</p> <p>4.5 Softening of Water</p> <p>4.5.1 Soda-Lime process</p> <p>4.5.2 Permutit process</p> <p>4.5.3 Ion Exchange process</p> <p>4.5.4 Reverse Osmosis process</p> <p>4.6 Treatment of Drinking water</p> <p>4.6.1 Sedimentation</p> <p>4.6.2 Coagulation</p> <p>4.6.3 Filtration</p> <p>4.6.4 Sterilization of water by chlorination</p> <p>4.6.5 Break-point chlorination</p>
--	---	---

Unit	Major Learning Outcomes	Topics and Sub-topics
<p>Unit– V</p> <p>Basic Concepts of Organic Chemistry</p>	<p>5.1 Explain the classification of organic compound</p> <p>5.2 Describe the function group classification of organic compound</p> <p>5.3 Describe difference between saturated and unsaturated hydrocarbons</p>	<p>5.1 Introduction: Organic chemistry</p> <p>5.2 Difference between organic and Inorganic compound</p> <p>5.3 Tetravalency of carbon</p> <p>5.4 Concept of hybridization-sp,sp²,sp³ type of one hybridization with example of each</p> <p>5.5 Sigma and pi-bonding</p> <p>5.6 Classification of Organic compound</p> <p>5.7 Functional group classification</p> <p>5.8 Explanation of following terms : Saturated and unsaturated hydrocarbon ,Isomerism, Homologues series,</p> <p>5.9 Sources of Hydrocarbons</p> <p>a. distillation of coal-tar b. refining of petroleum</p> <p>5.10 Study of Alkane,Alkene and Alkynes</p> <p>Preparation, properties & uses (Ethane, Ethylene & Acetylene)</p>
<p>Unit– VI</p> <p>Lubricants</p>	<p>6.1 Describe the terms Lubrication and Lubricants</p> <p>6.2 Comprehend different tests of lubricants</p> <p>6.3 Appreciate the process of selection of</p>	<p>6.1 Introduction and definition of lubricants and lubrication</p> <p>6.2 function of lubricants</p> <p>6.3 Types of lubrication</p> <p>6.3.1 Fluid film lubrication.</p> <p>6.3.2 Boundary lubrication</p> <p>6.4 Classification of lubricants</p> <p>6.4.1 Solid lubricants</p> <p>6.4.2 Semi-solid lubricants</p> <p>6.4.3 Liquid lubricants</p> <p>6.4.4 Synthetic oils</p> <p>6.5 Physical Properties of lubricants and their</p>

	<p>proper lubricants for engineering use</p> <p>6.4 Explain the properties and uses insulating materials</p>	<p>significance like</p> <p>6.5.1 Viscosity and viscosity index</p> <p>6.5.2 Flash point and fire point</p> <p>6.5.3 Pour point and cloud point</p> <p>6.5.4 oiliness</p> <p>6.6 Chemical Properties of lubricants like</p> <p>6.6.1 Saponification value</p> <p>6.6.2 Neutralization number</p> <p>6.6.3 Emulsification number</p> <p>6.7 Selection of lubricants for</p> <p>6.7.1 Gears</p> <p>6.7.2 Cutting tools</p> <p>6.7.3 Steam turbine</p>
<p>Unit– VII</p> <p>Polymer, Elastomers & Adhesives</p>	<p>7.1 Explain the process of polymerization</p> <p>7.2 Explain the properties and uses of Polymers, elastomers & adhesives.</p>	<p>7.1 Introduction and Definition of Polymer and Monomer</p> <p>7.2 Classification of Polymer on basis of Molecular structure as Linear, Branch and Cross-linked polymers</p> <p>7.3 Classification on basis of monomers (homopolymer and copolymer)</p> <p>7.4 Classification of Polymers on</p>

Unit	Major Learning Outcomes	Topics and Sub-topics
	7.3 Explain the process of vulcanization of rubber 7.4 Explain the different types of adhesives and their application	basis of Thermal behavior(Thermoplastics& Thermosetting) 7.5 Types polymerization Reaction 7.5.1 Addition Polymerization 7.5.2 Condensation Polymerization 7.6 Synthesis, properties and application of 7.6.1 Polyethylene 7.6.2 Polypropylene 7.6.3 Polyvinyl chloride 7.6.4 Teflon 7.6.4 Polystyrene 7.6.5 Phenol formaldehyde 7.6.6 Acrylonitrile 7.6.7 Epoxy Resin 7.7 Define the term:- elastomers 7.8 Natural rubber and its properties 7.9 vulcanization of rubber 7.10 Synthetic rubber, Synthesis, properties and uses 7.10.1 Buna-S Rubber 7.10.2 Buna-N Rubber 7.10.3 Neoprene Rubber 7.11 Definition of adhesives and Examples 7.11.1 Characteristics of adhesives 7.11.2 Classification of adhesives and their uses.

7. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1	Chemical Bonding and Catalysis	06	3	2	3	08
2	Concepts of Electro Chemistry	07	4	4	4	12
3	Corrosion of metals & its prevention	05	3	2	3	08
4	Water Treatment	06	4	2	4	10
5	Basic concepts of Organic Chemistry	06	3	4	3	10
6	Lubricants	05	3	2	3	08
7	Polymer ,Elastomers & Adhesives	07	4	4	6	14
	Total	42	24	20	26	70

Legends:

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

8. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	Experiment/Practical Exercises
1	1	Determine the strength of given acidic solution using standard solution of base.
2	3	Standardize KMnO_4 solution by preparing standard oxalic acid and to estimate ferrous ions.
3	3	Standardize $\text{Na}_2\text{S}_2\text{O}_3$ solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.
4	6	Determine the viscosity of given lubricating oil by using Red-wood Viscometer
5	2	Determine PH-Values of given samples of Solution by using Universal Indicator and PH-meter
6	--	Determination of phenol by iodometric method.
7	7	To Determine molecular weight of a polymer using Ostwald viscometer
8	5	Assign IUPAC names to first five members of Alkane and Alkene series
9	7	Preparation of (any one) polystyrene, urea formaldehyde, phenol formaldehyde and its Characterization
10	6	To Determine Acid Value of given lubricating Oil.
11	--	Determine of percentage of moisture in given sample of coal by proximate analysis
12	6	To Determine of saponification value of an lubricating oil
13	3	Study of corrosion of metals in medium of different pH
14	4	To Determine the COD of given water sample
15	6	Determine Flash & Fire point of given lubricating oil.
16	3	Study of Corrosion of Metals in the different Mediums.
	Note	Minimum Ten Experiments should be performed by the students from the above given list or experiments related to above topics

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities (individual or group-based)

Teacher guided self learning activities.

Course/topic based internet based assignments.

Library survey regarding Engineering Material used in different industries. Industrial Visits of one or Two Industries.

Quiz & Brain storming session related to Fuel properties & Utilization of fuel for different purposes.

Sampling & Testing of water collected from different places. These could be individual or group-based.

8. SUGGESTED LEARNING

RESOURCES A. List of Books

S.No.	Author	Title of Books	Publication
1	Engineering Chemistry	JAIN & JAIN	Dhanpat Rai and Sons
2	A Text Book of Polytechnic Chemistry	V.P. Mehta	Jain Brothers
3	A Text Book of Applied Chemistry	J. Rajaram	Tata McGraw Hill Co. New Delhi
4	Engineering Chemistry	S.S.Dara	S.Chand Publication

. B. List of Major Equipment/ Instrument

pH- Meter

Red wood Viscometer.

Pensky Martin Apparatus / Abel's Apparatus. Cleveland open cup apparatus.

Glass wares

C. List of Software/Learning Websites: ---

- www.chemistryteaching.com
- en.wikipedia.org/wiki/chemistry
- www.chm1.com
- www.em-ea.org
- www.ce.sc.edu
- www2.chemistry.msu.edu

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

Prof.J.C.Patel, I/C.Head, Science & Humanities Department,
Dr.S.& S.S. Gandhi College of Engineering Technology, Surat

Prof. Dr. P.R.Patel, Head, Science & Humanities Department N.G.Patel
Polytechnic, Isroli, Bardoli

Prof.S.A.Nimakwala, I/C. Head, Science & Humanities Department, Shri. K.J.
Polytechnic, Bharuch.

Prof.R.R.Patel, I/C.Head, Science & Humanities Department,G.P. Himmatnagar

Co-ordinator and Faculty Member from NITTTR Bhopal

Dr. Anju Rawlley , Professor Applied Science Dept. NITTTR, Bhopal

Dr. C.K.Chug ,Professor & Head Dept of electronic media , NITTTR, Bhopal

Course Title: Computer Application & Graphics
(Code: 3300012)

Diploma Programmes in which this course is offered	Semester in which offered
Ceramic Engineering, Chemical Engineering, Civil Engineering, Environment Engineering, Fabrication Technology, Mining Engineering, Plastic Engineering, Textile Manufacturing Technology, Textile Processing Technology, Transportation Engineering	First Semester
Automobile Engineering,	Second Semester

4. RATIONALE

This subject envisages making the student know the fundamentals of Computer Application. It will also help the student to have hands on experience on different application software used for office automation like MS-Word day-to-day problem solving, in particular for creating business documents, data analysis and graphical representations. Computer Application & Graphics is a course where student will be able to write, Draw, Tabulate, Report, Store and Retrieve and also print on Computer using various Hardware and Software.

Moreover the market driven economy demands frequent changes in product design to suit the customer needs. With the introduction of computers the task of incorporating frequent changes as per requirement is becoming simpler. Some units in this course has been introduced at Diploma level in order to develop the skills in student so that they can generate various digital drawings as required using various CAD software.

5. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

Use MS word software for word processing applications.

Use relevant software for drafting and editing 2D entities.

6. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	100
0	0	4	4	0	0	40	60	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit; ESE - End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Basics of Computer System	1.1 Describe computer hardware and software 1.2 Identify I/O devices 1.3 Describe functioning of CU ALU and memory unit 1.4 Differentiate various types of printers 1.5 Explain use of OS 1.6 Demonstrate various file handling operations	Basics of Computer System Concept of Hardware and Software Computer block diagram Input Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit Monitor, Printers: Dot matrix, Laser, Inkjet, Plotters, Scanner System software and Application Software Operating system concepts, purpose and functions Operations of Windows OS. Creating and naming of file and folders Copying file, renaming and deleting of files and folders, Searching files and folders, installation application, creating shortcut of application on the desktop Overview of control Panel, Taskbar.
Unit– II Using MS - Word 2007	2.1 Use basics text formatting features 2.2 Manipulate text 2.3 Use page Setup features 2.4 Use spell and grammar utility 2.5 Work with graphics/ clipart 2.6 Create and manipulate table 2.7 Use auto shapes and its formatting with text	Using MS - Word 2007 Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Inserting, deleting, undo and redo, Copy and Moving (cutting) text within a document, Formatting Paragraphs and Lists Setting line spacing; single Page settings and margins including header and footer Spelling and Grammatical checks Table and its options, Inserting rows or columns, merging and splitting cells, Arithmetic Calculations in a Table. Working with pictures, Inserting Pictures from Files, Using Drawings and WordArt; Lines and Shapes, Modifying Drawn Objects, Formatting Drawn Objects, options for Creating and Modifying a WordArt Object
Unit– III Creating digital drawings using a Computer Aided Drafting (CAD) Software	3.1 Start Computer aided drafting software (AutoCAD). 3.2 Invoke commands in AutoCAD. 3.3 Set limits & Coordinate systems. 3.4 Use object selection methods. 3.5 Create basic & advance 2D	Introduction to Basic Draw Commands in any Computer Aided Drafting software like Auto CAD Power draft, Micro station: System requirement & Understanding the interface. Components of a CAD software window: Such as Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify toolbar, cursor cross hair. Command window, status bar,

Unit	Major Learning Outcomes	Topics and Sub-topics
	entities. 3.6 Close & save your work	drawing area, UCS icon. File features: New file, Saving the file, Opening an existing drawing file, Creating Templates, Quit. Setting up new drawing: Units, Limits, Grid, Snap, Methods of Specifying points- Absolute coordinates and Relative Cartesian & Polar coordinates. Using Object Snap like Endpoint, Midpoint, Intersection, Center Point, Quadrant Point, Nearest, Perpendicular, Apparent Intersection SNAP, GRID, OTRACK, LINE, PLINE, ARC, CIRCLE, Ellipse, DONUT, Polygon, Region, File Commands: New, Open, Templates Save, Exit, Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview Concept of model space and paper space. Creating view ports in model space and creating floating viewport in paper space. Shifting from model space to paper space and vice versa
Unit – IV Editing & viewing a Digital Drawing using a CAD software	4.1 Modify existing 2D entities. 4.2 Use different arrays in existing 2D drawing. 4.3 View given drawing entities properly. 4.4 Enquire about various attributes of existing 2D entities.	Introduction to Basic Edit, Inquiry and display Commands in any Computer Aided Drafting software like Auto CAD Power draft, Micro station: Copy, Rotate, Move, Erase, Mirror, Array, Trim, Break, Extend, Chamfer, Fillet Zoom window, Zoom in-out, PAN List, Dblist, Area, Massprop
Unit – V Advance editing of a digital drawing using a CAD Software	5.1 Use layers for proper management of drawings. 5.2 Set properties of existing drawing entities as per requirement. 5.3 Able to dimension given 2D entities with perfection. 5.4 Use Blocks effectively to create perfect drawings.	Introduction to Advanced Modify & other utility Commands in any Computer Aided Drafting software like Auto CAD Power draft, Micro station: Properties, Line type, colour, line weight Concept of Layers: Creating Layers, Naming layers, Making layers ON/OFF, Freeze-Thaw layers, Lock/Unlock Layers. Setting the properties of layers like Color, Line type, Line weight Concept of Blocks: Local block, global block. Creating, inserting, redefining & exploding blocks. Concept of Hatch: Selecting Hatch pattern, Hatch styles, Hatch Orientations. Associative Hatch. Boundary Hatch, Hatching Object. Dimensioning: Types of dimensioning: Linear- Horizontal, Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions. Dim scale variable. Editing dimensions.

Unit	Major Learning Outcomes	Topics and Sub-topics
		Text: Single line Text, Multiline text. Text Styles: Selecting font, size, alignment etc.

5. SPECIFICATION TABLE (for theory)

There is no theory paper and hence specification table for theory is not applicable

5. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

S.No.	Unit No.	Practical Exercises
1	1	<p>Create and manage files and folder tree</p> <p>Use accessories utilities of windows OS</p> <p>Identify icons, processes going on, messages and interpretation</p> <p>Write given text using WORD software and beautify</p> <p>Plot and Print drawing, text on suitable paper</p> <p>Prepare report using stored text and drawing</p>
2	2	<p>Entering and editing text in document file.</p> <p>Apply formatting features on Text like Bold, Italics, Underline, font type, colour and size. Apply features like bullet, numbering</p> <p>Create documents, insert images, format tables</p> <p>Create and manipulate tables</p> <p>Students will prepare File for the above mentioned practical and assignments on individual basis.</p> <p>Students will collect photographs from internet which are related to field application of topics.</p>
3	3	<p>Study of different types of drafting packages related to 2D e.g. AutoCAD, Power draft, Micro station.</p> <p>Creating a new folder in the computer for saving your practical work.</p> <p>Draw any three complicated 2D shapes using lines only following Absolute, Relative coordinate systems and object snaps.</p> <p>Draw Five problems on different geometrical shapes in AutoCAD software using Lines, Polylines, Polygon, Circles, Arcs, Ellipse AutoCAD commands.</p> <p>Construc a common templates for all the following assignments with institutes logo & standard title block.</p> <p>Plot one drawing using above template and containing some 2D entities on suitable size of paper(A4).</p>
4	4	<p>List different properties of entities made in above activity slot.</p> <p>Try viewing commands on entities made in above activity slot.</p>

		<p>Create drawing of three different Doors & Windows (Elevations). Create drawing of a modern Study table (Elevations). Create drawing of a modern sofa Set (Plan). Draw three problems with polar & rectangular Arrays. Create Top view of a circular and a rectangular Dining Table with six chairs using Polar and Rectangular array concept respectively. Create plan & elevation of a primary school building. Create plan & elevation of a medium size modular kitchen.</p>
5	5	<p>Convert above door, windows, Bed, Dinning table into Blocks and use these blocks in following activities. Three problems on 2D entity generation, which involve the use of layers, blocks and hatching. Dimensioning of above figures. Create your own text style (individually) Draw two sheets on template developed at serial no.-3 and Create a plan & elevation of a Duplex Bungalow with following layers: Basic civil structure Water supply line Electric supply Toilet fittings Furniture(using blocks)</p>

7. SUGGESTED LIST OF STUDENT ACCTIVITY

Teachers can decide on their own the list of student activities to promote the intereste of students in use of computers and develop the competencies

8. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No.	Title of Book	Author	Publication
1.	R Taxali	Computer Course	Tata McGraw Hills. New Delhi.
2.	P. Nageswara Rao	AutoCAD For Engineering Drawing Made Easy	Tata McGraw Hill
3.	George Omura	Mastering AutoCAD	BPB publication
4.	Sham Tickoo	AutoCAD 2004	Galgotia Publications, New Delhi
5.	Devid Frey	AutoCAD 2000	BPB publication
6.	A. Yarwood	An Introduction to AutoCAD2000	LongMan
7.	Ron House	Using AutoCAD 2000	Prentice Hall
8.	Autodesk Inc.	Latest AutoCAD Manual	Autodesk Inc.

B. List of Major Equipment/ Instrument

Computer
System Printer
Flat Bed Plotter A4 size

C. List of Software/Learning Websites

Latest Educational Network version of Auto CAD
Software MS Office

8. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

Prof. H. L. Purohit, Head of Civil Engineering Department, L. E. College, MORBI

Prof. B G RAJGOR, HOD, Applied Mechanics Department , B & B Institute of Technology

Coordinator & Faculty from NITTTR Bhopal

Prof. Sanjay Agarawal, Professor & Head Dept. of Computer Engg. & Application,
NITTTR, Bhopal

Prof. Sharad Pradhan, Associate Professor, Dept. of Mechanical Engg., NITTTR, Bhopal

Course Title: Physical, Analytical & Inorganic Chemistry
(Code: 3310501)

Diploma Programmes in which this course is offered	Semester in which offered
Chemical Engineering	First Semester

1. RATIONALE

Swift progress in the study of external universe lead to the separation of Chemistry as a special branch of natural science. Chemical changes are always associated with a number of diversified physical changes. Physical chemistry uses the theoretical principles and experimental techniques to investigate the Chemical transformations and Physical changes accompanying them. Many industrial processes that have been developed are the results of Physico-Chemical investigations which are increasingly employed by organic, in-organic and analytical chemists. Inorganic chemistry explains chemistry of qualitative analysis, while analytical chemistry deals with the quantitative analysis. Hence study of physical & Analytical chemistry in engineering branch has become essential. This being a core course provides suitable background for Chemical Engg. Technicians for understanding their respective courses and will make them suitable for their job in industries. Thus good foundation in Chemistry will help the students in their self development, to cope up with continuous flow of innovations.

5. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency.

Apply basic concept of physical analytical and inorganic chemistry in chemical engineering application

6. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit;
ESE - End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I PROPERTIES OF LIQUID	1.1 Explain the different Physical properties of liquids. 1.2 Describe the properties of liquids. 1.3 Different use to determine the properties of liquids	1.1 Physical properties of liquid 1.2 Types of physical properties and Characteristics of each property. 1.3 Definition of the Surface tension, Parachor, Refractive index, Molar refraction, Specific refraction, Viscosity. 1.4 Surface tension and viscosity 1.5 Drop pipette method (Stalagmometer) to determine the Surface tension. 1.6 Ostwald's viscometer to determine viscosity of liquids. 1.7 Refractometer to determine refractive Index of liquid.
Unit– II CHEMICAL KINETICS	2.1 Explain the different reactions & kinetics of reaction. 2.2 Describe about order of reaction 2.3 List the of factors affecting the rate of reaction. 2.4 Solve problems	2.1 Define the terms : 2.1.1 Rate of reaction 2.1.2 Specific reaction rate 2.1.3 Velocity constant 2.2 Molecularity and order of reaction 2.3 Definition the terms : 2.3.1 First order reaction 2.3.2 Half concentration period 2.4 Derivation equation for first order reaction. 2.5 Derivation of equation for second order reaction. 2.6 Half life period for first & second order reaction. 2.7 Problems related chemical kinetics.
Unit– III CHEMICAL THERMO DYNAMICS	3.1 Explain the different types of processes. 3.2 Explain thermodynamic terms like- System, Surrounding etc. 3.3 Explain the laws of Chemical Thermodynamics. 3.4 State Hess's law & its application. 3.5 Differentiate between Exothermic & endothermic of reactions	3.1 System and surroundings, Types of System and suitable illustrations 3.2 Thermodynamic property- extensive and intensive 3.3 First law of thermodynamics. 3.4 Function , Internal energy, Enthalpy 3.5 Rule of assigning sign to work done(W) and heat transferred (Q) as positive and negative. 3.6 Molar heat capacity- at constant volume (Cv) and at Constant pressure (Cp). the relationship $C_p - C_v = R$ 3.7 Adiabatic change, Isothermal change , Reversible process, Irreversible process 3.8 Derivation equation for Adiabatic Expansion of an Ideal gas. $PV^{\gamma} = \text{Constant}$ 3.9 Second law of thermodynamics 3.10 Aspects of thermo-chemistry & Phenomenon of heat of reaction. 3.11 Types of heat of reactions – Exothermic and endothermic processes with examples

Unit	Major Learning Outcomes	Topics and Sub-topics
		3.12 State Hess's law of constant heat Summation. 3.13 Problems applying Hess's law.
Unit-IV BASIC CONCEPTS OF CHEMICAL ANALYSIS	4.1 Explain the concept of solubility product and ionic product and its application in inorganic analysis. 4.2 Explain the basic concepts of volumetric analysis. 4.3 Describe basic concepts of chromatography. 4.4 Use chromatograph analysis.	4.1 Basic Concepts: Common ion Effect, Solubility Product, Ionic product, Salt hydrolysis 4.2 State conditions for precipitation Considering I_p and K_{sp} 4.3 Application of H_2S and NH_4Cl in inorganic qualitative analysis 4.4 Volumetric analysis 4.4.1 Acid-base titration 4.4.2 Complex metric titration 4.4.3 Oxidation-reduction titration 4.4.4 Precipitation titration 4.5 Chromatography 4.5.1 Classification of chromatography 4.5.2 (a) Paper chromatography (b) Gas Chromatography
Unit- V SURFACE CHEMISTRY	5.1 Explain basic concepts of colloidal 5.2 Describe the preparation, properties of sol. 5.3 Describe about the purification of sol solutions. 5.4 Explain of Emulsion & its types. 5.5 Explain the Concepts of Adsorption & related terms. 5.6 Use basis concepts of colloids in different application such as smoke precipitation etc.	5.1 Adsorption, Adsorbate, Definition of Adsorbent 5.2 Classification of adsorption: Physical adsorption and Chemisorption 5.3 Types of solution: True solution, Suspension and colloidal solution 5.4 Classification of colloidal solution 5.5 Lyophobic and Lyophilic sol. 5.6 Methods of preparing colloidal Solutions. 5.6.1 Condensation methods 5.6.2 Dispersion methods 5.7 Purification of colloidal solutions 5.7.1 Dialysis 5.7.2 Ultra filtration 5.8 Important properties of colloidal solution and explain the following in details 5.8.1 Scattering of light (Tyndall effect) 5.8.2 Brownian movement 5.8.3 Electrophoresis 5.8.4 Electro osmosis 5.9 Emulsion & Gels. 5.7.1 Types of emulsion 5.7.2 Cleansing action of soap 5.10 Application of colloids Smoke precipitation, Purification of water, Sewage treatment, Leather tanning etc.

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit– VI ELECTROMETRIC METHODS OF ANALYSIS	6.1 Explain basic concepts of electrometric 6.2 Explain of construction & Working of electrochemical cells. 6.3 Describe about pH metry & Potentiometry titrations. 6.4 Describe Various aspects of conductometry & Kohlrausch Law of independent Migration of ions.	6.1 Defintion the term ` Electrode ' the Types of Electrodes 6.2 Distinction among the : Inert electrode, Working electrode & Reference electrode; with suitable Illustrations. 6.3 Construction & Working of reference electrode: 6.3.1 Hydrogen electrode 6.3.2 Calomel electrode 6.3.3 Quinhydrone electrode 6.3.4 Glass electrode 6.3.5 Ag/ Agcl/ Kcl electrode H⁺ OH⁻ 6.4 p ^H & p ^{OH} , give their relationship 6.4.1 Methods used to determine p ^H of given solution by— - p ^H paper, - p ^H meter & - Universal indicator methods. 6.4.2 Problem to ascertain p ^H and p ^{OH} . 6.5 p ^H metry titration 6.6 Potentiometry titration. 6.7 Various aspects of conductometric titration 6.8 Kohlrausch Law of independent Migration of ions.
Unit– VII PREPARATION OF STANDARD SOLUTION	7.1 Define the terms: Solute, Solvent and Solution. 7.2 Explain different methods of expressing concentration with examples. 7.3 List the types of chemicals & its uses. 7.4 Describe about primary & secondary standard solutions. 7.5 Describe the	7.1 Different methods of expressing concentration. i) Weight/Weight method (W/W) ii) Weight/Volume method (W/V) 7.1.1 Types of WW methods -Molality (M), -Mole fraction (X), -Parts per million (PPM) 7.1.2 Different types of W/V Methods. i) gms/liter ii) Normality (N) iii) Molarity (M) iv) Formality (F) v) P.P.M. / mg/liter 7.1.3 Problems on them. 7.2 Types of different standards i) Primary standards ii) Secondary standards 7.2.1 Conditions for primary standard 7.2.2 Procedure for preparing primary standard Solution.

Unit	Major Learning Outcomes	Topics and Sub-topics
	methods of preparation of standard solutions.	7.2.3 Primary standard for standardization of i) Acids ii) Bases iii) FeSO ₄ 7H ₂ O iv) KMnO ₄ & v) AgNO ₃ .
Unit– VIII INDUSTRIALLY IMPORTANT COMPOUNDS	8.1 Describe the manufacture and uses of important compounds	8.1 Caustic soda- Manufacture and uses 8.2 Ammonia- Manufacture and uses 8.3 Sulphuric Acid- Manufacture and uses 8.4 Potassium Dichromate- Manufacture and uses

7. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	PROPERTIES OF LIQUID	04	03	03	04	10
2.	CHEMICAL KINETICS	05	04	04	02	10
3.	CHEMICAL THERMODYNAMICS	08	04	05	04	14
4.	BASIC CONCEPTS OF CHEMICAL ANALYSIS	05	02	03	02	08
5.	SURFACE CHEMISTRY	06	03	03	04	10
6.	ELECTROMETRIC METHODS OF ANALYSIS	06	02	02	03	07
7.	PREPARATION OF STANDARD SOLUTION	04	01	02	02	05
8.	INDUSTRIALLY IMPORTANT COMPOUNDS	04	02	02	02	06
	Total	42	20	21	29	70

Legends:

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	Exercises/Practical/Experiments
1	All	about Course & Lab.
2	7	Acid-Base titration- Strong acid Vs Strong base using Phenolphthalein as an indicator. Prepare of standard solution.
3	7	Acid-Base titration- Strong acid Vs weak base using methyl orange as an indicator.
4	1	Determine viscosity by Oswald's Viscometer.
5	1	Determine f surface tension by Stalagmometer.
6	1	Determine Refractive Index Using Abbes Refractometer.
7	6	Find out pH value by: Universal indicator method pH paper pH meter
8	6	Determine the amount of HCl in the given solution by using NaOH solution by pH metrically
9	4,6,7	Redox titration
10	6&7	Titrate NaCl AgNO ₃ Potentiometrically and explain the nature of graph
11	6&7	Titrate HCl NaOH by conductometer and explain nature of graph
12	2&4	Determine the first order reaction.
13	2&4	Determine the second order reaction.
	Note:	Minimum Ten Experiments should be performed by the students from the above given list.OR any Other experiments related to above topics

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

Teacher guided self learning activities.

Course/topic based internet based assignments.

Library survey regarding Engineering Material used in different industries. Industrial Visits of one or Two Industries.

Quiz & Brain storming session related to Fuel properties & Utilization of fuel for different purposes.

Sampling & Testing of water collected from different places. These could be individual or group-based.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Title of Books	Author	Publication
1	Essentials of Physical chemistry	Bahl & Tuli	S. Chand & Co. New Delhi.
2	Principals of Physical chemistry	Puri, Sharma & Pathania	S.N. Chand & Co. Jalandhar
3	Basic Concepts of Analytical Chemistry	S. M. Khopkar	New Age Publication, New Delhi
4	Physical Chemistry	N. B. Singh, Shiva Saran Das & A. K. Singh	New Age Publication, New Delhi
5	Analytical Chemistry Problems & Solution	S. M. Khopkar	New Age Publication, New Delhi
6	Vogel's textbook of quantitative Chemical analysis (including instrumental methods)	Jeffery G.H	E.L.B.S. With Longman
7	Textbook of Physical Chemistry	Glasston & Samuel	Macmillan New Delhi

B. List of Major Equipment/ Instrument

ph- Meter

Ostwald's Viscometer

Potentiometer

Conductometer

Stalagmometer

Glass wares

8. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Polytechnic Faculty Members

Prof. J. C. Patel, I/C.Head, Dept. of Science & Humanities, Dr. S.& S.S. Ghandhy
College of Engineering, Surat

Prof. Dr. P. R. Patel, Head, Dept. of Science & Humanities, N.G. Patel Polytechnic, Bardoli

Prof. S. A. Nimakwala, I/C Head, Dept. of Science & Humanities, Shri. K.J. Polytechnic, Bharuch.

Prof. R. R. Patel, I/C Head, Dept. of Science & Humanities, G.P. Himmatnagar

NITTTR Bhopal Co-ordinator

Dr. Anju Rawlley Professor, Dept of Applied Science, NITTTR, Bhopal

**Course Title: Chemical Engineering Drawing
(Code: 3310502)**

Diploma Programmes in which this course is offered	Semester in which offered
Chemical Engineering	First Semester

6. RATIONALE

Engineering technicians irrespective of their field of operation in an industry is expected to possess a thorough understanding of engineering drawing, which includes clear spatial visualization of objects and the proficiency in identifying various equipment and devices from their symbols on control panel, to read and interpret process flow diagram & instrumentation diagram. Besides this they are also expected to possess a certain degree of drafting skill- depending upon their job functions-in day-to-day activities. This course of Chemical Engineering Drawing is aimed at developing deeper understanding of construction and working of some of the important chemical engineering equipment and valves.

7. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- i. **Prepare and interpret symbols, sketches, & drawings of various equipment, valves, devices and flow diagrams for chemical engineering applications**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	100
0	0	4	4	0	0	40	60	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit; ESE - End Semester Examination; PA - Progressive Assessment

4 DETAILED COURSE CONTENTS

Not applicable as only practical

5 SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Not Applicable

3. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	EXERCISES/PRACTICAL
1		Draw symbols of various equipment and devices for heat exchange, mass transfer and mechanical operations for example crusher, filter press, rotary filter, conveyors, screen, distillation and absorption columns, scrubbers, dryers, condenser, heat exchanger, jacketed vessel, cyclone, ESP, pump etc. in sketch book.
2		Draw symbols of various controllers such as pressure, temperature, flow & level in sketch book.
3		Draw various types of valves such as Globe valve, Gate valve, Diaphragm valve and non-return valves in a sheet.
4		Draw sketches of different pumps such as Centrifugal, reciprocating and rotary pumps- Gear, Lobe and Vane type in a sheet.
5		Draw sketches of different size reduction equipments such as Jaw crusher, Gyratory crusher, Roll crusher, Ball mill in sketch book.
5.		Draw Jacketed reactor with agitator.
6.		Draw 1-1 Shell & Tube Heat exchanger.
7.		Draw complete distillation tower assembly (Packed tower & Tray tower).
8.		Draw process flow diagram of a continuous manufacturing process.
10		Draw a simple process & instrumentation diagram of manufacturing processes / Unit operation

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

To be decided by the concerned teacher..

6. SUGGESTED LEARNING**RESOURCES A. List of Books**

S.No.	Author	Title of Books	Publication
1	W.L. McCabe, J.C. Smith	Unit Operations of Chemical Engineering	McGraw Hill
2	M. Gopala Rao, Marshall Sittig	Outline of Chemical Technology	Affiliated East West Press

B. List of Major Equipment/ Instrument

Models or working equipments like crusher, filter press, rotary filter, conveyors, screen, distillation and absorption columns, scrubbers, dryers, condenser, heat exchanger, jacketed vessel, cyclone, ESP, pump, Globe valve, Gate valve, Diaphragm valve and non-return valves to study construction and working.

C. List of Software/Learning Websites

www.fotosearch.com/photos-images/chemical-plant.html

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Polytechnic Faculty Members

Shri N. N. Hansalia, Lecturer in chemical engineering, G. P. Rajkot **Shri**

D. H. Joshi, Lecturer in chemical engineering, G. P. Gandhinagar **Shri P.**

M. Gadhiya, Lecturer in chemical engineering, G. P. Rajkot

NITTTR Bhopal Co-ordinator and Faculty Member

Dr. K.K. Jain, Professor & Head, Dept. of Mechanical Engg, NITTTR, Bhopal

Dr. Anju Rawlley, Professor, Dept. of Applied Science, NITTTR, Bhopal
