

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

BRANCH CODE:05 DIPLOMA PROGRAMME IN CHEMICAL ENGINEERING										
SEMESTER - II										
COURSE CODE	COURSE TITLE	TEACHING			CREDITS (L+T+P)	EXAMINATION SCHEME				GRAND TOTAL
		L	T	P		THEORY		PRACTICAL		
						ESE	PA	ESE	PA	
1990001	CONTRIBUTOR PERSONALITY DEVELOPMENT	4	0	0	4	70	30	20	30	150
3320002	ADVANCED MATHEMATICS(GROUP-1)	2	2	0	4	70	30	0	0	100
3300003	ENVIRONMENT CONSERVATION & HAZARD MANAGEMENT	4	0	0	4	70	30	0	0	100
3300004	ENGINEERING PHYSICS (GROUP-1)	3	0	2	5	70	30	20	30	150
3300007	BASIC ENGINEERING DRAWING	2	0	4	6	70	30	40	60	200
3320501	ORGANIC CHEMISTRY	4	0	2	6	70	30	20	30	150
		19	2	8						
TOTAL					29	420	180	100	150	850

ESE : END SEMESTER EXAM
PA: PROGRESSIVE ASSESSMENT
L: LECTURE
T: TUTORIAL
P: PRACTICAL

ESE for Practical includes Viva/Practical exam/Performance etc.
PA for Practicals includes TW/Report writing/Seminar etc. related to practices
PA for Theory includes Written Exam /Assignment/Quiz/Presentation or Combination of all with prior intimation to the students at beginning of term

Course Title: Organic Chemistry
(Code: 3320501)

Diploma Programmes in which this course is offered	Semester in which offered
Chemical Engineering, Textile Processing Technology	Second Semester

1. RATIONALE

Organic Chemistry is the foundation for Chemical Engineering, Textile Processing, Textile Manu., Plastic Engineering courses.

This course provides the basic knowledge of organic compounds and their chemical behavior. This course gives clarity to the students regarding the knowledge of aromatic, aliphatic and heterocyclic compounds & several inorganic salts with their structural formulas in detail. This course is designed in way that it may be useful in chemical industries as well as in textile field. Moreover it will be useful for the study of chemistry of dye stuff & intermediates, drugs & pharmaceutical, polymer science, plastic technology & the study of explosives materials it is an essential subject.

Thus good foundation in Basic Organic Chemistry will help the students in performing in a better way in their engineering field.

2. COMPETENCIES

The course content should be taught and implemented with the aim to develop different

types of skills so that students are able to acquire the following competencies:

- i. **Select proper organic compounds required for different application in their field of engineering.**
- ii. **Use selected organic compounds in different engineering processes appropriately.**

3. 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
4	0	2	06	70	30	20	30	

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

Note: It is the responsibility of the institute heads that marks for **PA of theory & ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I CONCEPT OF ORGANIC CHEMISTRY:	1a. Classify the Organic compound 1b. Classify the functional group 1c. Explain nomenclature of organic compound 1d. Comprehend the concept of isomerism	1.1 Introduction 1.2 Classification of Hydrocarbons 1.4 Functional group classification of organic compound 1.5 IUPAC system of nomenclature. 1.6 Isomerism. 1.6.1 Structural Isomerism - Position Isomerism - Chain Isomerism - Mesomerism Isomerism - Functional Isomerism 1.6.2 Stereo Isomerism. - Optical isomerism - Geometrical Isomerism
Unit– II PURIFICATION OF ORGANIC COMPOUNDS	2a. Describe various methods of purification 2b. Explain purification of organic compound	2.1 Crystallization 2.2 Sublimation 2.3 Distillation 2.3.1 Simple distillation 2.3.2 Fractional distillation 2.3.3 Distillation under reduced pressure 2.3.4 Steam distillation 2.4 Tests of purification- M.P. & B.P. of organic compounds.

Unit– III DETECTION & ESTIMATION OF ELEMENTS	3a. Use different methods for detection and testing of elements 3b. Estimate the elements by different methods	3.1 Detection of C, H, N, halogens, S & P. 3.1.1 Lassaigne's Test for detection of N, Cl, B I & S. 3.2 Estimation of C & H. 3.3 Estimation of Nitrogen by Duma's method. 3.4 Estimation of Nitrogen by Kjeldahl's method. 3.5 Estimation of halogens, sulphur and Phosphorous by Cariu's Method. 3.6 Problems based on methods of estimation.
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Unit	Major Learning Outcomes	Topics and Sub-topics
Unit– IV STUDY OF ALIPHATIC COMPOUNDS	4a. Differentiate aliphatic and aromatic compound 4b. Describe different methods of preparation and Uses of aliphatic compound	4.1 Preparation, Properties & Uses of following Compounds. 4.1.1 Alcohol, Aldehyde & Ketone (Methanol, Ethanol ,Acetaldehyde & Acetone.) 4.1.2 Carboxylic Acid (Acetic Acid & Oxalic Acid.) 4.1.3 Esters and ether (,Methy & Ethyl Acetate & Diethyl ethe 4.1.4 Amines (Methylamine, Ethyl Amine).
Unit– V STUDY OF AROMATIC COMPOUNDS	5a. Explain the specific properties of aromatic compound 5b. Describe different methods of preparation and Uses of aromatic compound	5.0 Preparation, Properties & Uses of following Compounds. 5.1 Benzene & Toluene 5.2 Nitrobenzene & Aniline. 5.3 Phenol & Benzaldehyde 5.4 Benzoic Acid & Salicylic Acid. 5.5 Styrene. & Naphthalene
Unit– VI BRIEF STUDY OF VARIOUS UNIT PROCESSES	6a. Identify the different unit process 6b. Define various unit processes 6c. Enlist suitable reagents for each unit process	6.1 Study of the following unit processes: 6.1.1 Sulphonation 6.1.2 Nitration 6.1.3 Halogenation 6.1.4 Diazotization 6.2 Reagents used for above unit processes.
Unit– VII CARBOHYDRATES, SOAPS & DETERGENT	7a. Classify carbohydrates 7b. Classify soaps and detergent 7c. Describe mechanism of cleansing action	7.1 Introduction: Carbohydrates and its classification with suitable Examples 7.2 Explain soaps and Detergent 7.3 Classification of soaps and detergent with suitable example of each class 7.4 Mechanism of cleansing action

Unit– VIII CHEMISTRY OF DYES & ITS CLASSIFICATION	8a. Explain difference between dyes & color	8.1 Define Dye.
	8b. Classify dyes in different ways	8.2 Difference between Dye & Colour. 8.3 Explain- Chromogens, Chromophore & Auxoc 8.4 Classification of Dyes base on Structure. 8.5 Classification of Dyes based on method of application.

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

Unit No	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Concept Of Organic Chemistry:	06	2	2	3	07
II	Purification Of Organic Compounds:	06	2	2	3	07
III	Detection And Estimation Of Elements :	07	3	3	4	10
IV	Study Of Aliphatic Compounds:	10	3	3	4	10
V	Study Of Aromatic Compounds:	10	4	4	4	12
VI	Brief Study Of Various Unit Processes:	07	3	3	4	10
VII	Carbohydrates, Soaps And Detergents	06	2	2	3	07
VIII	Chemistry Of Dyes & Its Classification	04	2	2	3	07
	Total	56	21	21	28	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF EXERCICES/PRACTICALS

The practical/experiments should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire above mentioned competencies:

Sr. No.	Unit No.	Practical Exercise	Approx Hours Required
1	All	Physically Observing of Organic Acid, Base, Phenol & Neutral Compounds.(Their physical state, Structural formula & Solubility).	04
2	II	Purification of a given organic compound by crystallization.	02
3	II	Purification of a given organic compound by Solvent Treatment method.	02
4	II,IV & V	Detection of Melting point of some Organic Solids by Thiele's Method.	04
5	II,IV & V	Detection of Boiling point of some Organic liquids by Semi micro method.	04
6	II,IV & V	Separation of some Organic Compounds (Acid + Phenol + Base) using solvent treatment method.	04
7	V, VI & VIII	Preparation of some compounds such as i) Nitrobenzene from Benzene	04
8	II , V& VI	Purification of some organic compounds by Sublimation method.	02
9	II	Detection of some Elements by Lassaigne's test.	02
10	IV & V	Practical are to be performed based on the organic spotting of the following compounds. Organic Qualitative Analysis i) Acetic Acid & Benzoic Acid (ii) Aniline & Nitrobenzene iii) Benzene & Acetone (iv) Chloroform & Phenol	04
		Total	32

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

Library Survey regarding Molecular & Structural formulas of Different Organic Compounds.

Group Discussion Regarding Purification of Several Organic Compounds.

Challenging task related to purification of organic Compounds given by faculty.

Oral presentation related to different unit processes.

Library Survey regarding Qualitative Analysis of different Compounds. Study of Industries involved in the mfg. of some important Compounds.

8. SUGGESTED LEARNING

RESOURCES A. List of Books

Sr.No.	Title of Books	Author	Publication
1	A Textbook of organic chemistry	B.S. Bahl & Arun Bahl	S. Chand & Co., New Delhi.
2	A Textbook of organic chemistry	P.L.Soni	S. Chand & Co., New Delhi.
3	A Textbook of organic chemistry	O.P. Agrawal	Krishna Prakashan
4	A Textbook of organic chemistry	Bahl & Tuli	S. Chand & Co., New Delhi.
5	A Manual of Practical Engineering Chemistry	Sudha Jain & Shradha Sinha	S. Chand & Co., New Delhi.
6	Organic Chemistry	I.L. Finar	ELBS
7	Organic Chemistry	Robert Morrison & Boyd	Prentice Hall of India, New Delhi.

B. List of Major Equipment/ Instrument

Glass wares

Melting Point apparatus.

Gas line & burners.

Distillation Assembly.

Chemicals & Reagents.

Water / Sand Bath.

Evaporating Dishes etc.

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.

Coordinator and Faculty Member From NITTTR Bhopal

Dr. Bashirulla Shaik, Assistant Professor, Dept. of Applied Sciences **Dr. Abhilash Thakur**, Associate Professor, Dept. of Applied Sciences

**Course Title: Advance Mathematics (Group-1)
(Code: 3320002)**

Diploma Programmes in which this course is offered	Semester in which offered
Biomedical Engineering, Chemical Engineering, Electrical Engineering, Computer Engineering, Electronics & Communication Engineering, Information Technology, Power Electronics	Second Semester

3. RATIONALE

The course is classified under Advance Mathematics and students are intended to understand the advance concepts and principles of Mathematics such as calculus, complex numbers and differential equations. This knowledge is required to understand and solve engineering problems.

2. COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of mathematical skills so that students are able to acquire following competencies:

Use proper Mathematical tool to understand engineering principles and concepts.

Apply concepts of calculus or suitable mathematical tool to solve given engineering problems.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)	Total Credits (L+T+P)	Examination Scheme		
		Theory Marks	Practical Marks	Total 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.

Note: It is the responsibility of the institute heads that marks for **PA of theory & ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Complex Number	1a. Simplify Complex expressions 1b. Find Modulus and Amplitude of given expressions 1c. Use De Moivre's Theorem to simplify mathematical expressions and to find roots	Concept, Modules and Amplitude form, Root of Complex Number, De Moivre's Theorem. Apply concept of complex numbers in simple engineering problems.
Unit– II Function & Limit	2a . Solve the problems using functions 2b . Solve the problem of function using the concept of Limit	2.1 Function Concept and Examples 2.2 Limit Concept of Limit, Standard Formulae and related Examples.
Unit– III Differentiation & it's Applications	3a. Differentiate the various function 3b. Apply the differentiation to Velocity, Acceleration and Maxima & Minima	3.1 Differentiation: Definition, Rules of, Sum, Product, Quotient of Functions, Chain Rule, Derivative of Implicit functions and Parametric functions, Logarithmic Differentiation. Successive Differentiation up to second order 3.2 Application: Velocity, Acceleration, Maxima & Minima.(simple problems)
Unit– IV Integration & its application	4a . Integrate the various function 4b . Apply the Integration for finding Area and Volume	4.1 Integration: Concept, Integral of Standard Functions, Working Rules of Integration, Integration by Parts, Integration by Substitution Method, Definite Integral and its properties. 4.2 Application: Area and Volume.(simple problems)
Unit-V Differential Equations(First Order First Degree)	1a. Find the Order and Degree of a Differential Equation. 1b. Form a Differential Equation for simple Engineering problems 1c. Solve Differential Equations using Variable Separable, Homogeneous and Integrating Factor methods.	5.1 Definition, Order and Degree of Differential Equation 5.2 Formation of DE 5.3 Solution of DE of First Degree and First Order by Variable Separable, Homogeneous and Integrating Factor methods.

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Complex Number	3	2	5	3	10

II	Function & Limit	4	3	5	4	12
III	Differentiation & its Application	8	4	8	6	18
IV	Integration & its Application	8	4	8	4	16
V	Differential Equations	5	2	8	4	14
Total		28	15	34	21	70

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICALS

The exercises should be properly designed and implemented with an attempt to develop different types of mathematical skills so that students are able to acquire above mentioned competencies.

S. No.	Unit No.	Practical Exercises
1	I	Complex Number, Practice Examples
2		Use software for further understanding of applications
3	II	Practice Examples of Function & Limit
4		Use of Various Method/Techniques
5	III	Differentiation and Related Examples
6		Solve problems related to various methods/techniques of differentiations
7		Identify the Engineering Applications from respective branches and solve the problems
8	IV	Integration & Related Examples.
9		Solve problems Related to Various Methods/Techniques of integration
10		Identify the Engineering Applications from respective branches and solve the problems
11	V	Identify the corresponding Engineering Applications for differential equations from respective branches and solve the problems.

Note: The above Tutor sessions are for guideline only. The remaining Tutorial hours are may be used by teachers appropriately for revision and practice.

SUGGESTED LIST OF 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. Some of these activities may be as below:

1. Applications to solve identified Engineering problems and use of Internet.
2. Learn graphical softwares:EXCEL,DPLOT,GRAPH etc.
3. Learn MathCAD to use Mathematical Tools and solve the problems of Calculus.
4. Learn MATLAB and use it 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,2012

2	Pandya N R	Advanced Mathematics for Polytechnic	Macmillan Publishers India Ltd.,2012
3	Deshpande S P	Polytechnic Mathematics	Pune Vidyarthi Gruh Prakashan,1984
4	Prakash D S	Polytechnic Mathematics	S Chand,1985

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. D Plot
3. Graph
4. MathCAD
5. MATLAB

You may use other Software like Mathematical and other Graph

Plotting software. Use websites such as 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.

Prof. (Smt) R L Wadhwa, Lect Govt Polytechnic,Ahmedabad **Prof. H C Suthar**,
BPTI,Bhavnagar

Prof. P N Joshi, Govt Polytechnic,Rajkot

Coordinator and Faculty Member From NITTTR Bhopal

Dr. P. K. Purohit, Associate Professor, Dept. of Science. **Dr. Deepak Singh**,
Associate Professor, Dept. of Science.

Course Title: Environment Conservation & Hazard Management
(Code: 3300003)

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

4. RATIONALE

For a country to progress, sustainable development is one of the key factors. Environment conservation and hazard management is of much importance to every citizen of India. The country has suffered a lot due to various natural disasters. Considerable amount of energy is being wasted. Energy saved is energy produced. Environmental pollution is on the rise due to rampant industrial mismanagement and indiscipline. Renewable energy is one of the answers to the energy crisis and also to reduce environmental pollution. Therefore this course has been designed to develop a general awareness of these and related issues so that the every student will start acting as a responsible citizen to make the country and the world a better place to live in.

3 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.

Take care of issues related to environment conservation and disaster management while working as diploma engineer.

5. 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
4	0	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.

DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Ecology and environment	1.1 Enhance knowledge about engineering aspects of Environment 1.2 Correlate the facts of ecology and environment A 1.3 assess the effect of pollution 1.4 List the causes of environmental pollution 1.5 State the major causes of air, water and noise pollution 1.6 Describe how industrial waste contaminates the land 1.7 Describe the effects of radiation on vegetables, animals	1.1 Importance of environment and scope 1.2 Engineering and environment issues 1.3 The natural system, Biotic and a-Biotic components and processes of natural system 1.4 Eco system, food chain and webs and other biological Systems, 1.5 Causes of environmental pollution 1.6 Pollution due to solid waste 1.7 water pollution, air pollution, the Noise as pollution, 1.8 Pollution of land due to industrial and chemical waste 1.9 Radiation and its effects on vegetables and animals
Unit– II Sustainable Development	2.1 Explain the concept of sustainable development 2.2 Justify the need for renewable energy 2.3 Describe the growth of renewable energy in India 2.4 Explain the concepts of waste management and methods of recycling	2.1 Concept of sustainable development, 2.2 Natural resources, a-biotic and biotic resources 2.3 Principles of conservation of energy and management 2.4 Need of Renewable energy 2.5 Growth of renewable energy in India and the world 2.6 Concept of waste management and recycling
Unit – III Wind Power	3.1 Describe the growth of wind power in India 3.2 State the differences between VAWTs and HAWTs 3.3 Explain the differences between drag and lift type wind turbines 3.4 Describe the working of large wind turbines 3.5 List the types of aerodynamic control of large wind turbines 3.6 Name the generators used in large wind turbines	3.1 Growth of wind power in India 3.2 Types of wind turbines – Vertical axis wind turbines (VAWT) and horizontal axis wind turbines (HAWT) 3.3 Types of HAWTs – drag and lift types 3.4 Working of large wind turbines 3.5 Aerodynamic control of large and small wind turbines 3.6 Types of electrical generators used in small and large wind turbines
Unit – IV Solar Power	4.1 Describe the salient features of solar thermal and PV systems 4.2 Describe a solar cooker and solar water heater 4.3 Describe the working of solar PV system 4.4 State the salient features of polycrystalline, monocrystalline and thin film PV systems	4.1 Features of solar thermal and PV systems 4.2 Types of solar cookers and solar water heaters 4.3 Solar PV systems and its components and their working 4.4 Types of solar PV cells 4.5 Solar PV and solar water heaters, rating and costing
Unit – V Biomass energy	5.1 State the different types of biomass energy sources 5.2 Describe about the energy content in biomass 5.3 Describe the working of simple biogas plant	5.1 Types of Biomass Energy Sources 5.2 Energy content in biomass of different types 5.3 Types of Biomass conversion processes 5.4 Biogas production

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – VI Seismic Engineering and disaster management	6.1 Explain the principles of seismic Engineering in design of structure 6.2 State the appropriate actions to be taken during disasters	6.1 Introduction of seismic engineering and its application civil engineering designs 6.2 Features of disasters such as Floods, Earthquakes, Fires, Epidemics, Gas/radioactive leaks etc. 6.3 Management and mitigation of above disasters

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 Marks
1.	Ecology and Environment	8	4	4	0	8
2.	Sustainable Development	10	4	5	1	10
3.	Wind Power	10	4	6	4	14
4.	Solar Power	10	4	6	4	14
5.	Biomass energy	8	4	4	2	10
6.	Seismic Engineering and disaster	10	6	6	2	14
	Total	56	26	31	13	70

Legends:

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

9. SUGGESTED LIST OF EXPERIMENTS/PRACTICAL EXERCISES

Nil

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Prepare paper on various sustainable development
- ii. Make a report after gathering information the values of water, noise pollution and air pollution in your city/town and compare the values in other cities and towns in India with respect to environmentally acceptable levels
- iii. Prepare a paper on air and water pollution in an industry/institute
- iv. Undertake some small mini projects in any one of the renewable energies
- v. Visit an energy park and submit project on various sources of energy
- vi. Prepare powerpoint on clean and green technologies
- vii. Prepare a list of do's and don'ts applicable during disasters
- viii. Submit a report on garbage disposal system in your city/town .

Course Title: Engineering Physics (Group-1)
(Code: 3300004)

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

5. RATIONALE

As Physics is the mother of all engineering disciplines, students must have some basic knowledge on physics to understand their core engineering subjects more comfortably. Accordingly, in reviewing the syllabus, emphasis has been given on the principles, laws, working formulae and basic ideas of physics to help them study the core subjects. Complicated derivations have been avoided because applications of the laws and principles of physics are more important for engineering students.

As Physics is considered as basic science its principles, laws, hypothesis, concepts, ideas are playing important role in reinforcing the knowledge of technology. Deep thought is given while selecting topics in physics. They are different for various branches of engineering. This will provide sound background for self-development in future to cope up with new innovations. Topics are relevant to particular program and students will be motivated to learn and can enjoy the course of Physics as if it is one of the subjects of their own stream.

Engineering, being the science of measurement and design, has been offspring of Physics that plays the primary role in all professional disciplines of engineering. The different streams of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear physics, Energy Studies, Materials Science, etc provide Fundamental Facts, Principles, Laws, and Proper Sequence of Events to streamline Engineering knowledge.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

Laboratory experiments have been set up keeping consistency with the theory so that the students can understand the applications of the laws and principles of physics.

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 competencies.....

Apply principles and concepts of Physics for solving various Engineering Problems

6. TEACHING AND EXAMINATION SCHEME

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

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	1.1 Explain Physical Quantities and their units. 1.2 Measure given dimensions by using appropriate instruments accurately. 1.3 Calculate error in the measurement 1.4 Solve numerical based on above outcomes	<u>SI Units & Measurements</u> 1.1 Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units 1.2 Least count and range of instrument, least count of vernier caliper, micrometer screw gauge 1.3 Definition of accuracy, precision and error, estimation of errors -absolute error, relative error and percentage error, rules and identification of significant figures. (Numerical on above topics)
Unit– II	2.1 List Newton’s laws of motion 2.2 Differentiate among various forces in nature 2.3 Define inertia, momentum and impulse of force 2.4 State Newton’s laws of motion 2.5 State law of conservation of momentum 2.6 Solve numerical problems based on above topics	<u>Force and Motion:</u> Recapitulation of equations of motion, Newton’s 1st law of motion, Force, basic forces in motion, gravitational force, electrostatic force, electromagnetic force, nuclear force, Inertia, types of inertia (inertia of rest, inertia of motion, inertia of direction), Momentum, Newton’s 2nd law of motion, measurement of force using second law, simple problems on $F = ma$ and equations of motion, Impulse of force, Impulse as the product of force and time, impulse as the difference of momentum, examples of impulse, simple problems on impulse, Newton’s 3rd law of motion and its examples. Law of conservation of momentum, Statement, simple problems (Numerical on above topics)
Unit– III	3.1 Comprehend the concept of elasticity and Define Stress, Strain and Elastic limit.	<u>General properties of matter</u> 3.1 Elasticity Deforming force, restoring force, elastic and plastic

Unit	Major Learning Outcomes	Topics and Sub-topics
	3.2 State Hooke's law. 3.3 Explain the term elastic fatigue. 3.4 Distinguish between Streamline and Turbulent flow 3.5 Define coefficient of viscosity. 3.6 Apply the principle of viscosity in solving problems. 3.7 State significance of Reynold's number 3.8 Explain terminal velocity. 3.9 Mention Stoke's formula. 3.10 Explain the effect of temperature on viscosity 3.11 Comprehend the phenomenon of surface tension and its applications. 3.12 Define surface tension. 3.13 Explain angle of contact and capillarity. 3.14 Solve problems related to surface tension.	body, stress and strain with their types. elastic limit, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity and relation between them (no derivation), stress strain diagram. behavior of wire under continuously increasing load, yield point, ultimate stress, breaking stress, factor of safety. 3.2 Surface Tension. Molecular force, cohesive and adhesive force, Molecular range, sphere of influence, Laplace's molecular theory, Definition of surface tension and its S.I. unit, angle of contact, capillary action with examples, shape of meniscus for water and mercury, relation between surface tension, capillary rise and radius of capillary (no derivation), effect of impurity and temperature on surface tension 3.3 Viscosity Fluid friction, viscous force, Definition of viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its S.I. unit, streamline and turbulent flow with examples, critical velocity, Reynolds's number and its significance, free fall of spherical body through viscous medium (no derivation), up thrust force, terminal velocity, Stokes law (statement and formula). (Numericals on Above topics)
Unit– IV	4.1 Distinguish between Heat and Temperature. 4.2 Explain modes of Transmission of heat and their applications. 4.3 Define heat capacity and specific heat of substances. 4.4 Explain temperature 4.5 List various temperature scales and convert among temperatures	Heat Transfer 4.1 Three modes of transmission of heat -conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity and its S.I. unit. 4.2 Heat capacity and specific heat of materials 4.3 Celsius, Fahrenheit and Kelvin temperature scales and their conversion formulae (Numericals on above topics)
Unit– V	5.1 Comprehend the concept of wave motion 5.2 Distinguish between transverse and longitudinal waves. 5.3 Define period, frequency, amplitude and wavelength 5.4 Explain principle of superposition of waves 5.5 Define resonance 5.6 Explain resonance. 5.7 State Formula for velocity of sound in air 5.8 Comprehend the Importance of Reverberation 5.9 State Sabine's formula and Factors affecting Reverberation time 5.10 Explain ultrasonic waves. Mention applications of	Waves and Sound Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength, longitudinal and transverse wave, principle of superposition of waves, definition of resonance with examples, Formula for velocity of sound in air and various factors affecting it Ultrasonic Waves Definition, Properties of ultrasonic waves Uses of ultrasonic waves. Acoustics Of Building Importance of Reverberation, Reverberation time, Optimum time of Reverberation, Coefficient of absorption of Sound, Sabine's formula for Reverberation time, Factors affecting Reverberation time and acoustics of building. (Numericals on above topics)

Unit	Major Learning Outcomes	Topics and Sub-topics
	ultrasonic waves	
Unit– VI	6.1 State Properties Of Light 6.2 Define various phenomena of light 6.3 State Snell's law of refraction. 6.4 Explain importance and list applications of nanotechnology in engineering field	<u>Light and Nanotechnology</u> Properties Of Light, Electromagnetic spectrum, Reflection, refraction, snell's law, diffraction, polarization, interference of light, constructive and destructive interference (Only definitions), physical significance of refractive index, dispersion of light Introduction to Nanotechnology (Numericals on above topics)
Unit – VII	7.1 Define radio activity 7.2 Distinguish between Natural & Artificial radioactivity 7.3 State relation between Half Life, Average Life & Decay Constant. 7.4 Describe properties of Alpha, Beta and Gamma rays.	<u>Radioactivity</u> 7.1 Radioactivity Definition, Natural & Artificial radioactivity, Units and Laws of Radioactivity, Half Life, Average Life & Decay Constant. 7.2 Radioactive Rays Properties and uses of alpha particles, beta particles and gamma rays (Numericals on Above topics)

8. 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.	SI Units & Measurements	05	03	02	05	10
2.	Force and Motion	05	02	02	04	08
3.	General Properties of Matter	10	04	06	08	18
4.	Heat Transfer	04	02	02	02	06
5.	Waves and sound	07	04	04	04	12
6.	Light and Nanotechnology	07	03	03	04	10
7.	Radioactivity	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)

Course Title: Basics Engineering Drawing
(Code: 3300007)

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

1 RATIONALE:

Engineering drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization. It is an attempt to develop fundamental understanding and application of engineering drawing. It covers knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian standards. The curriculum aims at developing the ability to draw and read various drawings, curves & projections.

The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas. Developing the sense of drawing sequence and use of drawing instruments effectively yields not only with productive preparation of computer aided graphics but also yields with effective industrial applications ranging from marking to performance of operations.

2 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:

6. Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments. .
7. Visualize the shape of simple object from orthographic views and vice versa.

5 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	
2	0	4	6	70	30	40	60	200

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	Sub-topics
Unit – 1 ENGINEERING DRAWING AIDS	1. 1 Use drawing equipments, instruments and materials effectively.	1.1 Drawing equipments, instruments and materials. (a) Equipments-types, specifications, method to use them, applications. (b) Instruments-types, specifications, methods to use them and applications. (c) Pencils-grades, applications, types of points and applications. (d) Other materials-types and applications.
Unit– 2 PLANNING, LAYOUT AND SCALLING OF DRAWING	2.1 Follow and apply standard practice as per bureau of I.S. for planning and layout 2.2 Choose appropriate scale factor for the drawing as per given situation	2.1 I.S. codes for planning and layout. 2.2 Scaling technique used in drawing.
Unit– 3 LINES, LETTERING AND DIMENSIONING	3.1 Write annotations on a drawing where ever necessary. 3.2 Choose appropriate line and dimensioning style for a given geometrical entity.	3.1 Different types of lines. 3.2 Vertical capital and lower case letters. 3.3 Inclined capital and lower case letters. 3.4 Numerals and Greek alphabets. 3.5 Dimensioning methods. (a) Aligned method. (b) Unilateral with chain, parallel, progressive and combined dimensioning.
Unit	Major Learning Outcomes	Sub-topics
Unit– 4 GEOMETRIC CONSTRUCTION	4.1 Develop the ability to draw polygons, circles and lines with different geometric conditions.	4.2 Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc. 4.3 Geometric construction related with angle like bisect an angle, trisect an angle, etc. 4.4 To construct polygon. a: Triangle b: Square / Rectangle. c: Pentagon with special method. d: Hexagon with special method. 4.5 To draw tangents. 4.6 Geometric construction related with circle & arc.

<p>Unit-5</p> <p>ENGINEERING CURVES</p>	<p>5.1 Able to draw engineering curves with proficiency and speed as per given dimensions.</p>	<p>5.2 Conic sections.</p> <p>(a) Concept and understanding of focus, directrix, vertex and eccentricity and drawing of conic sections.</p> <p>(b) Using various methods, understand construction of :</p> <p>i. Ellipse.</p> <p>ii. Parabola.</p> <p>iii. Hyperbola.</p> <p>5.3 Cycloidal Curves(Cycloid, Epicycloid, Hypocycloid)</p> <p>5.4 Involutés.</p> <p>(a) Involutés of a circle</p> <p>(b) Involutés of a polygon</p> <p>5.5 Spiral (Archimedean spiral only).</p>
<p>Unit- 6</p> <p>PROJECTION OF POINTS, LINES AND PLANES</p>	<p>6.1 Draw the projection of points, lines and planes with different conditions.</p> <p>6.2 Find out true shape and size of a inclined line or plane</p>	<p>6.1 Reference planes, orthographic projections.</p> <p>6.2 Concept of quadrant.</p> <p>6.3 1st angle and 3rd angle projection and their symbols.</p> <p>6.4 Projection of points.</p> <p>6.5 Projection of lines – determination of true length and inclinations for following cases.</p> <p>(a) Line parallel to one or both the plane.</p> <p>(b) Line perpendicular to one of the plane.</p> <p>(c) Line inclined to one plane and parallel to another.</p> <p>(d) Line inclined to both the planes.</p> <p>6.6 Projection of Planes.</p> <p>(a) Types of planes.</p> <p>(b) Projection of planes parallel to one of the reference planes.</p> <p>(c) Projection of plane inclined to one reference plane and perpendicular to another.</p> <p>(d) Projection of planes inclined to both reference planes.</p> <p>Note :</p> <p>Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.</p>
<p>Unit</p>	<p>Major Learning Outcomes</p>	<p>Sub-topics</p>
<p>Unit- 7</p> <p>ORTHOGRAPHIC PROJECTIONS</p>	<p>7. 1 Draw the orthographic views of object containing lines, circles and arc geometry.</p> <p>7.2 Interpret given orthographic views and to imagine the actual shape of the component.</p>	<p>7.1 Types of projections-orthographic, perspective, isometric and oblique: concept and applications.</p> <p>7.2 Various term associated with orthographic projections.</p> <p>(a) Theory of projection.</p> <p>(b) Methods of projection.</p> <p>(c) Orthographic projection.</p> <p>(d) Planes of projection.</p> <p>7.3 Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection.</p> <p>7.4 B.I.S. code of practice.</p>

		Note : (1) Problem should be restricted up to four views- Front view/Elevation, Top view/Plan and Side views only. (2) Use First Angle Method only.
Unit– 8 ISOMETRIC PROJECTIONS	8.1 Draw the isometric view from orthographic views of object/s containing lines, circles and arcs.	8.2 Isometric axis, lines and planes. 8.3 Isometric scales. 8.4 Isometric view and isometric drawing. 8.5 Difference between isometric projection and isometric drawing. 8.6 Illustrative problems limited to objects containing lines, circles and arcs shape only.

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Engineering drawing aids.	0	00	00	02	02
2.	Planning, layout and scaling of drawing.	0	02	00	03	05
3.	Lines, lettering and dimensioning.	0	00	02	00	02
4.	Geometric construction.	3	00	03	07	10
5.	Engineering curves.	6	02	00	10	12
6.	Projection of points, lines and planes.	8	03	00	14	17
7.	Orthographic projections.	6	00	00	12	12
8.	Isometric projections.	5	00	02	08	10
	Total	28	07	07	56	70

Legends:

R = Remembrance; U = Understanding; A = Application and above levels.

NOTES:

a: If midsem test is part of continuous evaluation, unit number 4, 5 and 6 (For Unit 6, except projections of planes) are to be considered.

b: Ask the questions from each topic as per weightage of marks. Choice of questions must be given from the same topic.

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.

Ex. No.	Unit No.	Practical Exercises	Hours
1	1,2,3	<p>USE OF DRAWING INSTRUMENTS:</p> <p>1. Teacher will demonstrate-</p> <p style="padding-left: 20px;">a: Use of drawing instruments.</p> <p style="padding-left: 20px;">b: Planning and layout as per IS.</p> <p style="padding-left: 20px;">c: Scaling technique.</p> <p>2. Draw following.</p> <p>Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter.</p> <p>Problem – 2 Types of lines.</p> <p>Problem – 3 Types of dimensioning.</p> <p>Problem – 4 Alphabets & numerical (Vertical & inclined as Per I.S.).</p>	14
2	4	<p>GEOMETRIC CONSTRUCTION:</p> <p>Drawing of set of lines with different conditions. (Two problems)</p> <p>Drawing Polygons. (Three Problems)</p> <p>Drawing circles and arcs with different geometric conditions and with line constraints. (Three problems)</p>	06
3	5	<p>ENGINEERING CURVES – I:</p> <p>Problem –1: Construction of ellipse using any two methods from arc of circle method, four centre method, rectangular method, eccentricity method and concentric circle method.</p> <p>Problem –2: Construction of parabola with any one method from rectangular method, tangent method and eccentricity method.</p> <p>Problem –3: Construction of hyperbola with any one method from eccentricity method and rectangular method.</p> <p>Problem –4: Construction of spiral. (Refer note c for dimensions).</p>	04
4	5	<p>ENGINEERING CURVES – II:</p> <p>Problem – 1: Construction of cycloid.</p> <p>Problem – 2: Construction of hypocycloid & epicycloids.</p> <p>Problem – 3: Construction of involute (circle).</p>	04
		<p>Problem – 4: Construction of involute (polygon). (Refer note c for dimensions).</p>	
5	6	<p>PROJECTIONS OF POINTS AND LINES:</p> <p>Draw projection of points-For 10 various conditions.(One problem)</p> <p>Draw projection of lines with different conditions. (Four problems)</p> <p>(Refer note c for dimensions).</p>	06

6	6	<p>PROJECTIONS OF PLANE: Draw projection of different planes with different conditions. (triangle, square / rectangular, pentagonal / hexagonal, and circular -one for each). (Four problems) (Refer note c for dimensions).</p>	04
7	7	<p>ORTHOGRAPHIC PROJECTIONS: Draw Orthographic projections of different objects. (Two problems) (Draw four views of each object). (Refer note c for dimensions).</p>	08
8	8	<p>ISOMETRIC DRAWINGS: Draw isometric drawings from given orthographic views (Three problems) (Refer note c for dimensions).</p>	10
9	All	<p>PROBLEM BASED LEARNING: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book.</p>	-
10	All	<p>SCHOOL WITHIN SCHOOL: Explain at least one problem for construction and method of drawing in sheet to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each batch student. Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.</p>	-

Notes :-

- a: **Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.**
 - b: Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.
 - c: The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.
 - d: The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students' activities are compulsory to be performed.
-

- e: A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.
- f: For 40 marks Practical Marks ESE, students are to be assessed for competencies achieved. Students are to be given data for practical ESE to prepare drawings.

9. LIST OF STUDENT ACTIVITIES:

Following is the list of student activities to be performed by each student individually:

Activity No.	Details of student activity
8.	Sketch the combinations of set squares to draw angles in step of 15° . (15° , 30° , 45° , 60° , 75° , 90° , 105° , 120° , 135° , 150° , 165° , 180°).
9.	Solve all problems for all sheets number 1 to 8 in sketch book (with dimensions). List the shapes you are observing around you in real life with place/item. (For ellipse, parabola and hyperbola).
3	
4	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
5	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
6	List at least two questions individually which you would like to ask for followings: a: Ellipse. b: Involute of circle. c: Perspective projections. d: Use of geometric constructions. e: Quadrants.

8. SUGGESTED LEARNING RESOURCES:

A. List of Books

Sr.No	Title of Books	Author	Publication
1	Elements of Engineering Drawing.	N.D. Bhatt	Charotar Publishing House, Anand.
2	Engineering Drawing.	P.J.Shah	S.Chand, New Delhi.
3	Fundamentals of Engineering Drawing.	W.J.Luzzadar	Prentice-hall of India Pvt. Ltd.-New Delhi
4	Fundamentals of Drawing.	K.R.Gopalkrishna	Subhash Publications, Bangalore.
5	Engineering Drawing	M.B.Shah, B.C.Rana	Pearsons.
6	Machine Drawing.	V. Laxminarayan & M.L.Mathur	Jain Brother, New Delhi.
7	Fundamentals of Engineering Drawing.	French & Vierck	McGraw-Hill

B. List of Major Equipments/ Instruments :

Models- full and cut.

Set of various industrial drawings being used by industries-up dated.

Drawing equipments and instruments for class room teaching- large size. Drawing board-half imperial size.

T-square or drafter (Drafting Machine).

C. List of Software/Learning Websites:

rgpv-ed.blogspot.com/2009/02/engineering-curves.html

<http://www.slideshare.net/sahilsahil992/conic-section-1819818>

<http://www.technologystudent.com/designpro/drawdex.htm>

http://www.engineeringdrawing.org/engg_curves/problem-3-8-engineering-curves/490/ <http://web.iitd.ac.in/~hirani/mel110-part3.pdf>

<http://www.studyvilla.com/ed.aspx>

http://www.youtube.com/watch?v=a703_xNeDao

http://www.youtube.com/watch?v=TCxTP_8ggNc

<http://www.youtube.com/watch?v=JpgFPZILTU8&feature=related>

<http://www.youtube.com/watch?v=o1YPja2wCYQ&feature=related>

<http://www.youtube.com/watch?v=dJyKV3Ay7vM&feature=fvwrel> E-learning package from KOROS.

E-learning package from Cognifront.

CD with book-Engineering drawing, M.B. Shah-B.S. Rana (Pearson). Computer based learning material published by KOROS.

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof.K. H. Patel.** Head Dept.of Mech., Engg., Dr. S. & S. Gandhi College of Engineering and Technology, Surat,
- **Shri.H. R. Sapramer,** Lecturer in Mech. Engineering, Dr. J.N.Mehta Government Polytechnic, Amreli.
- **Prof.A.M. Talsaniya,** Lecturer in Mech. Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.

Co-ordinator and Faculty Member from NITTTR Bhopal

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