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 Enginering,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**				
				Theory Marks		**Practical Marks**		**Total Marks**
L	**T**	**P**	**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	**1a**. Find the distance between two points, use Mid-Point formula for quadrilateral **1b.** Find the equation of locus using Distance Formula **1c**.Find the equation of line using the different forms **1d** .Find the equation of circle **1e**. Find Tangent and Normal to the circle	**1.1Point** : Distance Formula, Mid-point, Locus of a point **1.2Straight Line :** Forms of Equation of St Lines : Slope Point Form, Two Point Form, Intercept Form, Parallel and Perpendicular lines **1.3 Circle :** Equation of Circle, Centre and radius form, Tangent and Normal and related problems.
Unit– II Function & Limit	**2a** .Solve the problem 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	**3.1Differentiation**: 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 **3.2 Application:** Velocity, Acceleration, Maxima & Minima.
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.
Unit-V Statistics	**5a** .Measure Central Tendency in given data **5b**. Measure Dispersion in given data	**5.1 Measures of Central Tendency** for Ungrouped and Grouped Data : Mean, Median and Mode **5.2 Measure of Dispersion** for Grouped and Ungrouped data : Standard deviation

5. SUGGESTED SPRCIFICATION 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 sofwares: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				
				Theory Marks		Practical Marks		Total 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**	1.1Define scope of Engineering Mechanics 1.2 Classify Scalar & Vector quantity 1.3Diffrentiate 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**	2.1Understand Co - planer Concurrent Force system 2.2Compute 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 & Equilbrium** 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**	3.1Differentiate Co-planar , parallel and non - concurrent forces 3.2Compute 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**	4.1Distinguish between Centroid and Centre of Gravity 4.2Compute 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**	5.1Appreciate Friction and its Engineering applications 5.2Calculate 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**	6.1Establish relation between Work, Power Energy 6.2Calculate 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 **Energ**y – Kinetic & Potential energy and Engineering Problems
Unit – VII **Simple Machines**	7.1Apply 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 taxomonoy

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 Co efficient 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 7th 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: Material Science and Metallurgy
(Code: 3321902)

Diploma Programmes in which this course is offered	Semester in which offered
Mechanical Engineering, Automobile Engineering	Second Semester

1. RATIONALE

Engineering Materials play an important role as the vital tool for solving the problems of material selection and application in the production and manufacturing of equipment/machines, devices, tools, etc. Therefore, an engineering diploma student must be conversant with the properties, composition and behavior of materials from the point of view of reliability and performance of the product.

Subject is concerned with the changes in structure and properties of matter. Many of the processes which are involved to bring out these changes, forms the basis of engineering activities. The study of basic concepts of material science and metallurgy will help the students understanding engineering subjects where the emphasis is laid on the application of these materials.

2. LIST OF 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. **Select Engineering materials based on properties, behavior and environmental effect for given engineering application.**
ii. **Examine microstructure and alloying elements of given engineering materials**

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	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 CONTENT

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I **Engineering Materials**	1a. Explain different types of bonds material, its construction and characteristics	1.1 Types of bonds, construction and characteristics of electrovalent, covalent, coordinate, hydrogen and metallic
	1b.Draw molecular arrangement in solids, liquid and gases	1.2Intermolecular force of attraction 1.3Molecular arrangement in solids, liquid and gases 1.4 Structure of solids i.Concept of crystalline structure. ii.Structure of metal-unit cell, BCC, FCC and HCP. iii.Examples and properties of metallic structures
	1c. Describe various properties of material	1.5 Physical, chemical, electrical, electromagnetic and thermal properties of material
	1d. Explain effects of cooling rate, grain size on materials properties	1.6Solidification of metals and digital transducers i.Concept. ii.Crystal, grain, grain boundaries and dendritic solidification. iii.Effect of cooling rate on material properties. iv.Effect of grain size on properties of metal
Unit– II **Phase Diagrams**	2a. Explain the concept of equilibrium diagram 2b. Plot cooling curves for pure metals and alloys	2.1Equilibrium diagrams. i.Concept, definition and need. ii.Solid solution-definition, properties and examples. iii. Alloys-major elements, reasons to add and important effect on material properties. iv.Cooling curve-concept and method to plot. v.Cooling curve for pure metals and alloys.
	2c. Draw and Interpret TTT curves and Iron carbon diagram	2.2 Time Temperature Transformation curve-(TTT curve). i.Need and application. ii.Steps to construct TTT curve 2.3 Iron carbon equilibrium diagram. i.Concept, need & characteristics. ii.Definition of the terms used. iii. Plotting fundamentals. iv.Interpretation.
	2d. Explain various heat treatment processes	2.4 Heat treatment processes. i.Types of furnaces. ii.Heat treatment processes.(Annealing, normalizing, carburizing, case hardening, hardening, tempering, spherodising, nitriding, tempering, stabilizing, etc.).Methods, parameters and changes in properties. iii.Types of quenching mediums, their properties and applications.

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit– III Metallurgical Microscope	3a. Prepare specimens for microscopic examination 3b. Examine specimens using microscope	3.1 Metallographic examination and microstructures-need and importance 3.2 Principle & working of metallurgical microscope 3.3 Preparation of specimen for microscopic examinations
Unit– IV **Metals And Its Alloys**	4a. Identify various ferrous metals and alloys based on composition and properties for prescribed application 4b. Test material for alloying elements content 4c. Interpret material designations	4.1 Classification of metals. 4.2 Flow diagram for the production of iron and steel. 4.3 Ferrous metals i. Classification. ii. Steels-types, composition, properties, applications. (for Plain carbon steel, alloy steel including stainless steel and cast iron.) iii. Designation and coding methods according to BIS for plain & alloy steel and cast iron. iv. Designation and coding (as per BIS, ASME, EN, DIN,JIS)of plain & alloy steel and cast iron. v. Microstructure of mostly used ferrous materials-low carbon steel, alloy steel, cast iron.
	4d. Select various non-ferrous metals and alloys based on composition and properties for given application	4.4 Non ferrous metals i Classification. ii. Types, composition, properties and applications. (for Copper, copper alloys, Aluminum and Aluminum alloys.) iii. Designation and coding methods according to BIS . iv. Designation and coding (as per BIS, ASME, EN, DIN,JIS)of mostly used non ferrous materials. v. Microstructure of mostly used non ferrous materials-(Copper, Brass, Gunmetal, Aluminum).
Unit– V **Non Metallic Materials**	5a. Identify non-metallic material by judgment and lay-man tests 5b. Select the non metallic material for given simple machine elements	5.1 Introduction and classification of non metallic materials. 5.2 Classification of Polymers on basis of Thermal behavior (Thermoplastics & Thermosetting). 5.3 Properties and applications of polymers (like Polyethylene, Polypropylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Acrylonitrile, Epoxy resin.) 5.4 Surface coating methods, setup, working parameters and applications using polymers. 5.5 Composites. i. Introduction of composite. ii. Characteristics of composites. iii. Constituents of composite. iv. Types and applications of composites. 5.6 Other non metallic materials-types, properties and applications.(like rubber, ceramics, refectories ,

Unit	Major Learning Outcomes	Topics and Sub-topics
		insulators, abrasives, adhesives, etc). 5.7 Designation and coding of important non metallic materials as per BIS.
Unit– VI **Electrolysis**	6a.Select proper electrolyte for specified application. 6b.Select proper electrolysis process for surface coating.	6.1 Introduction 6.2 Electrolytes and Non-electrolytes. i. Types of electrolytes. ii. Construction and working of electrochemical cell. iii. Standard conditions. iv. Standard hydrogen electrodes. v. Electrochemical series, galvanic series. vi. Faraday's Laws of Electrolysis. vii. Industrial applications of electrolysis. viii. Surface coating through electrolysis-setup and working. 6.3 Corrosion-types and reasons.
Unit- VII **Fluid And Powder Materials.**	7a.Select suitable cutting oil for given machining process 7b.Select suitable lubricants. 7c.Interpret designations of oils and paints. 7d.List areas of powder metallurgy applications.	7.1 Classification of fluid and powder materials. 7.2 Oils. i.Types and properties. ii.Designation methods as per BIS. iii.Applications in Mechanical engineering. 7.3Paints and varnishes. i. Definition and classifications. ii. Surface preparation and coating methods using paints and varnishes. 7.4Powder metallurgy. i. Basic concept of powder metallurgy and its applications, merits and demerits. ii.Manufacturing process of powder coating-setup, equipment used and working.

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.	Engineering Materials.	05	4	2	2	8
II.	Phase diagrams.	10	6	4	8	18
III.	Metallurgical Microscope	03	3	2	0	5
IV.	Metals and alloys.	10	6	4	6	16
V.	Non metallic materials.	06	3	2	4	09
VI.	Electrolysis.	04	3	0	4	7
VII.	Fluid and powder materials.	04	3	0	4	7
	Total	**42**	**28**	**14**	**28**	**70**

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

Notes:

i) 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.

ii) If midsem test is part of continuous evaluation, unit numbers I, II, III and VII are to be considered. It is also compulsory for student to complete ex.no.1 to 4 to eligible for midsem test.

iii) Ask the questions from each topic as per marks weightage. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to marks allotted to each topic.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

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

S. No.	Unit No.	Practical/Exercises	Approx Hours. Required
1	I	a: State the criteria to identify any five (3 metallic and 2 non metallic) materials from the selected set of material b: List properties of each above identified materials. Also identify main alloying elements and reasons to add them.	2
2	II	Analyze content of ferrous/non ferrous material using photo spectrometer. (This may be covered during industrial visit).	2
3	II	a: Study various heat treatment furnaces. b: Perform hardening process on ferrous material. Measure the hardness before and after hardening.	4
4	III	Examine the given specimen by use of Metallurgical Microscope.	2
5	IV	Prepare ferrous micro specimens and examine them. Also prepare report on this. –Four specimens. (One of plain carbon steel, second of alloy steel, third of heat treated steel and fourth of cast iron.)	8
6	IV	Prepare non-ferrous micro specimens and examine them. Also prepare report on this. – Three specimens.(One of copper, second of brass and third of aluminium.)	4
7	VI	Study corrosive materials to identify different types of corrosion of metals.	2
8	ALL	Visit one relevant industry which has specifically heat treatment processes facilities and photo spectrometer.	-
9	All	**PROBLEM BASED LEARNING:** Group of 4-5 students will identify and collect five machine / product components which are made from different engineering materials and which are also failed in their applications. Students will measure and sketch the components (free hand-orthographic views) with dimensions. Students in group will also discuss the reasons of failure and will note down the discussion and outcome.	2
10	All	**SCHOOL WITHIN SCHOOL:**	2

S. No.	Unit No.	Practical/Exercises	Approx Hours. Required
		a. Each student will explain at least one diagram (assigned by teacher-may be part of iron-carbon diagram, TTT curve for specific material, etc) to all batch colleagues. b. Each student will share experiences of the student activities he/she has carried out.	

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 teacher.
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Term work report includes term work, objects taken for identification for laboratory work, student activity; parts experimented in acid as student activity and log book along with student activities. Term work report is compulsory part to be submitted at the time of practical ESE.
4. Term work report must not include any photocopy/ies, printed manual/pages, lithos, etc. It must be hand written / hand drawn by student only.
5. For 20 marks ESE, students are to be assessed for competencies achieved. Students are to be asked to prepare specimens, interpret microstructure-iron-carbon diagram-TTT curves, identify materials, select proper materials, etc.

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

7.1 Select any five objects (3 metallic and 2 non metallic) which will be used in laboratory and list the material of selected objects.

7.2 Prepare the material list of given tools and commonly used items such as razor blade, knife, scissor, hacksaw blade, carpentry chisel, fix spanner, etc. Also give reason(s) for using such material and discuss your answers with the teacher.

7.3 Take dilute acid which is commonly used at our home for cleaning purpose and put one scrap iron piece and one non ferrous metal piece in it for minimum 12 hours. Take out these two pieces by following all safety norms/steps (without touching acid) and observe the changes. Discuss with your teacher.

7.4 Group of 3-5 students will visit institute's workshop and will identify at least 5 nonmetallic components for a given machine / assembly. Also list the material of identified machine / assembly components.

7.5 List at least three questions individually which you would like to ask for followings:

i. Comparison of iron and fiber reinforced plastic.
ii. Comparison for strength of wood and cast iron.
iii. Annealing-heat treatment process.
iv. Materials used for construction of any bike.
v. Materials used for construction of any home appliance, like mixer, washing machine, iron, etc.

7.6 Any other relevant activity added by teacher including preparing industrial visit report.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication/Year
1.	GBS Narang	Materials science	Khanna Publishers, New Delhi.
2.	R.K.Rajpoot	Materials science	Laxmi Publication, Dariya ganj, New Delhi.
3.	R.S.Khurmi, R.S.Sedha	Materials science	S.Chand
4	D.S.Nutt	Materials science and metallurgy	S.K.Katariya and sons, Delhi.
5.	V.Raghavan	Materials science and Engineering	EEE Edition, Prentice Hill, New Delhi.
6.	Sidney Avner	Physical Metallurgy	Tata McGraw-Hill Education (2011).

B. List of Major Equipment/ Instrument

1. Metallurgical Microscope.
2. Standard specimens.
3. Furnaces to perform heat treatment process.
4. Sorted/required quenching mediums.
5. Hardness tester-to check Rockwell hardness-scales A,B and C.
6. Other hardness testers like sceleroscope, etc.
7. Polishing machine to prepare specimens with necessary consumables.
8. Hand grinder – specifically to prepare specimens and for spark testing.
9. Other consumables.

C. List of Software/Learning Websites

1. http://vimeo.com/32224002
2. http://www.substech.com/dokuwiki/doku.php?id=iron-carbon_phase_diagram
3. http://www-g.eng.cam.ac.uk/mmg/teaching/typd/
4. http://www.ironcarbondiagram.com/
5. http://uk.ask.com/web?q=Who+Discovered+Carbon%3F&qsrc=14097&o=41647924&l=dir
6. http://www.youtube.com/watch?v=fHt0bOfj3T0&feature=related
7. http://www.youtube.com/watch?v=cN5YH0iEvTo
8. http://www.youtube.com/watch?v=m9l1tVXyFp8
9. http://www.youtube.com/watch?v=98lh5Q0M0cg
10. http://www.youtube.com/watch?v=KIyGr-1snMY
11. http://en.wikipedia.org/wiki/Materials_science
12. http://www.studyvilla.com/electrochem.aspx

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnic

- **Prof. Y. R. Joshi**, TPO, B&B Institute of Technology, Vallabhvidyanagar.
- **Prof. D. A. Dave**, Head of Automobile Engineering Department, Sir B.P.I., Bhavnagar.
- **Prof. A. M. Talsaniya**, Lecturer in Mechanical Engineering, Sir B.P.I., Bhavnagar.
- **Prof. R. B. Dhruv**, Lecturer in Mechanical Engineering, R.C.T.I., Ahmedabad.

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,

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Mechanical Drafting
(Code: 3321901)

Diploma Programmes in which this course is offered	Semester in which offered
Mechanical Engineering, Mechatronics Engineering	Second Semester

1. RATIONALE:

The students of mechanical engineering programme are mainly involved in drafting, manufacturing, inspection and planning activities (such as preparing process plans, preparing bill of materials, etc.) at industries. For all such activities, reference document is the drawing of components/assemblies to be manufactured. In this context, it is of utmost priority to prepare, read and interpret these drawings correctly for production of components and assemblies accurately and precisely. The industrial practices of drafting are also important for the students to make them aware of drafting practices, symbols, codes, norms and standards generally used in industries. Development of sketching ability also strengthens effective engineering communication & presentation.

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. **Prepare engineering drawings using codes, norms and standards.**
ii. **Interpret basic engineering drawings for various planning, inspection and manufacturing activities.**

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	
2	0	6	8	70	30	40	60	200

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	Sub-topics
Unit – I **Multi views Representation**	1a. Draw isometric and multi views of an object. 1b. Interpret multi views drawings.	1.1 First & third angle projection methods and positions of six views. 1.2 Multi view drawings (all six views) from given isometric drawing / physical object. 1.3 Missing view drawings from given adequate orthographic views.
Unit– II **Sectional Ortho graphics**	2a. Draw sectional view/s of an object. 2b. Interpret sectional views.	2.1 Need of sections. 2.2 Section lines and cutting plane. 2.3 Rules for sectioning and section lines. 2.4 Types of sections- full, half, revolved, removed, partial, off-set, aligned. 2.5 Sectional view drawings from given isometrics drawing / physical object and cutting plane conditions.
Unit– III **Projections and Sections of Solids**	3a. Draw sectional views of different solids. 3b. Interpret sectional views of different solids.	3.1 Types and dimensional specifications of solids (prism, pyramid, cylinder, cone). 3.2 Projections of solids - in various positions with respect to the reference planes. (Parallel, perpendicular and inclined to HP and / or VP.) 3.3 Sectional views of different solids in given various positions. 3.4 True shape of section.
Unit– IV **Intersection and Penetration of Solids and Surfaces**	4a. Draw intersectional view/s of an object.	4.1 Importance and field use. 4.2 Intersection curve for Intersection / penetration of : i. Prism into prism. ii. Cylinder into cylinder. iii. Cylinder into prism. iv. Cone into cylinder.
Unit– V **Development of Surfaces**	5a. Develop the surface requirement of given application.	5.1 Importance of development of surfaces. 5.2 Drawing of development of surfaces of prism, pyramid, cylinder and cone – independent, sectioned and combination.
Unit– VI **Drafting Symbols**	6a. Use & Interpret drafting symbols.	6.1 Machining symbol and its interpretation. 6.2 Geometrical symbols and its interpretation. 6.3 Other drafting symbols like threading, dowels, pins, ribs, bearings, etc. 6.4 Notes in drawing like heat treatment conditions, surface conditions, assembly notes, etc. (All symbols as per BIS).
Unit– VII **Welded Joints, Piping & Duct Layouts**	7a. Draw & interpret weld joints, piping layout and duct drawings. 7b. Interpret Process	7.1 Weld symbols as per BIS-813 / ASME (primary symbols & supplementary symbols). 7.2 Weld nomenclature. 7.3 Weld dimensions.

	flow diagram & piping isometrics	7.4 Welding drawing interpretations. (like simple heat exchangers, pressure vessels, etc.) 7.5 Pipe-types, standards and designation methods. 7.6 Pipe line symbol as per passing fluid, air, gas, water etc. 7.7 Piping fitting symbols. 7.8 Pipe line diagram. 7.9 Interpretation of Process flow diagram & piping isometrics & pipe schedule chart. 7.10 Ducts-types and applications. 7.11 Duct layout.
Unit– VIII **Details & Assembly**	8a. Prepare and interpret detail and assembly drawing. 8b.Workout material requirement from a given drawing.	8.1 Importance and difference of these drwaings. 8.2 Detail drawing from given assembly. 8.3 Assembly drawings from given details. 8.4 Preparing bill of material (part list).
Unit– IX **Fasteners**	9a.Use appropriate fasteners for given situations. b. Draw sketches for different types of fasteners.	9.1 Detachable & permanent fasteners. 9.2 Sketches of threads (square, acme, knuckle, Internal – external threads, Left hand – right hand threads, Single & multi start threads). 9.3 Sketches of studs (cap screws, machine screws, set screws). 9.4 Sketches of bolts & nut (hexagonal, square). 9.5 Sketches of rivets (snap, pan, countersunk, conical). 9.6 Sketches of keys.

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

Unit No.	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I.	Multiviews representation	3	0	0	07	07
II.	Sectional orthographics	3	0	0	07	07
III.	Projections and sections of solids	4	0	0	07	07
IV.	Intersection & penetration of solids & surfaces	6	0	5	07	12
V.	Development of surfaces	4	0	0	07	07
VI.	Drafting symbols	2	5	0	00	05
VII.	Welded joints and Piping Layouts	4	2	2	04	08
VIII.	Details & assembly	2	2	0	09	11
IX.	Fasteners	-	4	0	02	06
	Total	**28**	**13**	**7**	**50**	**70**

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

Notes:

1. 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.
2. If midsem test is part of continuous evaluation, unit numbers 1, 2, 3 and 5 are to be considered. It is also compulsory for student to complete ex.no.1 to 5 and 7 to eligible for midsem test.
3. Ask the questions from each topic as per marks weightage. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to marks allotted to each topic.

5. SUGGESTED LIST OF PRACTICAL/EXERCISES:

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned expected competency. Following is the list of minimum sheets to be drawn.

Sheet No.	Unit No.	Practical/Exercises	Hours
1	I	**MULTIVIEWS:** a: Given the pictorial view, draw multi views.-Two problems. b: Select one object, measure it and draw multi views. The selected object has to be approved by Teacher. (Multi views include Elevation, Plan, Rear view, Bottom view, Right hand side view and Left hand side view.	08
2	I	**MISSING VIEWS:** Given adequate number of minimum views, draw additional view/s as asked.-Three problems.	04
3	II	**SECTIONAL VIEWS:** a: Given the pictorial view with cutting plane/s, draw the views as asked including sectional view/s.-Two problems. b: Select one object, measure it and draw the views as asked including sectional view/s. The selected object has to be approved by Teacher.	06
4	III	**PROJECTIONS OF SOLIDS:** Draw the projection of solids- 4 problems.(1-Prism, 1-Pyramid, 1-Cylinder and 1-Cone.). (With varied dimensions. Refer Note d.)	06
5	III	**SECTIONS OF SOLIDS:** Draw the sections of solids. Also draw true shape of each sections-4 problems.(1-Prism,1-Pyramid,1-Cylinder and 1-Cone.)	08

		(With varied dimensions. Refer Note d.)	
6	IV	**PENETRATION AND INTERSECTION:** Draw the intersection curves- 4 problems.(Prism into prism, Cylinder into cylinder, Cylinder into prism, Cone into cylinder. (With varied dimensions. Refer Note d.)	08
7	V	**SURFACE DEVELOPMENT:** Draw development of surface of prism, pyramid, cylinder and cone – independent, sectioned and combination.-Total 4 problems. (With varied dimensions. Refer Note d.)	04
8	VII	**WELD JOINT ASSEMBLY:** Draw the weld joint drawing with weld symbols and nomenclature. Take minimum 3 parts for weld joint assembly.	08
9	VII	**PIPING LAYOUT:** Prepare piping layout for given application/situation with piping symbols and nomenclature. Also prepare isometric piping layout for the same problem.	08
10	VIII	**DETAILS:** Draw the details of all parts for the assembly selected and sketched as student activity.	12
11	VIII	**ASSEMBLY:** Draw the assembly of all parts drawn for Sheet No.8. This includes minimum one sectional view and also the parts list.	12
12	All	**PROBLEM BASED LEARNING:** Complete the given orthographic views with few missing lines of at least three objects. Also sketch (free hand) isometrics of them.	-
13	All	**SCHOOL WITHIN SCHOOL:** a: 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. b: Each student will assess at least one sheet of other students (May be 5-6 students- to be assigned by teacher) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.	-
		Total	**84**

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.

NOTES:

a: **Use both sides of sheet. For example, draw sheet number 2 on backside of sheet number 1.**
b: It is compulsory to perform students' activities.
c: Submission includes sheets, objects, parts/assembly, drawings got for interpretation, student activities performed and sketch book. (Term work must not include any photocopy/ies, printed manual/pages, litho, etc. It must be hand written/hand drawn by student only.)
d: The dimensions of solids-like base dimension/diameter, height, number of sides (for prism and pyramid) must be varied for each student in batch so that each student will have same problem, but with different dimensions.
e: Ask for 6-8 components assembly only.
f: Keep "Westernmann Table" (Revised to Indian Standards, New Age International Publishers) during theory and practice periods.
g: For 40 marks under Practical Marks ESE, students are to be assessed for competencies achieved. Students are to be given data for practical ESE to:
   i. Prepare drawings.
   ii. Interpret given drawing/s.
   iii. Refer and interpret data from data book/codes/standards/ Westernmann Table.

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES:

Following is the list of student activities.

S. No.	Activity No.	Details of student activity
1	1	Solve all problems for sheet number 1 to 7 in sketch book (with dimensions).
2	2	Select two objects. Student will measure and sketch* the same in sketchbook for the reference to draw in sheet. One for MULTIVIEW (Sheet No.1) and another for SECTIONAL VIEWS (Sheet No.3). (*Only freehand isometric sketch with dimensions).
3	3	Select one assembly having minimum 6-8 mechanical related components. Student will measure and sketch the same in sketchbook for the reference to draw details and assembly sheets. This may be in group of 3-4 students. (*Only freehand isometric sketch with dimensions).
4	4	Draw freehand sketches for sheet number 8 to 11 in sketch book.
5	5	Draw various drafting symbols in sketch book. This includes mainly: a: Threading symbols. b: Machining symbols. c: Geometrical symbols d: Welding symbols. e: Piping symbols.
6	6	Get+ minimum one industrial drawing each for following , which are in use by industry: a: Machined component. b: Machined part assembly-6-8 components. c: Welded joint based component /assembly.

		d: Piping layout. Interpret above all drawings and write your conclusions in sketchbook. + Get by Industrial visits, internet search, reference book, etc.
7	7	Freehand sketches (in sketch book) of various fasteners assigned by teacher.
8	8	List at least two questions each for following cases. List those questions you would like to ask to know / improve further. a: More than six views. b: Combination of different solids. c: Impact of ability of manual drafting on computer aided drafting. d: Intersection and duct layout. e: Correlation between details drawings and assembly drawings.

8. SUGGESTED LEARNING RESOURCES:

A. List of Books.

S.No.	Title of Books	Author	Publication
1	Engineering Drawing.	N.D.Bhatt.	Charotar Publishing House, Anand.
2	Engineering Drawing.	K.R.Gopalakrishna.	Subhash Publications, Banglore.
3	Engineering Drawing.	P.J.Shah.	S.Chand, New Delhi.
4	Engineering Graphics.	M.B.Shah, B.C.Rana.	Pearsons.
5	Machine Drawing.	P. Sidheswar, P. Kannaiah & VVS Sastry.	Tata-McGraw Hill Publishing Co.Ltd.-New Delhi
6	Fundamentals of Engineering drawing.	Warren J. Luzadder	Prentice-hall of India Pvt. Ltd.-New Delhi
7	Westernmann Table, Revised to Indian Standards	Jutz, Scharkus.	New Age International Publishers

B. List of Major Equipment/ Instrument.

1. Models and cut sections.
2. Various machined parts assemblies.
3. Various weld joints.
4. Set of various industrial updated drawings being used by industries-.
5. Large size drawing equipments and instruments for class room teaching-.
6. Half imperial size drawing board.
7. T-square or drafter (Drafting Machine).
8. Set squires (45^0 and 30^0-60^0).
9. Protector.
10. Drawing instrument box (containing compasses and divider).
11. Drawing sheets.

12. Drawing pencils.
13. Eraser.
14. Drawing pins / clips.

C. List of Software/Learning Websites.

1. http://mvredp.blogspot.in/2010/04/sections-of-solids-introduction.html
2. http://www.youtube.com/watch?v=P5g5omLoDr8
3. http://engggraphics.wordpress.com/2012/04/10/an-advance-tamil-new-year-gift/
4. http://rgpv-ed.blogspot.in/2009/09/development-of-surfaces.html
5. https://sites.google.com/site/middleschooljghs/graphic-communication/geometric-drawing-and-surface-developments
6. http://www.techdrawingtools.com/12/l1201.htm
7. http://www.wermac.org/documents/isometric.html
8. http://www.me.metu.edu.tr/courses/me114/Lectures/assembly.htm
9. http://metal.brightcookie.com/2_draw/draw_t1/htm/draw1_2_1.htm
10. http://www.ductedreversecycleairconditioning.com.au/category/37165122
11. http://www.affordablecomfort.org/images/Events/15/Courses/422/Proctor_TAM07.pdf
12. http://en.wikipedia.org/wiki/Engineering_drawing
13. http://www.sevenhills-h.schools.nsw.edu.au/Graphics_TG201/Orthographic/Drawortho.htm
14. www.design-technology.info
15. www.studyvilla.com
16. www.authorstream.com
17. Computer based learning material published by KOROS.

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. **Prof. M. K. Dudharejiya**, Lecturer in Mechanical Engineering, Sir B.P.I., Bhavnagar.
2. **Shri A.M.Talsaniya**, Lecturer in Mechanical Engineering, Sir B.P.I., Bhavnagar.
3. **Shri P.L.Bhogayata**, Lecturer in Mechanical Engineering, Sir B.P.I., Bhavnagar.

Co-ordinator and Faculty Member from NITTTR Bhopal

1. **Prof. Sharad Pradhan**, Associate Professor, Dept. of Mechanical Engineering,

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Basic of Civil Engineering
(Code: 3320004)

Diploma Programmes in which this course is offered	**Semester in which offered**
Electrical Engineering ,Mechanical Engineering, Fabrication Technology	Second Semester

1. RATIONALE:

A mechanical or electrical technician is expected to look after many activities at work place, which may be interdisciplinary, for example if he/she has to mount a heavy machine, he should be able to supervise the preparation of foundation for it, which requires the knowledge of civil engg. Therefore he/she is supposed to be exposed to very basics of civil engineering. This course mainly encompasses the major and general areas of civil engineering, knowledge of which may be required by mechanical and electrical engineers/technicians.

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:

- **To supervise the simple civil engineering tasks related to own branch's integrated tasks.**

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**	
0	1	2	3	0	0	20	30	**50**

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 –1 **CIVIL ENGG. SURVEYING**	**1a.** Use surveying tools and equipments for field survey, leveling and measurements **1b.** Calculate different levels and angles **1c.** Understand given contour map	1.1 Surveying & leveling (its importance and types) 1.2 Necessity for leveling 1.3 Principals of surveying 1.4 Instrument/ tools used for survey and level 1.5 Various methods of finding the field survey measurements 1.6 Chain and Compass Survey 1.7 Preparations of contour sheets/ plan using survey data. 1.8 Procedure of leveling
Unit – 2 **CIVIL ENGG. DRAWING**	**2a.** Read and Interpret the building drawing **2b**. Plan lay out of a simple building	2.1 Types of building drawings 2.2 Abbreviation, conventions & symbols in civil drawing 2.3 Building byelaws for planning of residential building and industrial building 2.4 Planning of simple residential and industrial building
UNIT –3 **CONSTRUCTION MATERIALS**	3a. Select different types of construction materials as per requirements 3b. Test given construction materials for quality control 3c. Prepare approximate cost estimates	3.1 Common construction materials such as cement, Brick, Stone, Timber, Steel and Concrete. 3.2 Properties of each materials & their acceptable standards 3.3 Quality parameters of materials 3.4 Estimations and costing for simple structure (only the material cost)
Unit –4 **MACHINE FOUNDATIONS**	4a. Assess the typical requirements of foundations for medium sized electrical and Mechanical Machines.	4.1Criteria for machine foundation 4.2Provisions for foundation design considerations in machine foundations. 4.3Factors to be considered while designing machine foundations such as type of soil 4.4Design foundations for simple machine like lathe, compression press, universal testing machine , electric power hammer etc. BIS CODE of practice for machine foundations I.S.- 2974 - Part –I& II

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.	Civil engineering Surveying	04	NOT APPLICABLE			
II.	Civil engineering drawing	04				
III.	Construction materials	02				
IV.	Machine foundations	04				
	Total	14				

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 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 competency. This is the list of minimum experiments to be performed.

Ex. No.	Unit No.	Practical/Exercises	Approx Hours Required
1	I	Practice for linear measurements through ranging, chaining, taping offsetting, recording field book etc.	04
2	I	Practice for working on prismatic compass, dumpy Levels, for taking measurements and , recording length and angles.	04
3	II	Prepare surveying drawings using surveyed data	04
4	III	Test few construction materials such as cement, brick etc in laboratory	04
5	IV	Visit of industry to observe the machine foundation and study of foundation design	04
6	III	Market survey of construction materials and prepare of cost estimation	04
7	IV	Observe and draw machine foundation for some heavy machines.	04
Total			28

7. SUGGESTED LEARNING RESOURCES:

A. List of Books.

Sr.No.	Title of Books	Author
1	Text book on Surveying&leveling	T.P.Kanitkar
2	Text hook on Surveying&leveling	B.C.Punmia
3	Civil Engineering Drawing	Shah Kalel&Patkil
4	Engineering Material	S.C.Rangwala
5	Properties of concrete	A.M.Neville

B.List of Major Equipment/ Instrument.

1.Chain (10m, 20m, 30m, etc.)

2.Measure Tape, Ranging rods

3.Prismatic compass, Surveyor compass

4.Dumpy level, Tilting level

5.Compressive Testing Machine

C. List of Software/Learning Websites: QE PRO for estimation, Autocad for drawings

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. Bhavesh Modi** Principal ,B V P I T (DS) Umrakh Ta. Bardoli
- **Mr. Krishnaraj A. Khatri** L C E, B V P I T (DS) Umrakh Ta. Bardoli
- **Mrs. A. N. Pamnani** L C E ,B B I T , V V Nagar
- **Mrs. Rina Chokshi** L C E, P I E T (DS) Limda Vadodara

Co-ordinator and Faculty Members from NITTTR Bhopal

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