

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Advance Mathematics (Group-2)
(Code: 3320003)

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering, Ceramic Engineering, Environment Engineering, Mechanical Engineering, Mining Engineering,	Second Semester

1. RATIONALE

The course is classified under Advance Mathematics and students are intended to understand the advance concepts and principles of Mathematics such as calculus, coordinate geometry and Statics. 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				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	ESE	PA	ESE	PA	
2	2	0	4	70	30	0	0	100

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 Co-ordinate Geometry	<p>1a. Find the distance between two points, use Mid-Point formula for quadrilateral</p> <p>1b. Find the equation of locus using Distance Formula</p> <p>1c. Find the equation of line using the different forms</p> <p>1d . Find the equation of circle</p> <p>1e. Find Tangent and Normal to the circle</p>	<p>1.1Point : Distance Formula, Mid-point, Locus of a point</p> <p>1.2Straight Line : Forms of Equation of St Lines : Slope Point Form, Two Point Form, Intercept Form, Parallel and Perpendicular lines</p> <p>1.3 Circle : Equation of Circle, Centre and radius form, Tangent and Normal and related problems.</p>
Unit– II Function & Limit	<p>2a . Solve the problem using functions</p> <p>2b . Solve the problem of function using the concept of Limit</p>	<p>2.1 Function Concept and Examples</p> <p>2.2 Limit Concept of Limit, Standard Formulae and related Examples.</p>
Unit– III Differentiation & its Applications	<p>3a. Differentiate the various function</p> <p>3b. Apply the differentiation to Velocity, Acceleration and Maxima & Minima</p>	<p>3.1Differentiation: 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</p> <p>3.2 Application: Velocity, Acceleration, Maxima & Minima.</p>
Unit– IV Integration & its application	<p>4a . Integrate the various function</p> <p>4b . Apply the Integration for finding Area and Volume</p>	<p>4.1 Integration: Concept, Integral of Standard Functions, Working Rules of Integration, Integration by Parts, Integration by Substitution Method, Definite Integral and its properties.</p> <p>4.2 Application: Area and Volume.</p>
Unit-V Statistics	<p>5a . Measure Central Tendency in given data</p> <p>5b. Measure Dispersion in given data</p>	<p>5.1 Measures of Central Tendency for Ungrouped and Grouped Data : Mean, Median and Mode</p> <p>5.2 Measure of Dispersion for Grouped and Ungrouped data : Standard deviation</p>

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
I	Co-ordinate Geometry	5	2	8	4	14
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	Statistics	3	2	5	3	10
Total		28	15	34	21	70

Legends: R = Remember; U= Understand; A= Application 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 (During tutorial hours)

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.	Exercises/Tutorial
1	I	Co-ordinate Geometry, Practice Examples
2	I	Solve engineering problems using coordinate geometry
3	II	Practice Examples of Function & Limit
4	II	Use of Various Method/Techniques.
5	III	Differentiation and Related Examples
6	III	Solve problems related to various methods/techniques of differentiations
7	III	Identify the Engineering Applications from respective branches and solve the problems
8	IV	Integration & Related Examples.
9	IV	Solve problems Related to Various Methods/Techniques of integration
10	IV	Identify the Engineering Applications from respective branches and solve the problems
11	V	Statistics, Practice Examples
12	V	Use Excel 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.

7. 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 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. DPlot
3. Graph
4. Math CAD
5. 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.
- **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 Applied Science
- **Dr. Deepak Singh**, , Associate Professor, Dept. of Applied Science

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Applied Mechanics
(Code: 3300008)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Metallurgy Engineering	First Semester
Civil Engineering, Environment Engineering, Fabrication Technology, Mechanical Engineering, Mechatronics Engineering, Mining Engineering, Transportation Engineering	Second Semester

1. RATIONALE

Applied mechanics, as its name suggests, bridges the gap between physical theory and its application to technology. As such, applied mechanics is used in many fields of engineering, especially mechanical and Metallurgy Engineering. In this context, it is commonly referred to as engineering mechanics. To impart basic knowledge of Engineering Mechanics where in Laws of Physics are applied to Solve Engineering problems, this programme / course will help the student to develop basic know how & awareness of the various laws of physics & it's real life applications in the various fields of engineering

2. LIST OF COMPETENCIES

The course content leading to the achievement of the following competencies;

- i. **Apply the concepts of force, work and energy to calculate work done, power required & efficiency for various simple machines**

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		
L	T	P	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 CONTENT

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Introduction	1.1 Define scope of Engineering Mechanics 1.2 Classify Scalar & Vector quantity 1.3 Differentiate the systems of Units	Scalar & Vector Quantities – like force , pressure , velocity , acceleration Static & Dynamic – Kinetics & Kinematics MKS , CGS & SI units and its conversion along with FPI and Metric System
Unit– II Coplanar Concurrent Forces	2.1 Understand Co - planer Concurrent Force system 2.2 Compute resultant & Equilibrium forces for given coplanar concurrent force system	Force – units , elements , Laws/Principles of forces such as Principle of Superposition ,Principle of transmissibility Composition & Resolution of Forces Resultant & Equilibrium forces conditions of equilibrium Analytical & graphical method for Law of Parallelogram , Law of Triangle , Lami's Theorems , Law of Polygon
Unit– III Coplanar Non-Concurrent Forces	3.1 Differentiate Co-planar , parallel and non - concurrent forces 3.2 Compute resultant & Equilibrium forces for given coplanar concurrent force system 3.3 Calculate Support reactions of the given simply supported beam	Principal of Moment Moment , Couple , , application , properties of couple , conditions of equilibrium types of supports , end conditions – Hinge , free end , roller ,fix , types of loads like point load , U.D.L , U.V.L , Couple , Analytical method to Evaluate reactions in statically determinate beam subjected to point load and/ or U.D.L by analytical method of solving Statically determinate beams to
Unit – IV Centroid & Centre of Gravity	4.1 Distinguish between Centroid and Centre of Gravity 4.2 Compute Centroid & centre of gravity in different shape and lamina	First moment of area ; to find Centroid –standard shapes of I , L , Channel & T sections , axis of symmetry First moment of mass ; to find C.G of standard solids sections , Axis of symmetry
Unit – V Friction	5.1 Appreciate Friction and its Engineering applications 5.2 Calculate coefficient of friction for different surfaces	Friction , Laws of Friction , Angle of Friction , Angle of Repose, types of friction Application of Lami's theory and theory of resolution of forces , examples on friction for a block resting on horizontal plane & on inclined plane
Unit – VI Work, Power & Energy	6.1 Establish relation between Work, Power Energy 6.2 Calculate IHP and BHP in different conditions	Work – work done , force displacement diagram , torque , work done by torque Power – I.H.P and B.H.P of engine ,Equation of H.P in terms of Torque and R.P.M , Engineering Problems Energy – Kinetic & Potential energy and Engineering Problems
Unit – VII Simple Machines	7.1 Apply the principle & application of Simple Machines 7.2 Compare reversible & irreversible Machines, evaluate the efficiencies of various simple machines	principles of machines to evaluate Mechanical Advantage , Velocity Ratio of simple machine pulley blocks , Draw Line sketch of different systems of Simple and compound levers ,Problems , Laws of Machines , reversible & non reversible machines

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 Marks
1.	Introduction	02	04	00	00	04
2.	Coplanar Concurrent Forces	10	02	02	06	12
3.	Coplanar Non-Concurrent Forces	10	02	02	08	12
4.	Centroid and Centre of Gravity	04	02	02	06	10
5.	Friction	06	02	04	06	12
6.	Work, Power & Energy	04	02	02	06	10
7.	Simple Machines	06	02	02	08	12
	Total	42	16	14	40	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.	Practical Exercise/Experiment
1	01	----
2	02	Verify and calculate resultant force through Law of Parallelogram, Polygon Law of Forces, Lami's Theorem
3	03	Verify reactions in beam through Graphical & analytical method
4	04	Calculate Centroid of lamina and Centroid of different sections
5	05	Calculate Coefficient of Sliding Friction for different surfaces – Wood, Glass
6	06	----
7	07	Work-out M.A & Efficiency of Simple purchase crab, simple wheel and axle, simple screw jack

7. SUGGESTED LIST OF STUDENT ACTIVITIES

7.1 Students will prepare File/journal for the above mentioned Experiments.

7.2 Students may be given few exercises to calculate resultant/equilibrium force of the force system graphically & analytically verify the results. -unit 2

7.3 Student may be asked to collect photographs from internet which is related to field application of various topics.

8. SUGGESTED LEARNING ACTIVITIES

A. List of Books

Sr. No.	Title of Book	Author	Publication
1.	Engineering Mechanics	R S Khurmi	S. Chand , New Delhi
2.	Engineering Mechanics	D S Kumar	S. K. Kataria & Sons,
3.	Engineering Mechanics 7 th edition	Bear & Jonstan	New media
4.	Applied Mechanics	H J Shah & Junarkar	CHAROTAR Publication

B. List of Major Equipment/ Instrument

- 7.4 Apparatus for Law of Parallelogram , Lami's theorem & law of Polygon
- 7.5 Apparatus for determination of coefficient of friction
- 7.6 Apparatus to determine CG of Lamina
- 7.7 Beam apparatus to find reactions
- 7.8 Simple purchase crab , simple wheel and axle , simple screw jack

C. List of Software/Learning Websites

Video Lectures on Applied Mechanics By Prof.SK. Gupta, Department of Applied Mechanics, IIT Delhi

www.tut.fi/.../InstituteofAppliedMechanicsandOptimization/TME-51

ocw.mit.edu > ... > Mechanics of Materials

www.me.ust.hk/.../ME106-applied%20mechanics-lecture%201.pdf

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B G RAJGOR** , HOD , Dept of Applied Mechanics, B & B Institute of Technology
- **Prof. J H GABRA** , I/C HOD , Dept of Applied Mechanics, G.P , Godhara

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. J.P.Tegar**, Professor Dept. of Civil and Environmental Engg, NITTTR, Bhopal.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**COURSE CURRICULUM**

Course Title: Applied Chemistry (Group-1)

(Code: 3300009)

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering, Ceramic Engineering, Environment Engineering, Mining Engineering, Transportation Engineering	Second Semester

1. 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.

Applied Chemistry forms the part of applied science and the study of basic concepts of chemistry like chemical bonding, corrosion, water treatment, and different engineering materials like polymers, paints, glasses, cement, Refractories etc. and awareness of pollution in chemical industries etc. will help the students in 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 these processes, 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.

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 following competencies:

- **Apply the basic concepts and principles of Chemistry in Engineering applications.**
- **Select the proper materials for given engineering applications.**

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
3	0	2	5	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 Chemical Bondings and Catalysis	1a. Explain various properties of material depending upon bond formation 1b. Describe the molecular structure of solid, liquid and gases 1c. Explain the crystal structure of metal and properties reflected by packing of atoms 1d. Explain the various types of catalysis and catalyst	Introduction 1.1 Theory Of Valence 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 & its characteristics 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	Major Learning Outcomes	Topics and Sub-topics
Unit- II Ionization And pH	2a. Describe the theory of ionization and factors affecting it. 2b. Describe the importance of pH & and Perform its industrial application	2.1 Introduction 2.2 Arrhenius theory of ionization. 2.3 Ionic Equilibrium of water 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.
Unit- III Metal corrosion and its control	3a. Describe the different types of corrosion 3b. List the different factors affecting rate of corrosion 3c. Describe the different protective measures to prevent the corrosion	3.1. Explanation 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, 3.7 Corrosion Control Modification of environment , Modification of the properties of metal , Use of protective coatings. Anodic and Cathodic protection, Modification in design and choice of material
Unit- IV Water Treatment	4a. Differentiate the hard and soft water 4b. Explain the types and degree of Hardness 4c. Describe the ill effect of hard water in boiler operation 4d. Explain the different methods for removal hardness in water 4e. Apply the water treatment for drinking water	4.1. Hard water and soft water. 4.2 Types of hardness of water 4.2.1 Salts producing hardness of water. 4.2.2 Method to express the hardness of water 4.3 Estimation of total hardness by EDTA Method 4.3.1 Examples to calculate the hardness 4.4 Effect of hard water in Boiler operation 4.4.1 Scale and sludge formation and it's Prevention 4.4.2 Priming and foaming and it's prevention. 4.4.3. Caustic embrittlement and it's prevention. 4.4.4 Corrosion and it's prevention. 4.5 Softening of Water 4.5.1 Soda-Lime process 4.5.2 Permutit process 4.5.3 Ion Exchange process 4.5.4 Reverse Osmosis process

Unit	Major Learning Outcomes	Topics and Sub-topics
		4.6 Treatment of Drinking water 4.6.1 Sedimentation 4.6.2 Coagulation 4.6.3 Filtration 4.6.4 Sterilization of water by chlorination 4.6.5 Break-point chlorination 4.7 Treatment of waste water
Unit- V Cements, Glasses & Refractories	5a. Describe the constituents of cements 5b. Explain setting and hardening chemistry of cement 5c. Describe variety of glass and their application	5.1 Cement, Constituting compound in cement 5.2 Composition of Portland cement 5.3 Manufacture of Portland cement 5.4 Setting and Hardening of cement 5.5 Glass and its general properties 5.6 Manufacture of glass 5.7 Variety of Glasses and their application 5.8 Definition & application of refractories. 5.9 Characteristics of refractories 5.10 Classification of refractories like 5.10.1 Acid refractories 5.10.2 Basic refractories 5.10.3 Neutral refractories
Unit- VI Paints, Varnishes & Insulators.	6a. Differentiate paints and varnishes 6b. Describe different Ingredients of paints and their function 6c. Differentiate between paints and varnishes 6d. Describe the properties and uses of insulating materials	6.1 Definition of paints and Varnishes 6.2 Purpose of oil paint 6.3 Characteristics of oil paints 6.4 Ingredients of paints 6.5 Function and Examples of each ingredients 6.6 Varnish and its types 6.7 Difference between paints and varnishes 6.8 Definition Of Insulators 6.9 Characteristics of Insulators 6.10 Classification of insulators 6.11 Properties and Application of 6.11.1 Glass wool 6.11.2 Thermocole
Unit- VII Polymer, Adhesives & Elastomers	7a. Explain the process of polymerisation 7b. Describe the properties and uses of Polymers, elastomers & adhesives. 7c. Explain the process of vulcanization of rubber 7d. Classify the types of	7.1 Introduction and Definition of Polymer and Monomer 7.2 Classification of Polymer on basis of Molecular structure as Linear, Branch and Cross-linked polymers 7.3 Classification on basis of monomers (homopolymer and copolymer) 7.4 Classification of Polymers on basis of Thermal behavior (Thermoplastics & Thermosetting) 7.5 Types polymerization Reaction

Unit	Major Learning Outcomes	Topics and Sub-topics
	adhesives and their application	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.

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration –Hours)			
			R Level	U Level	A Level	Total
I	Chemical Bondings and catalysis	06	3	2	3	08
II	Ionization and pH	06	2	4	4	10
III	Metal corrosion & its control	05	3	2	3	08
IV	Water Treatment	06	4	2	4	10
V	Cements, Glasses & Refractories	07	4	2	4	10
VI	Paints, Varnishes & Insulators.	05	4	2	4	10
VII	Polymer, Adhesives & Elastomers	07	4	4	6	14
	Total	42	24	18	28	70

Legends: R = Remember; U = Understand; A = Application 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 experiments 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.	Practical Exercise	Approx Hours Required
1	I	Determine the strength of acidic solution by using standard solution of Base.	02
2	II	Standardize KMnO_4 solution by preparing standard oxalic acid and to estimate ferrous ions.	02
3	II	Standardize $\text{Na}_2\text{S}_2\text{O}_3$ solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.	02
4	II	Determine PH-Values of given samples of Solution by using Universal Indicator and PH-meter	02
5	IV	Determine the total hardness of water by EDTA method	02
6	VII	Determine molecular weight of a polymer using Ostwald viscometer	02
7	VII	Preparation of (any one) polystyrene, urea formaldehyde, phenol formaldehyde and its Characterization	02
8	V	Determine Calcium from given sample of cement by volumetric method	02
9	IV	Determination of total dissolved and suspended solids in given water sample	02
10	III	Study of corrosion of metals in medium of different pH	02
11	III	Determine total alkalinity of water sample	02
12	IV	Determine the COD of given water sample	02
13	III	Study of Corrosion of Metals in the different Mediums.	02
	Note	Minimum Ten Experiments should be performed by the students from the above given list or experiment related to above topics	
		Total	26

7. SUGGESTED LIST OF 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

Sr.No.	Title of Books	Author	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
- Electronic Balance/ Chemical Balance
- Glass wares

C. List of Software/Learning Websites:

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE:

- **Faculty Members from Polytechnics**
 1. **Prof.J.C.Patel**, I/C.Head, Science & Humanities Department, Dr.S.& S.S. Ghandhy College of Engineering Technology, Surat
 2. **Dr. P.R.Patel**, Head, Science & Humanities Department, N.G.Patel Polytechnic, Isroli, Bardoli
 3. **Prof.S.A.Nimakwala**, I/C.Head, Science & Humanities Department, Shri.K.J. Polytechnic, Bharuch.
 4. **Prof.R.R.Patel**, I/C.Head, Science & Humanities Department,G.P. Himmatnagar.
- **Coordinator and Faculty Members From NITTTR Bhopal**
 1. **Dr. Abhilash Thakur**, Associate Professor, Dept. of Applied Sciences
 - 2.**Dr. Bashirulla Shaik**, Assistant Professor, Dept. of Applied Sciences

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Building Drawing
(Code: 3320601)

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering, Environment Engineering, Transportation Engineering	Second Semester

1. RATIONALE

Drawing is very important subject especially for civil engineers. This is also considered as a language of engineering communication. Basic and primary features of Engineering Drawing are being taught in Basic Engineering Drawing (code 3300007). At advance stage the skills of producing working drawings are necessary for technicians, this course has been designed in such a way that a technician can produce more detailed Civil Engineering Drawing related to construction of single storied, double storied residential buildings, public buildings and other simple civil engineering structures. Moreover, application of building regulation and by-laws as per local authorities will also be taught in this course, knowledge of which is must for planning buildings so that plan is approved by local civic authorities.

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 following competencies:

- i. Read and interpret the building construction drawings.
- ii. Produce residential building drawing and other construction details with Building services considering building control regulations and by-laws

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	
2	0	4	6	70	30	40	60	200

Legends: L-Lecture; T – Tutorial/Teacher Guided Student 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 Introduction	1a.Appreciate types of Drawings and its importance. 1b.Draw various types of Projections 1c.Use building drawing Symbols, Conventions and Abbreviations 1d.Apply various types of scales as per needs.	1.1 Types of drawing with appropriate scale & uses index map, key plan, village map, site plan, layout plan. 1.2 Types of Projection adopted in Building Drawing 1.3 Scales for various types of Drawings 1.4 Working drawing, large scale drawing enlarges scale drawing. 1.5 Symbols, Conventions and Abbreviations for - Electrical fittings , water supply ,sanitary fittings, material for construction etc. 1.6 Sizes of various standard papers
Unit– II Building, regulation, byelaws and Principal of Planning	2a. Apply the Bye laws and Principles of Planning for residential and other public buildings.	2.1 building bye laws of local body for residential building (show local authority publication) -plot area, built up area, carpet area, FSI, size of rooms, margins, heights, passages, ventilation, circulation and others 2.2 principles of planning for residential building in detail such as - Room dimension, area, heights, privacy, roominess factor ,orientation, grouping, drainage, aspect, prospect, drainage, economy 2.3 Color code for alteration and addition in existing building 2.4 Approval procedure with respect to bye laws
Unit– III Planning of Residential Building	3a. Develop concept plan of buildings 3b.Prepare detail drawings for single and two storied residential building and public building	3.1 Concept plan and drawing of residential single and two storied buildings 3.2 Concept plan of public buildings such as hospital ,school, shopping center , office building and industrial unit 3.3 Given situation & Plot area, preparation of detailed drawing of a single storied and double storied residential building with detail of Line plan, Detailed Plan, Ground floor Plan, First floor plan, Elevation and Sections

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit- IV Perspective Drawings and modeling	4a. Generate perspective view of simple building by different methods 4b. Develop building models	4.1 Introduction of perspective view and other related terms. 4.2 Perspective view of single room residential building and simple public buildings 4.3 Elements of perspective drawing. 4.4 Model preparation of simple buildings
Unit- V Constructional details drawing of buildings	5a. Draw details of parts of buildings 5b. provide scope and provisions for building components and services	5.1 Drawings of Parts of buildings such as staircases, chajjas , projections, columns , pier, slabs, footings etc 5.2 provisions in drawings for building services such as air conditioning, plumbing, water supply and firefighting, elevators, lifts and escalators etc 5.3 Electrification plan and drawings: 5.4 Show building service like water supply, sanitary, electrification on line plan

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 Marks
1.	Introduction	04	04	02	00	06
2.	Building, regulation, bye-laws and Principal of Planning	06	02	04	04	10
3.	Planning of Residential Building	08	04	10	20	24
4.	Perspective Drawings and modeling	06	04	04	10	18
5.	Constructional details drawing of buildings	04	02	04	06	12
Total		28	16	24	40	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 PRACTICAL/EXERCISES

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

S. No.	Unit No.	Practical/ Exercises	Approx Hours. Required
1	I	interpretation of building drawings approved under local authority	02
2	II	Draw symbols , conventions and Abbreviations in sketch book	02
3	II	Study of building by-laws act and national building code (NBC)	02
4	III	Draw detail plan on drawing sheet - 1 plan ,elevation and section of existing building (actual Measurement Drawing)	08
5	IV	Draw detail of foundation plan of one room building /two room building in sketch book	04
6	IV	Draw working drawings sheet -2 for single storied residential building (bungalow)on 250sq.m plot with scale and show following detail: GF & FF plan with elevation, section and opening schedule	16
7	V	Prepare concept plan of any one other type of building considering local bye laws: high school building, Shopping centre, Hospital and Industrial Building in sketch book.	08
8	VI	Develop perspective view of single room residential building with verandah & steps by any methods.	04
9	VI	Visit a residential building and observe the existing building service and Draw line plan for above services in sketch book	04
10	VI	Prepare a model of a simple building using card board	06
TOTAL			56

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.

S. No.	Unit No.	Student Activities
1	III	Visit a construction site and collect drawings for the project.
2	II	Visit a urban development authority office and purchase a Development control regulations (by-laws) of local Body.
3	III	Visit a public building like school, hospital, shopping centre.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	V. B. Sikka	Civil engineering drawing	B. D. Kataria Sons , Ludhiana
2	Gurcharan singh, Subash chander	Civil Engineering Drawing	Standard Publishers Distributors, Delhi
3	R. S. Malek G. S. Meo	Civil Engineering Drawing	New Asian Delhi
4	B. H. Shukla	Civil Engineering Drawing	Atul Prakashan Ahmedabad
5	Urban Development Authority	Building Bye laws	Local Authority like AUDA

B. List of Major Equipment/ Instrument:

Drawing board, mini drafter, other manual drawing instruments

C. List of Software/Learning Websites:

Auto CAD, Zwcad, civil Architect, draw plus X5

www.Autodesk.com,

www.drawingnow.com

www.learn-to-draw.com

9. CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members From Polytechnics

- | | | | |
|-----------------------|-----------|-----------------------|----------------|
| 1. Prof. Bhavesh Modi | Principal | B V P I T (DS) Umrakh | Ta. Bardoli |
| 2. Mrs. A N Pamnani | L C E | B B I T V V | Nagar |
| 3. Mrs. Rina Chokshi | L C E | P I E T (DS) | Limda Vadodara |

Co-ordinator and Faculty Member from NITTTR Bhopal

1. Dr. J.P. Tegar, Professor Dept of Civil and Environmental Engg.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic Mechanical Engineering.
 (Code: 3320602)

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering, Environment Engineering	Second Semester

1. RATIONALE:

In the era of technology integration, it has become essential to possess the basic knowledge of various engineering disciplines. This course mainly encompasses the major areas of mechanical engineering which are being used by civil engineering diploma students and are required to perform tasks such as selection of hand tools, diesel generator sets, pumps, welding, cutting and material handling equipments used for various purposes. Such skills can be developed through the basic mechanical engineering. This course is designed in such a way that practical performed in this course will develop these basic skills to perform well in industry as well as in field work.

2. 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

- **Selection of tools and equipment as per task requirement**
- **Apply the knowledge of mechanical engineering in integrated tasks of civil engineering.**

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	50
0	1	2	3	0	0	20	30	

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 Introduction	1a. Identify mechanical related basic components and their uses.	1.1 Introduction of mechanical engineering. 1.2 Use of mechanical engineering : i: In day to day life. ii: Interdisciplinary use. 1.3 Items in general use- identification criteria, major types, specifications and uses : such as bolts, nuts, washers, bearings, bushes, belts, springs, levers, couplings, brakes, screws, rivets, keys, o' rings, oil seals, gears, pulleys, shafts, axles, etc. 1.4 Pipes and pipe fittings- Types, specifications and uses of pipes and pipe fittings. 1.5 Hand and power tools: i: Types, specifications and uses of spanners (such as fix, ring, box, pipe, allen, adjustable, etc.). ii: Types, specifications and uses of hand tools (such as pliers, screw drivers, saws, hammers, chisels, cutters, planes, etc.). Types, specifications and uses of power tools(drill, chipper, etc.)
Unit– II Power Transmission & Safety	2a. Describe the type of power transmission being used in electrical engineering 2b. Describe the different types of couplings used in electrical equipment 2c. Follow general safety norms applicable to mechanical engineering equipment	2.1 Power transmission: i. Importance. ii. Modes (belt drives, rope drives, chain drives and gear trains). iii. Types of belts. iv. Gear train-concept, transmission ratio. v. Applications. 2.2 Types and applications of couplings in power transmission. 2.3 Causes and remedies of general accidents in power transmission. 2.4 Safety norms to be followed for preventing accidents and damage in power transmission. 2.5 Safety norms to be followed in mechanical based industries / shop floors.
Unit– III Welding and Gas Cutting	3a. Explain different welding and gas cutting operations.	3.1 Welding and Gas Cutting i. Types of welding ii. Arc and gas welding equipment, accessories and consumables. iii. Types of work carried out by welding and gas cutting.

Unit	Major Learning Outcomes	Topics and Sub-topics
	3b. Make simple jobs by using arc and gas welding.	3.2 Welding and Gas Cutting Process i. Working setup of arc and gas welding. ii. Precautions and safety during arc and gas welding
Unit– IV Internal Combustion Engines (I.C.Engines)	4a. Explain working of internal combustion engines.	4.1 Internal combustion engines. i: Meaning. ii: Classification. 4.2 Working of petrol engine, diesel engine and gas engine. 4.3 Performance parameters.
	4b. Identify faults in a given IC engine and suggest remedies by using trouble- shooting charts	4.4 4.5 Main parts and functions. 4.6 Applications. Common troubles and remedies.
Unit– V Hydraulic and Pneumatic devices	5a. Explain different fluid properties	5.1 Concept of theory of fluid flow. 5.2 General properties of fluids.
	5b. Describe construction, working and applications of centrifugal and reciprocating pumps	5.3 Pump. i. Working principle. ii. Types. iii. Working of centrifugal and reciprocating pumps. iv. Performance parameters. v. Main parts of pumps and their functions. vi. Common troubles and remedies.
	5c. Explain working and applications of water turbines and air compressor	5.4 Water turbines-working principle, types and applications. 5.5 Common troubles and remedies of water turbine. 5.6 Air compressor. i. Working principle. ii. Types. iii. Performance parameters. iv. Applications.
	5d. Describe working and applications of other pneumatic/ hydro-pneumatic equipment	5.7 Other hydraulic/pneumatic/ hydro-pneumatic equipments. i. Principle of working-hydraulic lift, hydraulic pump, hydraulic power pack, hydraulic jack. ii. Applications of above equipments.
Unit – VI Material Handling	6a. Select proper material handling equipment for a given situation	6.1 Need of material handling. 6.2 Types, principle of working and applications of material handling equipments. i. Hoisting equipments. ii. Conveying equipments. iii. Surface & overhead equipments. iv. Earth moving machineries. v. Construction machineries.

Unit	Major Learning Outcomes	Topics and Sub-topics
		6.3 Criteria for selection of material handling equipments. 6.4 Factors affecting selection of material handling equipments. 6.5 Selection of suitable material handling equipment for the given situation.
	6b. Identify common troubles/problems in material handling equipments and list possible remedial measures.	6.6 Common troubles and remedies.

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

Unit No.	Unit Title	TUTORIAL HOURS	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I.	Introduction	2	NOT APPLICABLE			
II.	Power Transmission & Safety	3				
III.	Welding and gas cutting	3				
IV.	I.C. Engines	2				
V.	Hydraulic and pneumatic devices	3				
VI.	Material handling	1				

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

S. No.	Unit No.	Practical Exercise	Tutorial Hours	Approx Hours Reqr'd
1	I	a: Study various mechanical items, hand tools and power tools listed in Unit 1. Note their specifications/ designations (as per BIS) and uses. b: Identify use of each item demonstrated and will prepare the report with sketch of each item along with specifications/ designations (as per BIS) and uses.	02	04
2	II	a: Study various power transmission methods including points stated in Unit 2. Explain concept and calculation of velocity/ transmission ratio for belt drives and gear trains. b: Prepare the report including sketches of power transmission systems studies with labeling of each part, their specifications and functions. c: Calculate the velocity ratio, diameters/number of tooth based on data given. This has to be included in report also.	03	06
3	III	a: Study arc and gas welding including points stated at unit number 3. b: Explain welding transformer settings for welding. c: Explain pressure settings for gas cuttings. d: Study use of welding and gas cutting consumables, accessories and safety items. e: Observe safety norms to be followed for welding and gas cutting. f: Prepare the report including : i. Sketches for welding and gas cutting setups. ii. Specifications, uses and sketches for welding accessories, consumables and safety items. g: Prepare one job using welding and one job using gas cutting.	03	06
4	IV	a: Identify parts and demonstrate strokes of petrol, diesel and gas engines. b: Explain classification of IC engine on models. c: Determine the effect of variation of load on fuel-consumption of an I.C. engine. Also locate the faults in a given I.C. engine and suggest remedial measures.	02	04

		<p>d: Prepare the report including :</p> <p>a. Sketches for various parts of petrol, diesel and gas engines and will explain the functions of each.</p> <p>b. Explanation of working of petrol, diesel and gas engines.</p> <p>c. Workout various parameters like break power, indicated power, fuel consumption, etc..</p>		
5	V	<p>a: Explain concept of theory of fluid flow.</p> <p>b: Study properties of fluids.</p> <p>c: Classify, show various parts and explain their functions, also demonstrate working of:</p> <p>a. Various pumps.</p> <p>b. Various turbines.</p> <p>c. Various air compressors.</p> <p>d. Other hydraulic/pneumatic/ hydro-pneumatic equipments.</p> <p>d: Perform test on centrifugal pump. Also find fault and remedies for centrifugal pump. Work out important performance parameters.</p> <p>e: Study working of Air compressor.</p> <p>f: Prepare the report including :</p> <p>a. Sketches for various parts of pumps, turbines, air compressors and other hydraulic/pneumatic devices and will explain the functions of each.</p> <p>b. Explain working of various pumps, turbines, air compressors and other hydraulic and pneumatic devices.</p> <p>c. Workouts</p>	03	06
6	VI	<p>a: Explain concept / demonstrate working of various material handling equipments / devices listed in Unit number 6. Also explain / demonstrate working of main parts of each equipment / device.</p> <p>b: Prepare the report including :</p> <p>a. Sketches for various parts of various material handling equipments / devices .</p> <p>b. Explain working of various material handling equipments / devices.</p>	01	02
Total			14	28

NOTES:

1. It is compulsory to prepare log book of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by laboratory assistant/instructor and teacher.
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Term work report includes log book and term work reports. Term work report must not include any photocopy/ies, printed manual/pages, lithos, etc. It must be hand written / hand drawn by student only.
4. For 20 marks practical ESE, students are to be assessed for competencies achieved. Students may be asked to:
 - i. Presentation on given topic.
 - ii. Identify and specify given items.
 - iii. Answer short questions which are leading to test competencies developed.
 - iv. Explain working with neat sketch and state applications of various equipments/devices/instruments/etc. from the syllabus.
 - v. Start and operate given equipments/devices/instruments/etc. from the syllabus.

7. STUDENT ACTIVITIES:

S. No.	Details of activity.
1	Student will visit the civil site and carryout the following- a) Prepare the list of mechanical engineering related equipments/machineries used at that site. b) Observe and study concrete mixing process.
2	Student will observe the working of crane and will prepare the specifications of it.
3	Prepare the list of mechanical items surrounding to you.
4	Collect catalogue of various pumps and compare them. Also find suitable pump for specified head.
5	Collect catalogue of earth moving equipments and study their working.

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

S.No.	Title of Books	Author	Publication
1	Theory of Machines	R.S.Khurmi and J.K.Gupta	S.Chand
2	Hydraulic machines	Jagdish lal	Metropolitan Book Company
3	Elements of Workshop Technology (Vol. 1,2)	Hazara chaudhary	Asia Publishing House
4	Hydraulics	R.C.Patel	Acharya Book Depot
5	Pumps operation and maintenance	Tyler and Hicks	Tata McGraw-Hill
6	Material Handling equipments	M.Rundenko	Mir Publishers

B. List of Major Equipment/ Instrument.

- Various mechanical items, spanners, hand tools and power tools.
- Various power transmission devices.
- Welding transformers, welding accessories and consumables.
- Gas welding set up with all accessories and consumables.
- Gas cutting process set up with all accessories and consumables.
- Petrol engine test rig.
- Diesel engine test rig.
- Air compressor test rig.
- Water turbine / working model of water turbines.
- Centrifugal pump test rig.
- Models / working models of various material handling devices.

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

- <http://www.youtube.com/watch?v=1cFu2bkZ7Vw&feature=related> (ic engine)
- http://www.youtube.com/watch?v=pCg1Ih_oVSA (pump)
- <http://www.youtube.com/watch?v=V3aPHmZ97yM&feature=related> (pump)
- <http://www.youtube.com/watch?v=FENCiA-EfaA&feature=related> (impeller)
- <http://www.youtube.com/watch?v=TBdUcGYo7XA> (gas turbine)
- <http://www.youtube.com/watch?v=HzQPNpP55xQ> (turbines)
- <http://www.youtube.com/watch?v=A3ormYVZMXE> (hy.lift)
- <http://www.youtube.com/watch?v=FP05rYRI9JU&feature=related> (hy.pump)
- <http://homepages.cae.wisc.edu>
- http://www.youtube.com/watch?v=E6_jw841vKE&feature=related (air compressor)
- <http://www.youtube.com/watch?v=twM-GLUYQ-o&feature=related> (belt drive)
- <http://www.youtube.com/watch?feature=endscreen&v=gjUwJ1CJVq4&NR=1> (belt drive)
- <http://www.youtube.com/watch?v=XunM7yUC06M&feature=related> (gear drive)
- <http://www.youtube.com/watch?v=ftdgB93QOD8&feature=related> (gear box)

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

- **Prof. M.K.Shukla**, Lecturer in Mechanical Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.

Co-ordinator and Faculty Member from NITTTR Bhopal

- **Dr. K.K.Jain**, Professor and Head; Dept. of Mechanical Engg,
- **Dr. A.K.Sarathe**, Associate Professor; Dept. of Mechanical Engg,

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GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Civil Engineering Workshop Practice
Course Code: 3320603

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering, Environment Engineering, Transportation Engineering	Second Semester

1. RATIONALE

Civil diploma technician is expected to have basic skills in, Carpentry, Masonry, Welding, Fitting, Drilling, Tapping, plumbing works etc. Therefore, students should be given basic practices of these skills with the safety aspects required for the same.

The course of Civil Engineering Workshop Practices would facilitate the development of basic skills a Diploma holder is expected to possess. He/she should be able to supervise construction activities like brick masonry, woodwork, concreting, welding, finishing etc. including quality control and maintenance of safety to self, coworkers and the constructed components of the building.

The students are advised to practice each of the experiences with an understanding of necessary technical aspects and safety precautions needed to be observed.

2. COMPETENCIES

The content should be taught and implemented with the aim to develop skills so that students are able to acquire following competencies

- i. **Perform basic tasks in Masonry, Concreting, Carpentry, Welding, Fitting, Drilling, Tapping, Plumbing and False Ceiling Works etc**
- ii. **Follow safety norms for handling materials, tools and equipments required for each construction activity**

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 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 Civil Engineering Activities At Construction Site	1a. Develop basic technical know-how of construction activities 1b. Inspect Construction Site	<ul style="list-style-type: none"> Construction activities such as excavation, brick masonry, concreting, carpentry, welding, plumbing, etc. Importance and Interdependency of various activities Technical aspects involved in workmanship and Safety precautions
Unit- II Masonry and Concreting	2a. Apply basic techniques for masonry and concreting works 2b. Use quality control measures	<ul style="list-style-type: none"> Brick and stone Masonry work, Different type of joints/bonds, Concept of line, plumb, right angle and water level. Plastering, Pointing, Flooring, Skirting and Dado Concrete Laying: Proper Mixing of concrete, Use of tools like concrete mixtures and vibrators, different types of vibrators. -Formwork -Scaffolding -Centering/ Shuttering
Unit- III Carpentry, Welding and Drilling work	3a. Identify appropriate materials required for each activity 3b. Select appropriate tools and equipments involved in various activities for specific uses	<ul style="list-style-type: none"> Types of woods/timber, different types of tools, machines and accessories for wood works Types of welding, ARC welding, Gas welding, Gas Cutting, welding of dissimilar materials, Selection of welding rod material, welding processes. Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc. Drilling machine. Safety precautions in carpentry, welding, fittings safety equipments and its use in
Unit- IV Plumbing	4a. Install the plumbing and fixtures in buildings 4b. Observe the technical aspects involved in workmanship of various plumbing tasks 4c. Observe the safety precautions	<ul style="list-style-type: none"> Different types of pipes, joints, taps, fixtures and accessories used in plumbing. Components (pipes, bends, chambers etc.) used in sanitary/sewerage lines Scheme/plan for water supply and sanitary system for a simple residential building.
Unit- V Finishing Works	5a. Provide and fix the false ceiling , aluminum –glass works 5b. Carry out whitewashing and painting	<ul style="list-style-type: none"> False ceiling, POP work, aluminum –glass works Whitewashing and painting: brush, roller and spray painting, types of finishing, preparation of surface, need of primer for timber, steel and plastered surface.

NOTE: There is no provision for lecture classes for above theoretical inputs. These theoretical inputs have to be given before practical in the workshop or sites where material/tools/equipments are available and being used. The focus of these theoretical inputs should be how to use these equipment/tools, sequence of steps for different tasks and how to perform them with safety and quality.

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

Not Applicable

6. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises 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. Following is the list of practical/exercises for guidance.

S. No.	Unit No.	Practical Exercises	Approx. Hours Required
1.	I, II and IV	<p>Visit a nearby site where construction is at initial stage and observe for following (if necessary visit two/three times with a gap of a week). If drawings are available relate/match activities with the drawings.</p> <ul style="list-style-type: none"> (a) Digging and filling (b) Foundation preparations (c) Brick/stone masonry (d) Concrete laying and Curing (e) Laying of sewerage/sanitary lines (f) Bar bending and bar laying for columns, beams and ceiling. (g) Onsite testing for quality (h) Onsite preparation for construction work (i) Erection and removal of form work, scaffolding, centering/shuttering <p>Prepare a brief report on construction activities observed and methods, tools, equipment and materials being used.</p>	08
2.	All	<p>Visit a nearby site where construction is at advance stage and observe for following (if necessary visit two/three times with a gap of a week) :</p> <ul style="list-style-type: none"> (a) Plumbing (b) Welding , fittings, (c) Plastering (d) Flooring (e) POP work <p>Prepare a brief report on construction activities observed and material, tools, equipment and methods being used.</p>	08
3.	I, III and V	<p>Visit a nearby site where construction work is at finishing stage and observe for following (if necessary visit two/three times with a gap of a week):</p> <ul style="list-style-type: none"> (a) Carpentry work (b) False ceiling and aluminum –glass works (c) White washing/painting work (surface preparation being carried out for timber/steel/plastered surface.) <p>Prepare a brief report on construction activities observed and material, tools, equipment and methods being used.</p>	08

4.	II	Assemble a brick wall of 120 cm length and 20 cm thickness and 60 cm height by arranging bricks in different bonds (using only wet mud as mortar). Ensure that wall is in line, plumb and at right angle to a given structure. (Group of 10 students)	04
5	II	Mark level of given height from ground level at different locations in the workshop using water pipe technique. (Group of 10 students)	02
6	III	Prepare a plain smooth block (cuboid) of timber of given dimension using sawing and planning operations. (Individual)	08
7	III	Join two wooden blocks with the help of dovetail joint. (Using sawing and chiseling operations) (Individual)	06
8	III	Drill the hole of given dimension at given location on a metal/wood piece. (Individual)	02
9	III	Observe demonstration of Arc welding and Gas Cutting of metal plates. (Group of 20 Students)	02
10	IV	Assemble a pipe line as per given drawing using pipes of one inch diameter, pipes of half inch diameter, nipple, reducer, union, T, elbow, tap etc. (This may involve basic tasks such as marking, cutting, threading, etc and use of appropriate techniques so that water leakage does not occur) and then disassemble this pipe line. (Group of 10 students)	08
Total			56

Note: The teacher will have to facilitate, check and assess the progress of the student in above activities; and collect the progress book at the end of the semester. The students are required to

- Write and maintain a progress work book.
- Write Technical Aspects and Safety Precautions involved in the job
- Study and Make drawing of the job to be practiced
- Write a report/ Make a model / Prepare a Demonstration of the given job for practice

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- Visit Construction site of different types such as simple residential buildings, malls, multistory buildings etc. and observe the course/topic based practices on the field
- Teacher guided self-learning activities
- Course/ library /internet based mini-projects etc.

These could be individual or group-based.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No.	Author	Title of Books	Publication
1	Bull, J.W.	The Practical design of Structural Elements in Timber	Gower Press, 1989
2	Howard C. Massey	Basic Plumbing With Illustrations Revised Edition	Craftsman Book Co;
3	E.Keith Blau KenBanker	Modern Plumbing	
4	B.S. Raghuvanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
5	PWD	PWD- Standard Data Book for Building Work	
6	CPWD	CPWD work manual	CPWD, new Delhi

B. List of Major Equipment/ Instrument

- Workbench, Vice, Saw, Plane, Chisel, Level, Tri-square with spirit level
- String, Level / Water tube, Plumb bob, Right Angle
- Welding machine
- Plumbing materials such as pipes and accessories
- Formwork and centering
- Raw material such as bricks, cement, sand, metal, timber, mild steel pieces, electrodes, etc.

C. Civil engineering related websites and software

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. K Venkateshwarulu**, HAMD, Tolani Polytechnic, Adipur,
- **Prof. Vikram M. Patel**, I/C HC, R. C. Technical Institute, Ahmedabad
- **Prof. Arti Pamnani**, Lecturer, BBIT, Vallabh Vidhyanagar.
- **Prof. Bhavesh Modi**, Principal, BVPIT (DS), Umrakh.
- **Prof.(Mrs.) Rina Chokshi**, Lecturer, PIET (DS), Limda, Vadodara

Co-ordinator and Faculty Member from NITTTR Bhopal

- **Dr. J.P.Tegar**, Professor Dept of Civil and Environmental Engg,