GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL ENGINEERING DEPARTMENT

BRANCH CODE:06 DIPLOMA PROGRAMME IN CIVIL ENGINEERING										
SEMESTER - I										
COURSE CODE	COURSE TITLE	TEACHING SCHEME/WEEK			CREDITS (L+T+P)	EXAMINATION SCHEME				
						THEORY		PRACTICAL		GRAND TOTAL
		L	T	P		ESE	PA	ESE	PA	
3300001	BASIC MATHEMATICS	2	2	0	4	70	30	0	0	100
3300002	ENGLISH	3	2	0	5	70	30	20	30	150
3300003	ENVIRONMENT CONSERVATION & HAZARD MANAGEMENT	4	0	0	4	70	30	0	0	100
3300004	ENGINEERING PHYSICS (GROUP-1)	3	0	2	5	70	30	20	30	150
3300007	BASIC ENGINEERING DRAWING	2	0	4	6	70	30	40	60	200
3300012	COMPUTER APPLICATION & GRAPHICS	0	0	4	4	0	0	40	60	100
		14	4	10						
TOTAL					28	350	150	120	180	800

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basics Mathematics
(Code: 3300001)

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

1. RATIONALE

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

2. LIST OF COMPETENCIES

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

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

3. TEACHING AND EXAMINATION SCHEME

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

4. DETAILED COURSE CONTENTS

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

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

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

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

6. SUGGESTED LIST OF EXERCISES (During tutorial hours)

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

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

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

7. SUGGESTED LIST OF STUENT ACTIVITIES

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

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

8. SUGGESTED LEARNING RESOURCES

A. List of Books

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

B. List of Major Equipment/ Instrument

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

C. List of Software/Learning Websites

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

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

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE:

Faculty Members from Polytechnics

- **Dr.N.R.Pandya**, HOD-General Dept. Govt. Polytechnic, Ahmedabad
- **Dr N. A. Dani**, Lecturer, Govt. Polytechnic, Junagadh.
- **Smt R. L. Wadhwa**, Lecturer, Govt. Polytechnic, Ahmedabad
- **Shri H. C. Suthar**, Lecturer, BPTI, Bhavnagar
- **Shri P. N. Joshi**, Lecturer, Govt. Polytechnic, Rajkot
- **Shri P. T. Polara**, Lecturer, Om Institute of Engg. And Tech, Junagadh,
- **Smt Ami C. Shah**, Lecturer, BBIT, V. V. Nagar.

Coordinator and Faculty Member From NITTTR Bhopal

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

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: English
(Code: 3300002)

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

1. RATIONALE

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

2. LIST OF COMPETENCIES

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

i. **Communicate verbally and in writing in English.**
ii. **Comprehend the given passages and summarize them.**

3. TEACHING AND EXAMINATION SCHEME

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

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

4. DETAILED COURSE CONTENTS

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

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

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

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

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

6. SUGGESTED LIST OF TUTORIAL EXERCISES

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

S. No.	Unit No.	Experiment
1	I	**Conversation** 1. Introducing oneself 2. Introduction about family 3. Discussion about the weather 4. Seeking Permission to do something 5. Description about hobbies 6. Seeking Information at Railway Station/ Airport 7. Taking Appointments from superiors and industry personnel 8. Conversation with the Cashier- College/ bank 9. Discussing holiday plans 10. Asking about products in a shopping mall 11. Talking on the Telephonic 12. Wishing Birthday to a Friend 13. Talking about Favourite Sports
2	II	**Presentation Skills** General Presentations pertaining to Unit I, II, III

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- course/topic based seminars,
- internet based assignments,
- teacher guided self learning activities,
- course/library/internet/lab based mini-projects etc.

  These could be individual or group-based.

8. SUGGESTED LEARNING RESOURCES

A. Text Book

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

B. List of Reference Books

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

C. List of Major Equipment/ Instrument

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

D. List of Software/Learning Websites

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

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Polytechnic Faculty Members

- **Prof. K. H. Talati**, Govt. Polytechnic, Gandhinagar (Convener)
- **Ms. Almas Juneja**, Gujarat Technological University, Ahmedabad.
- **Shri. D. M. Patel**, Govt. Polytechnic, Ahmedabad.
- **Dr. Sonal K. Mehta**, Govt. Girls Polytechnic, Ahmedabad.
- **Shri. Bhadresh J. Dave**, Govt. Polytechnic, Rajkot.
- **Dr. Peena Thanki**, Govt. Polytechnic, Jamnagar.
- **Dr. Chetan Trivedi**, Govt. Engineering College, Bhavnagar.
- **Dr. Raviraj Raval**, Govt. Polytechnic, Rajkot.
- **Shri Vaseem Qureshi**, Vishwakarma Govt. Engineering College, Chandkheda, Ahmedabad.

NITTTR Bhopal Faculty and Co-ordinator

- **Dr. Joshua Earnest,** , NITTTR, Bhopal
- **Prof.(Mrs.) Susan S. Mathew,** NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

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

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

1. RATIONALE

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

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.

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

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	
4	0	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.

4. DETAILED COURSE CONTENTS

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

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

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

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

6. SUGGESTED LIST OF EXPERIMENTS/PRACTICAL EXERCISES

Nil

7. SUGGESTED LIST OF STUDENT ACTIVITIES

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

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Title of Book	Author	Publication/Year
1	Renewable Energy Technologies	Solanki, Chetan Singh	PHI Learning, New Delhi, 2010
2	Ecology and Control of the Natural Environment	Izrael,Y.A.	Kluwer Academic Publisher
3	Environment Engineering and Disaster Management	Sharma, Sanjay K.	Luxmi Publications, New Delhi
4	Environmental Noise Pollution and Its Control	Chhatwal,G.R.; Katyal,T.; Katyal,	Anmol Publications, New Delhi
5	Wind Power Plants and Project Development	Earnest, Joshua & Wizelius, Tore	PHI Learning, New Delhi, 2011
6	Renewable Energy Sources and Emerging Technologies	Kothari, D.P. Singal, K.C., Ranjan, Rakesh	PHI Learning, New Delhi, 2009
7	Environmental Studies	Anandita Basak	Pearson
8	Environmental Science and Engineering	Alka Debi	University Press
9	Coping With Natural Hazards, Indian Context	K. S. Valadia	Orient Longman
10	Engineering and Environment	Edward S. Rubin	Mc Graw Hill Publ.

B. List of Major Equipment/ Instrument

i. Digital sound level meters (to check noise pollution)
ii. Digital air quality meter (to measure air pollution)
iii. Digital handheld anemometer (to measure wind speeds)
iv. Digital hand held pyranometer (to measure solar radiation levels)

C. List of Software/Learning Websites

i. http://www1.eere.energy.gov/wind/wind_animation.html
ii. http://www.nrel.gov/learning/re_solar.html
iii. http://www.nrel.gov/learning/re_biomass.html
iv. http://www.mnre.gov.in/schemes/grid-connected/solar-thermal-2/
v. http://www.mnre.gov.in/schemes/grid-connected/biomass-powercogen/

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. H.L.Purohit** , HOD, Civil Engg. Dept. L.E.College. Morbi
- **Shri. P.A.Pandya**, LCE, Civil Engg. Dept, G.P , Himatnagar

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. J.P.Tegar**, Professor Dept of Civil and Environmental Engg, NITTTR, Bhopal.
- **Dr. Joshua Earnest,** Professor and Head, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

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

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

1. RATIONALE

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

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

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

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.
Laboratory experiments have been set up keeping consistency with the theory so that the students can understand the applications of the laws and principles of physics.

2. LIST OF COMPETENCIES

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

i. Apply principles and concepts of Physics for solving various 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	
3	0	2	5	70	30	20	30	**150**

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

4. DETAILED COURSE CONTENTS

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

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

Unit	Major Learning Outcomes	Topics and Sub-topics
	ultrasonic waves	
Unit– VI	6.1 State Properties Of Light 6.2 Define various phenomena of light 6.3 State Snell's law of refraction. 6.4Explain importance and list applications of nanotechnology in engineering field	**Light and Nanotechnology** Properties Of Light, Electromagnetic spectrum, Reflection, refraction, snell's law, diffraction, polarization, interference of light, constructive and destructive interference (Only definitions), physical significance of refractive index, dispersion of light Introduction to Nanotechnology (Numericals on above topics)
Unit – VII	7.1Define radio activity 7.2Distinguish between Natural & Artificial radioactivity 7.3State relation between Half Life, Average Life & Decay Constant. 7.4Describe properties of Alpha, Beta and Gamma rays.	**Radioactivity** 7**.1 Radioactivity** Definition, Natural & Artificial radioactivity, Units and Laws of Radioactivity, Half Life, Average Life & Decay Constant. 7**.2 Radioactive Rays** Properties and uses of alpha particles, beta particles and gamma rays (Numericals on Above topics)

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
1.	SI Units & Measurements	05	03	02	05	10
2.	Force and Motion	05	02	02	04	08
3.	General Properties of Matter	10	04	06	08	18
4.	Heat Transfer	04	02	02	02	06
5.	Waves and sound	07	04	04	04	12
6.	Light and Nanotechnology	07	03	03	04	10
7.	Radioactivity	04	02	02	02	06
	Total	**42**	**20**	**21**	**29**	**70**

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

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.	Experiment /Practical Exercises
1	1	Linear Measurement by Vernier calipers
2	1	Linear Measurement by Micrometer screw
3	3	Measurement of Surface tension
4	3	Measurement of Viscosity
5	3	Measurement of Young's Modulus
6	3	To determine Force constant with the help of periodic time of oscillations of spring
7	3	Measurement of specific gravity
8	6	To calculate refractive index of material of prism using spectrometer device.
9	4	Joule's mechanical equivalent of heat
10	4	Measurement of co-efficient of thermal conductivity
11	5	To study the relation between the length of a stretched string and the tension in it with the help of a sonometer.
12	6	To calculate SA/V ratio of simple objects to understand nanotechnology

Minimum 8 experiments/practical exercises should be performed from the above list

- Hours distribution for Physics Experiments :

Sr. No.	Description	Hours
1	An introduction to Physics laboratory and its experiments (for the set of first four experiments)	02
2	Set of first four experiments	08
3	An introduction to experiments (for the set of next four experiments)	02
4	Set of next four experiments	08
5	Mini project	06
6	Viva and Submission	02

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:
Laboratory based mini projects:

1. To calculate acoustics of given class room
2. To prepare models of Vernier calipers, micrometer screw gauge and travelling microscope

And many more Teacher guided self learning activities:

1. To prepare a chart of applications of nanotechnology in engineering field
2. To prepare models to explain different concepts

And many more Course/topic based seminars:

1. Seminar by student on any relevant topic

8. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr No.	Author	Title of Books	Publication
1	Sears And Zemansky	University Physics	Pearson Publication
2	Paul G Hewitt	Conceptual Physics	Pearson Publication
3	Halliday & Resnick	Physics	Wiley India
4	G Vijayakumari	Engineering Physics, 4e	Vikas-Gtu Students' Series
5	Arvind Kumar & Shrish Barve	How And Why In Basic Mechanics	Universities Press
6	Ncert	Physics Part 1 And 2	Ncert
7	Giancoli	Physics For Scientists And Engineers	
8	H C Verma	Concepts Of Physics	
9	Gomber & Gogia	Fundamentals Of Physics	Pradeep Publications, Jalandhar

B. List of Major Equipment/ Instrument

1. Redwood's Viscometer
2. Digital Vernier Calipers And . Digital Micrometer Screw Guage
3. Digital Travelling Microscope
4. Joule's Calorimeter
5. Searle's Thermal Conductivity Apparatus
6. Visible Light Spectrometer

C. List of Software/Learning Websites

1. www.physicsclassroom.com
2. www.physics.org
3. www.fearofphysics.com
4. www.sciencejoywagon.com/physicszone
5. www.science.howstuffworks.com

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Dr. S. B. Chhag**, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Rajkot
- **Ku. B. K. Faldu**, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad
- **Shri D. V. Mehta**, Lecturer in Physics, Science Deptt, RCTI, Ahmedabad
- **Shri S. B. Singhania**, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad
- **Dr. U. N. Trivedi,** Lecturer in Physics, Science Deptt, RCTI, Ahmedabad

Coordinator and Faculty Members From NITTTR Bhopal

- **Dr. P. K. Purohit**, Professor, Department of Applied Science, NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basics Engineering Drawing
(Code: 3300007)

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

1 RATIONALE:

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

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

2 LIST OF COMPETENCIES:

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

i. **Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments. .**
ii. **Visualize the shape of simple object from orthographic views and vise versa.**

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	4	6	70	30	40	60	**200**

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

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Sub-topics
Unit – 1 **ENGINEERING DRAWING AIDS**	1.1 Use drawing equipments, instruments and materials effectively.	1.1 Drawing equipments, instruments and materials. (a) Equipments-types, specifications, method to use them, applications. (b) Instruments-types, specifications, methods to use them and applications. (c) Pencils-grades, applications, types of points and applications. (d) Other materials-types and applications.
Unit– 2 **PLANNING, LAYOUT AND SCALLING OF DRAWING**	2.1Follow and apply standard practice as per bureau of I.S. for planning and layout 2.2 Choose appropriate scale factor for the drawing as per given situation	2.1 I.S. codes for planning and layout. 2.2 Scaling technique used in drawing.
Unit– 3 **LINES, LETTERING AND DIMENSIONING**	3.1 Write annotations on a drawing where ever necessary. 3.2Choose appropriate line and dimensioning style for a given geometrical entity.	3.1 Different types of lines. 3.2 Vertical capital and lower case letters. 3.3 Inclined capital and lower case letters. 3.4 Numerals and Greek alphabets. 3.5 Dimensioning methods. (a) Aligned method. (b) Unilateral with chain, parallel, progressive and combined dimensioning.

Unit	Major Learning Outcomes	Sub-topics
Unit– 4 **GEOMETRIC CONSTRUCTION**	4.1 Develop the ability to draw polygons, circles and lines with different geometric conditions.	4.2 Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc. 4.3 Geometric construction related with angle like bisect an angle, trisect an angle, etc. 4.4 To construct polygon. a: Triangle b: Square / Rectangle. c: Pentagon with special method. d: Hexagon with special method. 4.5 To draw tangents. 4.6 Geometric construction related with circle & arc.
Unit–5 **ENGINEERING CURVES**	5.1 Able to draw engineering curves with proficiency and speed as per given dimensions.	5.2 Conic sections. (a) Concept and understanding of focus, directrix, vertex and eccentricity and drawing of conic sections. (b) Using various methods, understand construction of : i. Ellipse. ii. Parabola. iii. Hyperbola. 5.3 Cycloidal Curves(Cycloid, Epicycloid, Hypocycloid) 5.4 Involutes. (a) Involutes of a circle (b) Involutes of a polygon 5.5 Spiral (Archimedean spiral only).
Unit– 6 **PROJECTION OF POINTS, LINES AND PLANES**	6.1 Draw the projection of points, lines and planes with different conditions. 6.2 Find out true shape and size of a inclined line or plane	6.1 Reference planes, orthographic projections. 6.2 Concept of quadrant. 6.3 1st angle and 3rd angle projection and their symbols. 6.4 Projection of points. 6.5 Projection of lines – determination of true length and inclinations for following cases. (a) Line parallel to one or both the plane. (b) Line perpendicular to one of the plane. (c) Line inclined to one plane and parallel to another. (d) Line inclined to both the planes. 6.6 Projection of Planes. (a) Types of planes. (b) Projection of planes parallel to one of the reference planes. (c) Projection of plane inclined to one reference plane and perpendicular to another. (d) Projection of planes inclined to both reference planes. Note : Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.

Unit	Major Learning Outcomes	Sub-topics
Unit– 7 **ORTHOGRAPHC PROJECTIONS**	7. 1 Draw the orthographic views of object containing lines, circles and arc geometry. 7.2 Interpret given orthographic views and to imagine the actual shape of the component.	7.1 Types of projections-orthographic, perspective, isometric and oblique: concept and applications. 7.2 Various term associated with orthographic projections. (a) Theory of projection. (b) Methods of projection. (c) Orthographic projection. (d) Planes of projection. 7.3 Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection. 7.4 B.I.S. code of practice. Note : (1) Problem should be restricted up to four views- Front view/Elevation, Top view/Plan and Side views only. (2) Use First Angle Method only.
Unit– 8 **ISOMETRIC PROJECTIONS**	8.1 Draw the isometric view from orthographic views of object/s containing lines, circles and arcs.	8.2 Isometric axis, lines and planes. 8.3 Isometric scales. 8.4 Isometric view and isometric drawing. 8.5 Difference between isometric projection and isometric drawing. 8.6 Illustrative problems limited to objects containing lines, circles and arcs shape only.

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

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

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

NOTES:

a: If midsem test is part of continuous evaluation, unit number 4, 5 and 6 (For Unit 6, except projections of planes) are to be considered.
b:Ask the questions from each topic as per weightage of marks. Choice of questions must be given from the same topic.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

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

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

		Problem – 4: Construction of involute (polygon). (Refer note c for dimensions).	
5	6	**PROJECTIONS OF POINTS AND LINES:** Draw projection of points-For 10 various conditions.(One problem) Draw projection of lines with different conditions. (Four problems) (Refer note c for dimensions).	06
6	6	**PROJECTIONS OF PLANE:** Draw projection of different planes with different conditions. (triangle, square / rectangular, pentagonal / hexagonal, and circular -one for each). (Four problems) (Refer note c for dimensions).	04
7	7	**ORTHOGRAPHIC PROJECTIONS**: Draw Orthographic projections of different objects. (Two problems) (Draw four views of each object). (Refer note c for dimensions).	08
8	8	**ISOMETRIC DRAWINGS:** Draw isometric drawings from given orthographic views (Three problems) (Refer note c for dimensions).	10
9	All	**PROBLEM BASED LEARNING:** Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book.	-
10	All	**SCHOOL WITHIN SCHOOL:** • Explain at least one problem for construction and method of drawing in sheet to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each batch student. • Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.	-

Notes :–

a: **Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.**

b: Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.

c: The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.

d: The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students' activities are compulsory to be performed.

e: A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.

f: For 40 marks Practical Marks ESE, students are to be assessed for competencies achieved. Students are to be given data for practical ESE to prepare drawings.

7. LIST OF STUDENT ACTIVITIES:

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

Activity No.	Details of student activity
1	Sketch the combinations of set squares to draw angles in step of 15^0.(15^0, 30^0, 45^0, 60^0, 75^0, 90^0, 105^0, 120^0, 135^0, 150^0, 165^0, 180^0).
2	Solve all problems for all sheets number 1 to 8 in sketch book (with dimensions).
3	List the shapes you are observing around you in real life with place/item. (For ellipse, parabola and hyperbola).
4	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
5	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
6	List at least two questions individually which you would like to ask for followings: a: Ellipse. b: Involute of circle. c: Perspective projections. d: Use of geometric constructions. e: Quadrants.

8. SUGGESTED LEARNING RESOURCES:

A. List of Books

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

B. List of Major Equipments/ Instruments :

- Models- full and cut.
- Set of various industrial drawings being used by industries-up dated.
- Drawing equipments and instruments for class room teaching-large size.
- Drawing board-half imperial size.
- T-square or drafter (Drafting Machine).

- Set squires (45^0 and 30^0-60^0)
- Protector.
- Drawing instrument box (containing set of compasses and dividers).
- Drawing sheets.
- Drawing pencils.
- Eraser.
- Drawing pins / clips.
- Roller scale

C. List of Software/Learning Websites:

- rgpv-ed.blogspot.com/2009/02/**engineering-curves**.html
- http://www.slideshare.net/sahilsahil992/conic-section-1819818
- http://www.technologystudent.com/designpro/drawdex.htm
- http://www.engineeringdrawing.org/engg_curves/problem-3-8-engineering-curves/490/
- http://web.iitd.ac.in/~hirani/mel110-part3.pdf
- http://www.studyvilla.com/ed.aspx
- http://www.youtube.com/watch?v=a703_xNeDao
- http://www.youtube.com/watch?v=TCxTP_8ggNc
- http://www.youtube.com/watch?v=JpgFPZILTu8&feature=related
- http://www.youtube.com/watch?v=o1YPja2wCYQ&feature=related
- http://www.youtube.com/watch?v=dJyKV3Ay7vM&feature=fvwrel
- E-learning package from KOROS.
- E-learning package from Cognifront.
- CD with book-Engineering drawing, M.B. Shah-B.S. Rana (Pearson).
- Computer based learning material published by KOROS.

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof.K. H. Patel**. Head Dept.of Mech., Engg., Dr. S. & S. Gandhi College of Engineering and Technology, Surat,

- **Shri.H. R. Sapramer**, Lecturer in Mech. Engineering, Dr. J.N.Mehta Government Polytechnic, Amreli.

- **Prof.A.M. Talsaniya**, Lecturer in Mech. Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.

Co-ordinator and Faculty Memberfrom NITTTR Bhopal

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

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

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

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

1. RATIONALE

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

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

2. LIST OF COMPETENCIES

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

i. **Use MS word software for word processing applications.**
ii. **Use relevant software for drafting and editing 2D entities.**

3. TEACHING AND EXAMINATION SCHEME

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

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

4. DETAILED COURSE CONTENTS

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

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

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

5. SPECIFICATION TABLE (for theory)

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

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.

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

		• Create drawing of three different Doors & Windows (Elevations). • Create drawing of a modern Study table (Elevations). • Create drawing of a modern sofa Set (Plan). • Draw three problems with polar & rectangular Arrays. • Create Top view of a circular and a rectangular Dining Table with six chairs using Polar and Rectangular array concept respectively. • Create plan & elevation of a primary school building. • Create plan & elevation of a medium size modular kitchen.

5	**5**	• Convert above door, windows, Bed, Dinning table into Blocks and use these blocks in following activities.
		• Three problems on 2D entity generation, which involve the use of layers, blocks and hatching.
		• Dimensioning of above figures.
		• Create your own text style (individually)
		• Draw two sheets on template developed at serial no.-3 and Create a plan & elevation of a Duplex Bungalow with following layers:
		  • Basic civil structure
		  • Water supply line
		  • Electric supply
		  • Toilet fittings
		  • Furniture(using blocks)

7. SUGGESTED LIST OF STUDENT ACCTIVITY

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

8. SUGGESTED LEARNING RESOURCES

A. List of Books

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

B. List of Major Equipment/ Instrument

- Computer System
- Printer
- Flat Bed Plotter A4 size

C. List of Software/Learning Websites

- Latest Educational Network version of Auto CAD Software
- MS Office

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. H. L. Purohit**, Head of Civil Engineering Department, L. E. College, MORBI
- **Prof. B G RAJGOR**, HOD, Applied Mechanics Department , B & B Institute of Technology

Coordinator & Faculty from NITTTR Bhopal

- **Prof. Sanjay Agarawal**, Professor & Head Dept. of Computer Engg. & Application, NITTTR, Bhopal
- **Prof. Sharad Pradhan**, Associate Professor, Dept. of Mechanical Engg., NITTTR, Bhopal

BRANCH CODE:06 DIPLOMA PROGRAMME IN CIVIL ENGINEERING										
SEMESTER - II										
COURSE CODE	COURSE TITLE	TEACHING			CREDITS (L+T+P)	EXAMINATION SCHEME				
						THEORY		PRACTICAL		GRAND TOTAL
		L	T	P		ESE	PA	ESE	PA	
1990001	CONTRIBUTOR PERSONALITY DEVELOPMENT	4	0	0	4	70	30	20	30	150
3320003	ADVANCED MATHEMATICS(GROUP-2)	2	2	0	4	70	30	0	0	100
3300008	APPLIED MECHANICS	3	0	2	5	70	30	20	30	150
3300009	APPLIED CHEMISTRY (GROUP-1)	3	0	2	5	70	30	20	30	150
3320601	BUILDING DRAWING	2	0	4	6	70	30	40	60	200
3320602	BASIC MECHANICAL ENGINEERING	0	1	2	3	0	0	20	30	50
3320603	CIVIL ENGINEERING WORKSHOP PRACTICE	0	0	4	4	0	0	40	60	100
TOTAL		14	3	14	31	350	150	160	240	900

ESE : END SEMESTER EXAM
PA: PROGRESSIVE ASSESSMENT

L: LECTURE

T: TUTORIAL
P: PRACTICAL

ESE for Practical includes Viva/Practical exam/Performance etc.
PA for Practical includes TW/Report writing/Seminar etc. related to practices

PA for Theory includes Written Exam /Assignment/Quiz/Presentation or Combination of all with prior intimation to the students at beginning of term.

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Sem-2/ B.E. Sem-2 & 7 / B.Pharm. Sem-2 & 7/ Diploma Engineering Sem-2 & 5 (01-07-2013)

Subject Name: **Contributor Personality Development**
Subject Code: **1990001**

Table-I -For MCA/B.E. / D.E

Table-I						
Teaching Scheme				*Evaluation Scheme*		
Theory (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	***University Exam (E)***	***Mid Sem Exam (Theory) (M)***	***Practical (Internal)***
4	0	0	4	70	30	50

***For the Evaluation Scheme of Diploma Engineering Sem – 2, please refer the link**
http://www.gtu.ac.in/Syllabus/New_Diploma/sem-2/Pdf/3990001.pdf

Table-I –For B.Pharm only

Table-II						
Teaching Scheme				*Evaluation Scheme*		
Theory (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	***University Exam (E)***	***Mid Sem Exam (Theory) (M)***	***Practical (Internal)***
4	0	0	4	80	0	20

Note:

1. **This subject is compulsory.**
2. **4 Credits will be over and above the existing credit structure.**
3. **This subject will be taught by faculty of English. For B. Pharm., the institute will have to nominate one faculty member for the subject.**
4. **In Institutes, where as the load is not managed by the lecturers of English only, please nominate the other faculty for teaching the course of Contributor Personality Development.**

(A) Background

The Contributor Personality Program has been designed keeping in mind the following:

1.0 Technology students should not only be excellently trained in the technological field, they should acquire soft skills if they are to be successful. Every student must also learn about the techniques of effective participation in a group discussion. He/she must learn to prepare his/her resume and he/she should also be groomed for presenting himself/herself at an interview.

2..0 There is a great need to equip students with not only the right skill-sets but also the right mindsets.

3.0 The 'mindsets' needed in today's environment must support both (i) effective action and (ii) values and service oriented behavior.

Effective action without human values can lead to personal benefits for individuals but a long-term cost to both nation and society. Human values without effective action can lead to an inability on the part of the individual to perform and flourish in today's environment.

This combination of effectiveness with human values is crystallized in the concept of "contributor ship".

4.0 Students who adopt and develop the right mindsets early in their professional career are able to bring about a positive and sustainable change in their overall personality.

They are able to grow the right approaches to their peers, seniors, industry, and their own future. They become more responsible and capable of shaping their own lives.

Therefore, the program may be rightly called a "Contributor Personality Development Program".

5.0 Any program of this sort must, in order to be effective, be inspired and guided by a high ideal and principles/ practices flowing from that ideal.

The Contributor Personality Program is guided by the ideals and ideas of Swami Vivekananda – who represented in his leonine personality the highest ideals of human values combined with effective action.

(B) Course Outline

Topics 1-6 relate to the basic axioms or "mental models" that students carry about themselves, about success, careers, contribution, etc. The right mental models are a necessary prerequisite for developing into a Contributor.

Topics 7-12 are 6 core practices that will help a student manifest the ideal of contributor ship in one's life.

Topics 13-15 relate to the students capability to connect into the job-market.

Topic	Course Title
1	**Who is a Contributor** Student develops an appreciation of who the Contributors are and how they fundamentally differ from Non-contributors in their overall approach to work, to other human beings, to society as a whole.

2	**The Contributor's identity** Student develops his/ her own answer to the question "who am I?" The student becomes aware of the fact that Non-contributors usually define themselves in terms of what they have acquired in life (e.g. qualifications, position, years of experience, etc.) while Contributors define themselves in terms of what they will become or accomplish (e.g. capacity to deliver, commitment and ownership of the organization's purpose, etc.).
3	**The Contributor's vision of success** The student explores the meaning of success in his life. Through this exploration, the student is expected to recognize that Contributors have a wider definition of success than Non-contributors. While Non-contributors define success in terms of material success, achievement, external impact, etc., Contributors are able to widen this definition of success to include personal fulfillment, development of self-esteem, ongoing development of personal capabilities etc.
4	**The Contributor's vision of career** The student learns to distinguish between an "acquisitive career" and a "contributive career". An acquisitive career is one in which the career-seeker is focused on acquiring higher position, higher salary, more benefits etc. This preoccupation with selfish interests often damages the individual's career, as well as, damages the organization and society. A contributive career is one where the career-seeker is focused on contributing, with rewards being a by-product of the contributions made.
5	**The scope of contribution** The student learns to perceive that in all type of work, every type of role, there is a possibility of contributing at multiple levels – contributing to self, contributing to organization, and contributing to society. The student also appreciates the difference between "acquisition for self" and "contribution to self" – the former being material acquisition and the latter being conscious development of oneself through the medium of one's career.
6	**Embarking on the journey to contributor ship** The student recognizes the fundamental "building blocks" for becoming a Contributor – the first building block being a shift from a "victim" to being a "creator of one's destiny"; the second building block being acceptance of the ideal of contributor ship; the third building block being the willingness to take full responsibility for one's own development; the fourth building block being the capacity to reflect on one's development and make appropriate modifications.

7	**Design Solutions** When faced with a challenge, the Contributor's first response is: "Can we find a solution?" This is unlike a Non-contributor who may respond to the challenge by trying a little and giving up, blaming others, or finding excuses to cover up the issue. Whereas, the Contributor finds a solution. In other words, the Contributor develops the capacity to find solutions through continuous practice and learning from other Contributors. In this topic, students learn the importance of willingness and ability to find solutions.
8	**Focus on value** What does creating value mean? It means making a positive difference, a tangible impact, a specific contribution to any situation. This positive difference or impact can be in the form of achieving a specific goal, creating a product, creating 'human touch' in a particular interaction, or enhancing one's own capacity, or the capacity of one's colleagues and team- mates. Contributors are therefore extremely result-focused, but the result is measured in terms of value created. In this topic, students learn to clarify the meaning of the word "value" and how value is created in various situations.
9	**Engage deeply** Contributors are instantly distinguished by the way they approach work. They get involved. They are enthusiastic. They go deep into the subject. In short, Contributors love what they do. This is in direct contrast to Non-contributors who want to do only what they love - an approach that seems reasonable until you realize that life and workplaces have so much variety that you may very often be called upon to do tasks that seem unpleasant or boring until you get involved. In this topic, students learn the importance of engaging deeply with whatever work they do – at work, in study, in personal life.
10	**Think in Enlightened Self-interest** Contributors think in Enlightened Self-Interest. In every situation they get into, they find a way to create something good for self and for all at the same time – including team mates, bosses, customers and their organization. Contrasting to this is the mindset of a Non-Contributor. Such a person is only concerned with his/ her own self-interest in a situation. He/she is not concerned about the impact (positive or negative) on the other person. This leads to unpleasant

	situations, broken relationships, unhappy team-mates, subordinates, and bosses, and lower trust in any situation. Students are expected to learn to appreciate the importance of thinking win-win for all stakeholders and also in various situations.
11	**Practice Imaginative Sympathy** One of the unique qualities of Contributors is their ability to appreciate and understand others' life situation, others' mental condition, and others' point of view. How do they do this? They have consciously developed a 'way of thinking' called 'Imaginative Sympathy'. In this way of thinking, they are able to give due importance to the human aspects of a situation, and not just the technical or commercial aspects. But this is not all. Imaginative Sympathy goes beyond looking at the human aspects of the situation. It also means that Contributors are able to anticipate possible interactions or reactions, they are able to take a multi-dimensional view of a situation and they are able to bring about changes or results while taking everybody along with them. Imaginative Sympathy translates itself into active concern for others. Students will learn the importance and consequences of Imaginative Sympathy in a workplace situation.
12	**Demonstrate Trust Behavior** Contributors recognize that they are able to achieve results and make contributions with the help of other human beings. They receive this help if and only if they are trusted and, in turn, trust. Contributors practice trust behavior from very early in their career, thereby building a huge trust balance (like a bank balance) over their career and relationships. The term Trust Behavior may be described as character-in-action. This includes keeping one's word and commitments, staying with a task, acting with integrity in every situation, making sure that there is complete transparency in one's actions and interactions, etc. Students are expected to learn to develop a deep appreciation of trust behavior and how it is practiced.
13	**Resume Building** In this topic, students learn to develop a resume for the job-market. Students will learn to develop both a generic resume and resumes specific to some types of jobs. Students learn about best practices and common errors in developing their resume.

	Most important, students learn to analyze the jobs offered and present themselves in terms of their potential / willingness to contribute to the job.
14	**Group Discussions (GDs)** In this topic, students learn (i) how to participate in a group discussion from the contributor's view-point (i.e. how to speak) (ii) how to contribute to the development of the topic (i.e. what to speak) and (iii) to develop the Contributor's view-point on various GD topics (i.e. how to interpret a topic of discussion from the point of view of a contributor)
15	**Interview Skills** In this topic, students learn about (i) common interview questions and how to develop answers (ii) typical challenges faced in interviews beyond the questions (such as body language, grooming, presentation) (iii) most important, the student learns the importance of trust building and creating confidence in the interview.

(C) Course Plan

The course duration is 48 hours. It can be conducted in sessions of 1 hour each or some of the sessions can be combined as 2 hours each. The course plan is as follows –

Topic 1: Who is a Contributor – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol I) – 1 hour Presentations and Projects	**3 hours**
Topic 2: The Contributor's identity – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol I) – 1 hour Presentations and Projects	**3 hours**
Topic 13: Resume Building – 2 hours for Concepts, Tools, and Techniques – 2 hours for Projects	**4 hours**
Topic 3: The Contributor's vision of success – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol I) – 1 hour Presentations and Projects	**3 hours**
Topic 4: The Contributor's vision of career – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol I) – 1 hour Presentations and Projects	**3 hours**
Topic 5: The scope of contribution – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol I) – 1 hour Presentations and Projects	**3 hours**

Topic 6: Embarking on the journey to contributorship – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol I) – 1 hour Presentations and Projects	**3 hours**
Topic 14: Group Discussions (GDs) – 2 hours for Concepts, Tools, and Techniques – 2 hours for Projects and Practice	**4 hours**
Topic 7: Design Solutions – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol II) – 1 hour Presentations and Projects	**3 hours**
Topic 8: Focus on value – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol II) – 1 hour Presentations and Projects	**3 hours**
Topic 9: Engage deeply – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol II) – 1 hour Presentations and Projects	**3 hours**
Topic 10: Think in Enlightened Self-interest – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol II) – 1 hour Presentations and Projects	**3 hours**
Topic 11: Practise Imaginative Sympathy – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol II) – 1 hour Presentations and Projects	**3 hours**
Topic 12: Demonstrate Trust Behavior – – 2 hours Theory and practice exercises based on Contributor Personality Program Workbook (Vol II) – 1 hour Presentations and Projects	**3 hours**
Topic 15: Interview Skills – 2 hours for Concepts, Tools, and Techniques – 2 hours for Projects and Practice	**4 hours**
TOTAL	**48 hours**

(D) Examination Approach

Total marks: 150. Break-up of marks -

(i) Final exam : 70 marks (equal weightage for topics 1-15)

(ii) Presentations and projects for topics 1-12: 30 marks

(iii) Projects for topics 13-15: 50 marks

(E) Instructional Strategy

1.0 The entire course will use a three-level instructional strategy

Level I: Classroom Explorations

Level II: Projects and Presentations

Level III: Self-study by students

2.0 Level I: Classroom Explorations

1. The Classroom Explorations will be organized around the 'Contributor Personality Program – Study Book'.

   The Study Book may be downloaded by the student from the resource site produced by GTU.

2. The Classroom Explorations involves two kinds of explorations:

   (i) Exploration of key concepts / frameworks such as "contributors vision of success" etc.

   (ii) Exploration of the examples provided in the CPP Study Book.

3. The Classroom Explorations will be supported by Session Guide Sheets available online in the CPP ActivGuide.

3.0 Level II: Projects & Presentations

1. The entire Classroom Exploration process will be supplemented by projects and presentations.
2. Session Guides will provide sample topics for projects and presentations. Individual instructors will be free to develop their own projects/ presentation topics also.
3. This will not only enhance conceptual clarity but also build presentation, public-speaking, report writing, and group discussion skills of the students.

4.0 Level III: Self Study by students

1. Students will be given extensive learning support (upto 400 learning units) in the ActivGuide website. This will include videos, presentations, tests, etc.
2. Students can refer to ActivGuide on their own time through internet.

(F) Reference Material

Basic Study Material

SN	Author/s	Name of Reference	Publisher	Edition
1	Illumine Knowledge Resources Pvt. Ltd. (Downloadable from the internet)	Contributor Personality Program Workbook (Vols I & II)	Illumine Knowledge Resources Pvt. Ltd	Latest
2	Illumine Knowledge Resources Pvt. Ltd. (will be made available to all students on the Internet)	Contributor Personality Program ActivGuide	Illumine Knowledge Resources Pvt. Ltd	Latest

Reference Books

Topic	Course Title	Reference
1	**Who is a Contributor**	1. On Contributors, Srinivas V.; Illumine Ideas, 2011 2. Enlightened Citizenship and Democracy; Swami Ranganathananda, Bharatiya Vidya Bhavan, 1989 3. Personality Development, Swami Vivekananda; Advaita Ashrama
2	**The Contributor's identity**	1. To have or to be, Erich Fromm; Continuum International Publishing Group, 2005 2. The art of being, Erich Fromm; Continuum International Publishing Group, 1992 3. Raja Yoga, Swami Vivekananda; Advaita Ashrama
3	**The Contributor's vision of success**	1. Eternal Values for a Changing Society – Vol IV (Ch 25, 35), Swami Ranganathananda; Bharatiya Vidya Bhavan, 1993 2. Karma Yoga, Swami Vivekananda; Advaita Ashrama
4	**The Contributor's vision of career**	1. Six Pillars of Self Esteem , Nathaniel Branden; Bantam, 1995 2. Mindset: The New Psychology of Success, Carol S. Dweck; Random House Publishing Group, 2007
5	**The scope of contribution**	1. Awakening India, Swami Vivekananda; Ramakrishna Mission, New Delhi, 2011 2. Eternal Values for a Changing Society – Vol IV

		(Ch 35), Swami Ranganathananda; Bharatiya Vidya Bhavan, 1993 3. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007
6	**Embarking on the journey to contributor ship**	1. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama 2. Eternal Values for a Changing Society – Vol IV (Ch 33), Vol III (Ch 19, 21, 30) Swami Ranganathananda; Bharatiya Vidya Bhavan, 1993 3. Lectures from Colombo to Almora, Swami Vivekananda; Advaita Ashrama
7	**Design Solutions**	1. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003 2. How to Have a Beautiful Mind, Edward De Bono; Vermilion, 2004
8	**Focus on value**	1. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004 2. Managing for Results, Peter F. Drucker; HarperCollins, 2009
9	**Engage deeply**	1. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
10	**Think in Enlightened Self-interest**	1. The 7 Habits of Highly Effective People, Stephen R. Covey; Simon and Schuster, 2004 2. Creating Shared Value, Michael E. Porter and Mark R. Kramer; Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
11	**Practice Imaginative Sympathy**	1. Eternal Values for a Changing Society – Vol IV (Ch 8, 10, 23, 35, 37), Swami Ranganathananda; Bharatiya Vidya Bhavan, 1993 2. Eternal Values for a Changing Society – Vol III (Ch 18), Swami Ranganathananda; Bharatiya Vidya Bhavan, 1993
12	**Demonstrate Trust Behavior**	1. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R. Covey, Rebecca R. Merrill, Stephen R. Covey; Free Press, 2008 2. Integrity: The Courage to Meet the Demands of

		Reality, Henry Cloud; HarperCollins, 2009 3. Responsibility at work: how leading professionals act (or don't act) responsibly, Howard Gardner; John Wiley & Sons, 2007
13	**Resume Building**	1. What Color Is Your Parachute? 2012: A Practical Manual for Job-Hunters and Career-Changers, Richard Nelson Bolles; Ten Speed Press, 2011 2. The what color is your parachute workbook: how to create a picture of your ideal job or next career, Richard Nelson Bolles; Ten Speed Press, 2011
14	**Group Discussions (GDs)**	1. Effective Group Discussion: Theory and Practice, Gloria J. Galanes, Katherine Adams; McGraw-Hill, 2004
15	**Interview Skills**	1. What Color Is Your Parachute? 2012: A Practical Manual for Job-Hunters and Career-Changers, Richard Nelson Bolles; Ten Speed Press, 2011 2. The what color is your parachute workbook: how to create a picture of your ideal job or next career, Richard Nelson Bolles; Ten Speed Press, 2011

General References:-

SN	Author/s	Name of Book	Publisher	Edition
1	Swami Ranganathananda	Universal Message of the Bhagavad Gita (Vol 1-3)	Advaita Ashrama, Kolkata	Latest
2	Swami Ranganathananda	Eternal Values for a Changing Society (Vol 1-4)	Bharatiya Vidya Bhavan	Latest
3	Asim Chaudhuri	Vivekananda: A Born Leader	Advaita Ashrama, Kolkata	Latest
4	Swami Vivekananda	Complete Works of Swami Vivekananda (Vol 1-9)	Advaita Ashrama, Kolkata	Latest
5	Swami Vivekananda	Letters of Swami Vivekananda	Advaita Ashrama, Kolkata	Latest

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**.

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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.

7.2Students 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: 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				
				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 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, Explationation 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 pains 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 7.6.4Teflon 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 $Na_2S_2O_3$ 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**				
				Theory Marks		**Practical Marks**		**Total Marks**
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	
2	0	4	6	70	30	40	60	**200**

Legends: L-Lecture; **T** – Tutorial/Teacher Guided 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 .	3.1Concept plan and drawing of residential single and two storied buildings 3.2Concept 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 Introducti on of perspective view and other related terms. 4.2 Perspectiv e 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 Construction al details drawing of buildings	5a. Draw details of parts of buildings 5b. provide scope and provisions for building components and services	5.1Drawings of Parts of buildings such as staircases, chajjas , projections, columns , pier, slabs, footings etc 5.2provisions in drawings for building services such as air conditioning, plumbing, water supply and firefighting, elevators, lifts and escalators etc 5.3Electrification 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 (bunglow)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				
				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 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	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.
	2b. Describe the different types of couplings used in electrical equipment	2.2 Types and applications of couplings in power transmission.
	2c. Follow general safety norms applicable to mechanical engineering equipment	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 Reqrd
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

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

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 posses. He/she should be able to supervise construction activities like brick masonry, woodwork, concerting, welding, finishing etc. including quality control and maintenances 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				
				Theory Marks		Practical Marks		Total 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	• 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	• 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	• 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	• 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	• 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	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. (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 Prepare a brief report on construction activities observed and methods, tools, equipment and materials being used.	**08**
2.	All	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) : (a) Plumbing (b) Welding , fittings, (c) Plastering (d) Flooring (e) POP work Prepare a brief report on construction activities observed and material, tools, equipment and methods being used.	**08**
3.	I, III and V	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): (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.) Prepare a brief report on construction activities observed and material, tools, equipment and methods being used.	**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 dissemble 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 Blan KenBanker	Modern Plumbing	
4	B.S. Raghuwanshi	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,

BRANCH CODE:06 DIPLOMA PROGRAMME IN CIVIL ENGINEERING										
SEMESTER - III										
COURSE CODE	COURSE TITLE	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	P	CREDITS (L+T+P)	THEORY MARKS		PRACTICAL MARKS		GRAND TOTAL
						ESE	PA	ESE	PA	
3330601	BUILDING MATERIALS	3	0	2	5	70	30	20	30	150
3330602	CONSTRUCTION TECHNOLOGY	3	0	2	5	70	30	20	30	150
3330603	HYDRAULICS	3	1	2	6	70	30	20	30	150
3330604	STRUCTURAL MECHANICS	4	1	2	7	70	30	20	30	150
3330605	SURVEYING	3	0	6	9	70	30	60	90	250
TOTAL		16	2	14	32	350	150	140	210	850

ESE : END SEMESTER EXAM
PA: PROGRESSIVE ASSESSMENT

L: LECTURE

P: PRACTICAL

T: TUTORIAL

ESE for Practical includes Viva/Practical exam/Performance etc.

PA for Practicals includes TW/Report writing/Mini Project/Seminar etc. related to practicals

PA for Theory includes Written Exam /Assignment/Tutorial Work/Mini Project/Quiz/Presentation or Combination of all with prior intimation to the students at beginning of term

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: BUILDING MATERIALS (Code: 3330601)

Diploma Programme in which this course is offered	Semester in which offered
Civil / Environment Engineering	THIRD

1. RATIONALE :

The selection of materials for engineering purpose is very much crucial activity. In civil engineering any material of construction, the first and for most necessisity is to know its properties, suitability, strength and durability. Based on this, one can suggest the most suitable material which may fit the exact requirement of the construction items. In this course, the technology related to some of the important and widely used construction materials has been dealt with. This course will enrich civil engineering technicians in performing their jobs with ease and confidence and will be able to select appropriate material for the given item of work on site.

2. COMPETENCY

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

1. To develop the conceptual knowledge in building material.
2. To select appropriate material in given field situation.
3. To develop awareness about latest building 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	
03	00	02	05	70	30	20	30	150

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

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I INTRODUCTION	1. Describe important properties of building materials used in civil engineering construction	1.1 Physical , chemical and engineering properties of building materials. 1.2 Application of building materials 1.3 Alternative materials for the given items in building construction.
Unit – II CLAY PRODUCTS	2 Identify clay based products for use in building constructions based on its properties.	2.1 Classification of clay products 2.2 Types of bricks 2.3 Manufacturing process of bricks 2.4 Test on bricks 2.5 Standard requirements and grades of bricks as per BIS 2.6 Types of clay tiles and its uses
Unit – III ROCKS AND STONES	3. Select appropriate rock / stone products for different uses in building construction	3.1 Classification of rocks 3.2 Rock products 3.3 Characteristics of stones - Structure , texture , strength , gravity , porosity , absorption , hardness , durability, weight.. etc. 3.4 Standard requirement of building stone 3.5 Important stones used in construction with its suitability.
Unit – IV LIME AND POZZOLANA	4.Appreciate the uses of lime and Pozzolana products in building construction	4.1 Sources and classification of Lime 4.2 Uses of lime with specific field situation 4.3 Types of poozzolanic materials 4.4 Advantages of addition of pozzolonic material
Unit – V CEMENT CONCRETE	5 Select appropriate ingredients of proper quality for cement concrete as per required BIS codes	5.1 Types of cement with their specific use 5.2 Grade of cement as per BIS 5.3 Engineering properties of cement 5.4 Field and laboratory test of cement as per BIS 5.5 Methods of storing the cement 5.5 Types of aggregate as per BIS 5.6 Requirements of aggregate as per BIS 5.7 Engineering properties of aggregate 5.8 Test on aggregate
Unit – VI TIMBER	6. Describe timber and wood products and its uses in building construction	6.1 Types of timber 6.2 Uses and application of timber 6.3 Defects in timber and wood 6.4 Seasoning, 6.5 Wood products with specific uses
Unit – VII MISCELLANEOUS CONSTRUCTION MATERIALS	7. Explain different types of advanced building materials and their uses in construction.	7.1 Plastics and PVC 7.2 Ceramic products 7.3 Paints and Varnish 7.4 Materials for damp proofing , water proofing 7.5 Materials for anti termite treatment 7.5 Glass and fiber 7.6 Steel and iron materials 7.7 Materials used for false ceiling 7.8 Asbestose 7.9 Concrete blocks

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	INTRODUCTION	04	03	04	00	07
II	CLAY PRODUCTS	10	03	04	07	14
III	ROCKS AND STONES	04	03	04	00	07
IV	LIME AND POZZOLANAS	04	03	04	00	07
V	MATERIALS FOR CEMENT CONCRETE	10	03	04	10	17
VI	TIMBER	04	00	03	04	07
VII	MISCELLANEOUS MATERIALS	06	00	03	08	11
Total		**42**	**15**	**26**	**29**	**70**

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

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 the competency. Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	Conduct local market survey for different civil engineering materials with respect to applications cost , and. quality	Home assignment
2	II	Perform tests on given sample of brick such as • Soundness • Water absorption • Compressive strength	06
3	III / IV	Idenfication of different types of stones and lime	02
4	II / V	Conduct field test on given sample of brick and cement	04
5	V	Perform lab tests on given sample of cement • Initial and final setting time • Compressive strength	04
6	V	Conduct field test on given sample of fine and coarse aggregate	02
7	IV	Perform test on given sample of fine aggregate • Sieve analysis • Silt and clay content	04
8	VI	Assess the quality of different types of timber and timber products (please arrange to visit nearby saw mill or timber mart)	02
9	VII	Prepare a report regarding collected miscellaneous civil engineering materials with respect to cost , quality and applications..	04
		Total	**28**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- Prepare a list of construction materials adopted in your residence.
- Observe AND WRITE A REPORT OF SELECTION AND USE OF APPROPRIATE BUILDING MATERIAL AT GIVEN CONSTRUCTION SITE

8. SUGGESTED LEARNING RESOURCES

(A) List of Books:

SR. No.	Title of Books	Author	Publications
01	Engineering Materials	Dr. Janardan Jha	Khanna
02	Materials of Construction	A K Roy Chaudhary	
03	Building materials	S. K. Duggal	New Age International
04	Engineering Materials	Vazirani and Chandola	
05	Engineering Materials	S C Rangwala	Charotar
06	Construction Materials	D.N. Ghose	TATA Mc Graw Hill
07	Civil Engineering materials	TTTI ,Chandigarh	TTTI

Handbooks

SR. No.	Title	Author
01	PWD Handbooks for -Materials - Masonry -Building -Plastering and Pointing - Foundation	All India Council for Technical Education
02	Practical Civil Engineering Handbook	Khanna

BIS/ International Codes of Practice:

SR. No.	Title
01	National Building Code

B. List of Major Equipment/Materials

1. UTI/ Compression testing machine capacity – 40 tonne
2. Vicat apparatus for cement testing
3. Sets of sieve and sieve shaker
4. Abrasion testing machine with balls
5. Impact machine
6. Weighing machine of required capacity.

C List of Software/Learning Websites

01	Khan academy
02	Civilengineering.org

9. INSTRUCTIONAL STRATEGIES

Lecture ,Charts, PPt, Assignments, Demonstration, Field Visits.

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. Mr. Bhavesh V, Modi (Principal) BVPIT(DS) Umrakh
2. Mr. V.K.Shah (Head) Dr.S&S.Gandhi College, Surat
3. Mr. A.K.Popat (Sr.Lect) Government Polytechnic, Dahod

Coordinator and Faculty Members from NITTTR Bhopal

1. Dr.V.H.Radhakrishnan PROFESSOR , DEPARTMENT OF CIVIL & ENVIORNMENT ENGINEERING
2. Dr. A K JAIN , PROFESSOR , DEPARTMENT OF CIVIL & ENVIORNMENT ENGINEERING
3. Prof J.P.Tegar, PROFESSOR AND HEAD , DEPARTMENT OF CIVIL & ENVIORNMENT ENGINEERING

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: CONSTRUCTION TECHNOLOGY
(Code: 3330602**)**

Diploma Programme in which this course is offered	**Semester in which offered**
Civil/Transportation Engineering	THIRD

1. RATIONALE

Construction technology is a core subject in civil engineering. This subject is intended for gaining useful knowledge with respect to facts. Concepts, principles and procedures related to building construction system so that student can effectively able to execute building construction work and carry out repairs and maintenance of existing building with safety and quality in construction.

2. COMPETENCY :

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

(i) Understand different types of technology used in construction works.

(ii) **Students are able to appreciate various types of construction machineries, formworks and safety measures involved in construction works.**

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**	
3	0	2	5	70	30	20	30	**150**

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

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I INTRODUCTION	1a. Appreciate various types of civil engineering structures. 1b. Develop concept of various types of components of building.	1.1 Introduction of various Civil Engineering structures 1.2 Functions of various components of building and other structures
Unit – II FOUNDATIONS	2a. Know type of foundation and its suitability to different type of soil. 2b. Explain the failure of foundation and remedial measures	2.1Classification and types of foundations 2.2 Selection of the suitable type of foundation for required structure and as per situation 2. 3Foundations in black cotton soil, loose soils etc. 2.4Timbering in trenches 2.5Failures in foundation Precautions & remedial measures
Unit – III BUILDING CONSTRUCTION	3a. Develop concept of different types of brick and stone masonry. 3b. Explain construction procedure. 3c. Explain different types of concrete and its type. 3d..Develop concept about various type of form work.	3.1 Brick and stone masonry 3.2 Selection of suitable type of masonry 3.3 Construction procedures. 3.4 Ingredients of concrete. 3.5 Production of concrete, transportation, placing, compaction, curing 3.6 Concrete in different situations viz. hot weather, cold weather, under water etc. 3.7 Purpose & types of scaffolding and centering 3.8 Suitability of scaffolding as per situations and type of structures. 3.9 Erection of centering for different component
Unit – IV BUILDING ITEMS	4a. Appreciate the different types of building items. 4b. Explain various construction activity like damp proof course (D.P.C) and anti termite treatment. 4c. Able to know the different types of plumbing and electric fittings and laying procedure.	4.1 Plastering & pointing- its purpose, various types, construction procedures, advantages and disadvantages, suitability of each. 4.2 Damp proof course (DPC) 4.3 Anti-termite measures and treatments 4.4 Construction joints-need and materials used. 4.5 Plumbing and electrification- various types of fittings and laying procedure.
Unit – V CONSTRUCTION MACHINARY	5a. Able to introduce different types of construction machinery, its features and Working.	5.1Purpose, advantages and disadvantages. 5.2 Machineries used for earthwork and for other construction works. Mortar – Types & specific uses 5.2.1Their details, special features, suitable uses, specifications.

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – VI BUILDING MAINTENANCE AND SAFETY MEASURES	6a. Describe concept about the maintenance work , know causes, types and its remedial measures 6b. Understand about the important laws/norms and act of safety. 6c. Explain precautions and precautionary measures of safety.	6.1 Purpose, need, importance, methods. 6.2 Causes and types of defects in buildings. 6.3 Preparation of report on maintenance work. 6.4 Remedial measures and execution procedure of any one type of building maintenance work. 6.5 Importance of various Laws / Norms / Regulations / Acts for safety. 6.6 Precautions and precautionary Measures. 6.7 Post-accident procedures. Give Examples.

5 SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**INTRODUCTION**	4	04	02	00	06
II	**FOUNDATIONS**	6	04	02	04	10
III	**BUILDING CONSTRUCTION**	10	02	08	08	18
IV	**BUILDING ITEMS**	8	02	06	06	14
V	**CONSTRUCTION MACHINARY**	6	00	06	04	10
VI	**BUILDING MAINTENANCE AND SAFETY MEASURES**	8	02	04	06	12
Total		**42**	**14**	**28**	**28**	**70**

6 SUGGESTED LIST OF EXERCISES/PRACTICAL

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 the competency. Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1		**Sketches for**	10
	II	Foundations – various types, Layout plan, timbering in trenches	
	III	Brick and stone masonry work	
	III	Scaffolding works and cantering	
	IV	Different types of Damp Proof Course	
2		**Field work**	
	II	Exercise for layout using foundation plan of a given building on site	8
	III	Exercise for carrying out different types of masonry	
3		**Field Visit**	**10**
		Arrange field visit at construction site where the following works are in progress	
	II	(a) Excavation for foundation • Describe machinery involved • Describe types of structure • Precautions and safety measures	
	III	(b) Concreting • Grade of concrete • Admixtures and its effects • Batching of concreting • Transporting, placing and curing of concrete	
	III	(c) Masonary • Types of masonary • Types of mortar and ratio • Types of bond and construction procedure • Methods involved in quality control of masonary work	
	IV	(d) Flooring • Types of flooring • Proportion and procedure of flooring • Anti termite treatment	
	IV	(e) Plastering & Pointing • Types of mortar and ratio • Types of plastering work and its suitability • Types of pointing work and its suitability • Quality check for plastering and pointing work	
		Total	28

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.

8. SUGGESTED LEARNING RESOURCES

A. List of Books:

S. No.	Title of Books	Author	Publication
1	Building Construction	B.C. Punmia	
2	Building Construction	Shushil Kumar	
3	Building Construction	S. C. Rangwala	
4	Building Construction	Sharma And Kaul	
5	Construction Planning, Equipments and methods	R. L. Perurifoy	

B. List of Major Equipment/Materials

C List of Software/Learning Websites

9. INSTRUCTIONAL STRATEGIES

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. Mrs.Vandana P. Pandya, Head, Civil Deptt., Parul Polytechnic Institute , Limda, Vadodara

2. Mr. Chintan D. Bhatt, Lecturer, Civil Deptt., Tolani F.G.Polytechnic, Adipur

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

HYDRAULICS
(Code: 3330603)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering, Environmental Engineering, Transportation Engineering	3rd semester

1. RATIONALE

It is necessary for civil, environmental and transportation engineers to understand the behavior of fluid flow in different conditions in pipes, channels, canals, notches, weirs etc. In the field these conditions are very common and diploma passouts has to solve problems related to water seepage and discharge.

The basic knowledge about hydraulics and fluid mechanics will be useful in subjects like Irrigation, Water Resources Management and Public Health Engineering. In this course, basics of hydraulics and its application oriented content has been kept with a focus that students should be able to solve practical problems. Competencies developed by this course would therefore be useful for students while performing his/her job in the field of Water resources / Irrigation/PHE and Environment Engineering.

2. COMPETENCIES (Programme Outcomes as per NBA Terminology)

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 **Measure the pressure and flow of water in different conditions using various measuring devices**

ii **Compute discharge and loss of head through pipes, open channels, notches and other hydraulic structures.**

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	1	2	6	70	30	20	30	

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

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Introduction, Pressure and pressure measurement	1a.Explain the terms associated with Hydraulics 1b.Clarify different properties of liquid 1c. Describe different types of pressure and methods of measurement	1.1 Technical terms used in Hydraulics – Fluid Mechanics, Hydrostatics, Hydro-kinematics, Hydro-Dynamics-Ideal and Real Fluid. 1.2 Properties of liquid – Viscosity-Density-Specific Gravity-Surface Tension-Capillarity Vapour Pressure-Elasticity. 1.3 Various types of pressure – Atmospheric Pressure-Gauge Pressure-Absolute Pressure Vacuum Pressure-Separation Pressure/s 1.4 Measurement of pressure/s by different methods 1.5 Measurement of difference of pressure using "U" tube Manometer and inverted "U" tube Manometer
Unit – II Hydrostatics	2a Explain the Relationship between pressure and depth of liquid 2b.Compute total Pressure and Centre of pressure	2.1 Relationship between pressure and depth of liquid 2.1.1 Pressure diagram for different conditions 2.2 Total pressure and center of pressure 2.2.1 Computation of Total Pressure and depth of centre of pressure
Unit – III Hydro kinematics & Hydrodynamics	3a. Explain different types of flow 3b. Derive Continuity Equation 3c. Explain different kinds of energy 3d Apply Bernoulli's theorem to measure the pressure and Discharge.	3.1 Types of flow - Laminar --Turbulent --Uniform --Non-uniform –Steady--Un-steady –Rotational and irrotational --One, Two and Three Dimensional flow 3.2 Reynold's number 3.3 Continuity Equation 3.4 Types of Energy – Potential, Pressure and kinematics 3.5 Bernoulli's Equation and its applications. 3.6 Momentum Equation
Unit – IV Hydraulic icient, notches and weirs	4a. Compute different Hydraulic Coefficient for different types of orifice 4b. Identify types of Notches and weirs. 4c. Calculate discharge through notches and weirs.	4.1 Definition and types of orifice 4.2 Various Hydraulic Coefficient and its relation - Coefficient of Contraction, Velocity, Discharge. 4.3 Types of notches and weirs 4.4 Computation of discharge through notches 4.4.1 Rectangular Notch 4.4.2 V -Notch. 4.5 Computation of discharge through weirs 4.5.1 Discharge through narrow crested and broad Crested weir. 4.5.2 Discharge through Cipolletti weir.
Unit – V Flow through pipes	5a. Explain Energy (Head) losses 5b. Draw Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) 5c. Design Pipeline	5.1 Characteristics of flow through pipes 5.2 Major and Minor Energy (Head) losses in pipe Flow- frictional loss, loss of head at entry , exit, Sudden enlargement and contraction and at bend. 5.2.1 Computation of major head by Darcy Weisbach Equation. 5.3 Hydraulic Gradient Line (HGL) and Total Energy

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	network using formula and nomogram	Line (TEL) 5.4 Design of Pipeline-using formula & Nomogram
Unit – VI **Flow through Open Channel**	6a. Analyse uniform flow 6b. Understand Specific Energy Diagram 6c. Describe Procedure for measuring Velocity of flow 6d. Calculate discharge.	6.1 Characteristics of open channel flow 6.1.1 Comparison of pipe flow and channel flow. 6.1.2 Field examples of open channel 6.2 Analyse uniform flow 6.2.1 Froud's number, 6.2.2 Hydraulic mean depth- concept & computation 6.2.3 Use of Chezy's and Manning's formulae. 6.2.4 Most economical sections of channel 6.2.4.1 Rectangular, Trapezoidal and circular shapes. 6.3 Specific Energy Diagram 6.4 River Gauging 6.4.1 Measurement of mean velocity using surface float, velocity rod and current meter.

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction**,** Pressure and pressure measurement	7	3	4	4	11
II	Hydrostatics	5	3	4	-	7
III	Hydro kinematics & Hydrodynamics	8	2	7	7	16
IV	Hydraulic coefficient, notches and weirs	8	2	5	7	14
V	Flow through pipes	7	3	4	4	11
VI	Flow through Open Channel	7	3	4	4	11
Total		**42**	**16**	**28**	**26**	**70**

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

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

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (Course Outcomes in psychomotor and affective domain) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of Programme Outcomes/Course Outcomes in affective domain as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

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S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA terminology)	Apprx. Hrs. Required
1	I	Measure the pressure of water in pipe using (a) Piezometer (b) Different types of manometers	4
2	III	Determine discharge through a given venturimeter.	4
3	IV	Determine coefficient such as Cc, Cv, and Cd for different types of orifices	4
4	IV	Compute coefficient of discharge for V notch and Preparation of calibration graph for interpolation and extrapolation	4
5	IV	Compute coefficient of discharge for Rectangular notch and Preparation of calibration graph for interpolation and extrapolation	4
6	V	Determine loss of head in various diameter of pipes and effect of material of pipe on loss of head	4
7	III	Demonstrate functioning of Bernoulli's Appratus	2
8	III	Demonstrate use of Reynold's number	2
		Total	**28**
		TUTORIALS	
1	I	Solve numerical problems based Pressure measurement	**2**
2	II	Solve numerical problems based on Hydrostatics	**2**
3	III	Solve numerical problems based on Hydrodynamic and Hydro kinematics	**4**
4	IV	Solve numerical problems based on Hydraulic coefficient, notches and weirs	**2**
5	V	Solve numerical problems based on Flow through pipes	**2**
6	VI	Solve numerical problems based on Flow through Open Channel	**2**
		Total	**14**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

1. Student will visit nearby Canal Structure and Submit report consisting flow data, cross sections, hydraulic data etc. for the same.
2. Student will Survey an industry / Department for handling or using pressure measuring devices.

3. Student will carry out market survey for pipes of different materials.

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Use demonstration, video/animation films field/industry visit for explaining complex/abstract concepts of Hydraulics.

ii. This course requires lot of practice on numerical. Students may be asked to solve the numerical during lecture periods and tutorial periods, in addition home assignments may be given. To avoid copying by students each problem must have different parameters for each student or at least there may be five to six sets of problems with different values., In other words each student will get same problem but with varied parameters. (Values of pressure, volume, flow, force, distance, speed etc may be different for each student)

9. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
	Hydraulics, Fluid Mechanics and Hydraulic machine	S.Ramamrutham	Dhanpat Rai
	Hydraulics, Fluid Mechanics and Hydraulic machine	R. S. Khurmi	S.Chand
2	Hydraulics, Fluid Mechanics and Hydraulic machine	R K Bansal	S.Chand
3.			
4.	Fluid Mechanics	A K Jain	Khanna Publishers
5.	Journal of experiments in Hydraulics	Rao and Hasan	New Height
6.	Hydraulic laboratory	Rao and Hasan	New Height
7.	Fluid Mechanics	Dr.M.L.Mathur	Std.Publication
8	Fluid Mechanics & Hydraulics	S.C.Gupta	Pearson Education
9.	Hydraulics and Hydraulic machine	Prof.V.P.Priyani	Charotar Publication

B. List of Major Equipment/Materials

1. Piezometer 2. U-Tube Manometer 3. Ventutrimeter 4. V-notch
5. U-notch 6. Pipes- PVC, G.I., 7. Measuring Tank 8. Stop Watch
9. Gauge 10. Mercury

Or Hydraulic Bench equipped with all above equipments

C List of Software/Learning Websites

i. www.waterbouw.tudelft.nl/
ii. www.learnrstv.com
iii. www.shiksha.com , IIT, Roorkee
iv. www.blackwellpublishing.com
v. www.hrpwa.org
vi. www.creativeworld9.com
vii. nptel.iitm.ac.in

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. P.A. Pandya,** Lecturer in Civil Engg. Deptt. – Govt. Polytechnic, Himatnagar
- **Prof. H. R. Mehta**, Lecturer in Civil Engg. Deptt. – C. U. Shah Polytechnic, Surendranagar
- **Prof. Anil K. Belani**, Lecturer in Civil Engg. Deptt. – Tolani F. G. Polytechnic, Adipur
- **Prof. Rina K. Chokshi**, Head, Civil Engg. Deptt. – Parul Institute of Engg. And Tech. (Diploma Studies), Limda, Vadodara.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. A K JAIN ,** Professor , Department of Civil & Environmental Engineering
- **Prof J. P. Tegar,** Professor and Head Department of Civil & Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Structural Mechanics (Code: 3330604)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering /Environment Engineering/Transportation Engineering	THIRD SEMESTER

1. RATIONALE

The Applied Mechanics in Second Semester was taught to study the external effects on the body due to action of force system. The behaviour of structure under different loading conditions is needed to understand so that design can do by the engineer. In this course, analysis of determinate structures under action of transverse loading, along with, analysis of members under direct loading is to be studied. Analysis of Industrial Trusses is also incorporated to give an idea of typical structure to the students. The Structural Mechanics-I, will enable the student to analyse Steel & Concrete Structures used in Civil Engineering construction.

2. COMPETENCY

Calculate various structural material properties under direct loading condition
Analyse Statically Determinate structures like Beam, Column & Truss.

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	
04	01	02	07	70	30	20	30	**150**

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

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I **DIRECT STRESS & STRAIN**	1a. Calculate Material Properties Under Longitudinal & Lateral Loads 1b. Analyse Composite & Compound Sections 1c. Compute Strain Energy under Different Types of Loading	1.1 Different types of Structures and Loads 1.2 Direct Stress , linear Strain , Hook's Law Numerical Problems on Direct Stress & Linear Strain . Stress Strain curve of Mild Steel . Modulus of Elasticity. Yield , Breaking & Ultimate Stress and factor of Safety along with numerical problems 1.3 Lateral Strain and Poission's ratio with numerical problems 1.4 Basics Concepts of Shear Stress , Shear Strain & Shear Modulus 1.5 Bulk Modulus , volumetric Strain along with numerical Problems 1.6 Differentiate between Sudden , Gradual & Impact Loads Define Strain Energy , Proof Resilience for Sudden , Gradual & Impact Load along with numerical problems
Unit – II **MOMENT OF INERTIA**	2 Compute Moment of Inertia of Symmetric & asymmetric structural sections	2.1 Moment of Inertia & its Importance 2.2 Parallel & Perpendicular Axis Theorem 2.3 Formula of Moment of Inertia of solid & Hollow sections like Rectangle , Triangle , Circle 2.4 Moment of Inertia about C.G for I section , H section , Channel Section , Angle Section , T Section and Built up Section having flange plates to I & H Section and of Double Channels back to back & toe to toe
Unit – III **S.F & B.M IN BEAM**	3 Draw Shear Force & Bending Moment Diagram for Statically Determinate Beams	3.1 Statically Determinate Beam Like Cantilever , Simply Supported & Over Hang Beam 3.2 Shear Force and Bending Moment and its relationship 3.3 Sagging & Hogging Bending Moment and its importance 3.4 Point of Contra-flexure & its importance 3.5 S.F & B.M Diagram for Cantilever , Simply Supported & Over Hang Beam subjected to Point Load and/ or U.D.L
Unit – IV **BENDING & SHEAR STRESSES IN BEAM**	4 Apply Bending Theory. 4.1 Calculate Bending Stress 4.2 Draw stress distribution diagram	4.1 Bending Theory Equation Bending stress , Sectional Modulus , Nutral Axis Apply Bending theory to Statically determinate beams having rectangular or circular section 4.2 Shear Stress equation Shear Stress Distribution Diagram for

Unit	Major Learning Outcomes	Topics and Sub-topics
		Solid & Hollow Rectangular And Circular Section Apply shear Stress Equation & Draw Shear Stress Distribution Diagram for I , H , T , Channel & Angle Section
Unit – V **ANALYSIS OF TRUSS**	5. Analyse Statically Determinate Trusses	5.1 Perfect & Imperfect Truss 5.2 Various trusses for different spans and application 5.3 Analysis of Triangle , Howe , North Light & Fan trusses under Panel Point Loads using Graphical & Method of Joint
Unit – VI **COLUMN & STRUT**	6 Calculate Load carrying Capacity of Columns & Struts	6.1 Column & Strut 6.2 Short & Long Column 6.3 End Condition of Column and effective Length of Column & Modes of Failure in column 6.4 Radius of Gyration , Slenderness Ratio 6.5 Euler's Crippling Load 6.6 Rankin's load / Buckling Load of Column

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**DIRECT STRESS & STRAIN**	10	02	02	06	10
II	**MOMENT OF INERTIA**	06	02	00	08	10
III	**S.F & B.M IN BEAM**	14	04	00	16	20
IV	**BENDING & SHEAR STRESSES IN BEAM**	10	04	00	06	10
V	**ANALYSIS OF TRUSS**	10	04	02	06	12
VI	**COLUMN & STRUT**	06	02	02	04	08
Total		**56**	**18**	**06**	**46**	**70**

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

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 the competency. Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	Conduct Tension test on a given sample of mild steel and draw Stress Strain Curve	04
2	I	Determine Young's Modulus of wire of given material	02
3	I	Calculate impact value of mild steel using IZOD impact test apparatus	02
4	I	Calculate impact value of mild steel using Charpy impact test apparatus	02
5	I	Solve at least six problems pertaining to Unit – I	02
6	II	Work out Moment of Inertia of Fly Wheel	02
7	II	Solve Four Problems of Moment of Inertia	02
8	IV	Solve at Least Eight numerical Problems of Unit- IV	02
9	V	Analyse Truss using Graphical Method (At least THREE Trusses) and verify using analytical method.	06
10	VI	Demonstrate End Conditions of Column using suitable model/example	02
11	VI	Solve Least Six numerical Problems pertaining Unit - VI	02
		TOTAL	**28**
TUTORIAL			
1	III	Solve few problems of UNIT III and give similar exercises at least 12 to the students to practice	08
11	V	Solve PROBLEMS OF UNIT V and ask students to practice for at least 04 problems based on Method of Joint	06
		Total	**14**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

1. Visit Industrial Shed and submit a brief report of Different Types of Trusses and its Components are in use .
2. Survey the market and prepare a list of various type of Structural Steel Sections commonly used.

8. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1.	Strength of Material & Mechanics of Structures	Dr. B C Punamia	

2.	Strength of Material	S RAMAMURTHAN	
3.	Strength of Material	Timo Shanku	
4.	Theory of Structures	R S KHURMI	

B. List of Major Equipment/Materials

1. Universal Testing Machine
2. SEARL'S Apparatus to find Young's Modulus
3. Working Model of End Conditions of Column
4. IZOD Impact Test Apparatus
5. CHARPY Test Apparatus
6. FLY WHEEL

C List of Software/Learning Websites

1. nptel.iitm.ac.in/courses/.../IIT.../lecture%2023%20and%2024.htm
2. en.wikipedia.org/wiki/Shear_and_moment_**diagram**
3. *www.freestudy.co.uk/mech%20prin%20h2/**stress**.pdf*
4. *www.engineerstudent.co.uk/**stress_and_strain**.html*
5. *https://www.iit.edu/arc/workshops/pdfs/**Moment_Inertia**.pdf*

9. INSTRUCTIONAL STRATEGICS:

Subject Teacher may use Lecture, demonstration, video films field/industry visit as instructional strategies.

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. **PROF. B G RAJGOR, H.O.D, APP. MECH. , BBIT , V V NAGAR**
2. **PROF. K VENKATESHWARLU , H.O.D, APP. MECH. , TFG POLYTECHNIC , ADIPUR**
3. **PROF. J H GABRA , I/C H.O.D , APP. MECH. , G.P , GODHARA**

Coordinator and Faculty Members from NITTTR Bhopal

1. **Dr. A K JAIN , PROFESSOR , DEPARTMENT OF CIVIL & ENVIORNMENT ENGINEERING**
2. **Prof J.P.Tegar, PROFESSOR AND HEAD , DEPARTMENT OF CIVIL & ENVIORNMENT ENGINEERING**

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

SURVEYING
(Code: 3330605)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering, Environmental Engineering, Mining Engineering, Transportation Engineering	3rd Semester

1. RATIONALE

Before development and planning process for any civil engineering or mining project, at first field survey of that area is carried out and various type of survey maps are prepared. These maps and drawing are used for taking various decisions regarding the planning, designing, estimation, execution and construction process etc.

The diploma pass outs/technicians should therefore know the various methods and instruments required for surveying. They should also have the skill and information to handle and operate the needed survey instruments. It is also important for them to be well aware about the use of advance surveying instrument such as total station, GPS and related software to enhance the knowledge and abilities required for surveying in field.

This course is therefore one of the core courses required for civil, mining, environmental and transportation engineers. Students are advised to master the desired skills which are expected from them for survey related works.

2. COMPETENCIES (Programme Outcomes according to NBA Terminology):

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

1. **Carry out civil engineering survey to prepare drawings & maps**
2. **Interpret the drawings and maps for calculating different physical quantities like length, area, volume, elevations etc.**

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	
3	0	6	9	70	30	60	90	250

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

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I **Introduction and Scale**	1.a Explain the basics of surveying. 1.b Apply various types of scale as per needs.	1.1 Definitions 1.2 Objective and uses of surveying 1.3 Plain and Geodetic Survey 1.4 Classification of Survey 1.5 Principals of Survey 1.6 Types of Scale and selection of scale 1.7 Construction of diagonal scale
Unit – II **Chain Survey**	2.a Explain procedure for linear measurements. 2.b Prepare drawing as per recorded measurements in the field book.	2.1 Introduction 2.2 Instruments used in chain survey Metric Chain, Tapes, Arrow, Tapes, Ranging rod, Offset rod, Open cross staff, optical square 2.3 Technical terms related with chain survey Survey Station, Base line, Check line, Tie line, Offset, Tie station 2.4 Method of Chaining 2.5 Errors in length due to incorrect length and related problems. 2.6 Obstacles in chaining 2.7 Ranging -Direct Ranging & Indirect Ranging 2.8 Types of offsets -Perpendicular & Oblique 2.9 Location Sketch of survey station and running measurements of building. 2.10Conventional Signs 2.11Recording of measurements in a field book
Unit – III **Compass Survey**	3.a Explain procedure for angular measurements. 3.b Record bearing accurately 3.c Prepare drawing as per recorded and corrected measurements of bearings with chain and compass survey	3.1 Introduction - Triangulation Survey & Traversing 3.2 Components of Prismatic Compass 3.3 Functions of different parts of prismatic compass 3.4 Differentiate Prismatic and Surveyor compass 3.5 Method to use Prismatic Compass 3.6 Technical Terms - True Meridian & Bearing, - Magnetic Meridian & Bearing, - Arbitrary Meridian & Bearing, - Dip of Magnetic needle - Declination, - Fore Bearing & Back Bearing 3.7 Whole Circle Bearing System and

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
		Reduced Bearing System & examples on conversion of given bearing to another bearing (from one form to another) 3.8 Method of finding included angles from bearings & examples 3.9 Local attraction and Closing error with relevant examples 3.10 Errors in compass survey and elimination of errors
Unit – IV **Levelling**	4.a Explain different methods and their procedure for levelling. 4.b Explain procedure for using the instruments and levelling staff and entering level in proper table 4.c Carryout corrections for errors in levelling records if any 4.d Prepare contour maps by calculating Reduce level as per data book.	4.1 Introduction 4.2 Basic terminology related with levelling like Level surfarces,Horizontal & vertical surfaces, Datum, Bench Marks, Reduced Level, Rise, Fall, Line of collimation, Axis of Telescope, Axis of bubble tube, Station, Back sight, Fore sight, intermediate sight, Change point, Height of instruments, Focusing ans parallax,etc. 4.3 Types of Level Dumpy Level, Tilting Level, Auto Level, Digital Level 4.4 Components of Dumpy Level with neat sketch 4.5 Types of Levelling Staffs Self-reading staff & Target staff 4.6 Temporary adjustment of Level 4.7 Classification of Levelling - Simple Levelling, Differential Levelling, Fly Levelling, Profile Levelling, Reciprocal Levelling and Precise Levelling 4.8 Examples & methods of finding out the R. L. in Level Book by H.I. Methods and Rise & Fall Methods with necessary check. 4.9 Correction for Curvature and refraction and related examples 4.10 Errors in Levelling 4.11 Contour 4.12 Uses of contours 4.13 Characteristics of contours 4.14 Methods of Contouring

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
		4.15 Interpolation of contours 4.16 Preparing drawing & estimation of gradients 4.17 Calculation of capacity of reservoirs & related examples
Unit – V **Plane Table Survey**	5.a Explain procedure for plain table survey 5.b Prepare drawing as per field conditions and requirments. 5.c Find the areas from prepared drawings	5.1 Introduction to Plane Table surveying 5.2 Equipments and accessories of plane table survey 5.3 Advantages and disadvantages of plane table survey 5.4 Orientation of plane table survey 5.5 Methods of setting up plane table over the station 5.6 Points to be kept in mind during plane table surveying 5.7 Errors in plane table surveying
Unit – VI Introduction to Global Positioning System (GPS)	6.a Appreciate the applications of GPS in civil engineering	6.1 Introduction to GPS 6.2 Maps & types of digital map 6.3 Fundamentals of GPS 6.4 Uses of GPS 6.5 GPS Receivers(Hand Held GPS Receivers) 6.6 Field procedures of GPS 6.7 Observations and applications in Civil Engineering

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction and Scale	04	00	04	03	07
2	Chain Survey	06	02	02	06	10
3	Compass Survey	08	04	04	06	14
4	Levelling	14	04	10	12	26
5	Plane Table Survey	06	03	03	03	09
6	Introduction to Global Positioning System (GPS)	04	02	02	00	04
Total		**42**	**15**	**25**	**30**	**70**

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

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

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills **(Course Outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies (Programme outcomes). Following is the list of practical exercises for guidance.

Note: Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those programme outcomes/course outcomes related to affective domain.

Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA terminology)	Approx. Hrs. Required	
		For lab./Field	For Project
II and III	Perform ranging and chaining operations in different field conditions.	**04**	
	Perform chaining and ranging where different types of obstructions are present.	**04**	
	Take offsets (Perpendicular and Oblique) in different filed conditions.	**04**	
	Perform temporary adjustments of Prismatic Compass	**04**	
	Determine bearings of different survey lines by using Prismatic Compass	**04**	
	Determine included angles from measured bearings.	**04**	
	Project in chain, tape and compass Survey: survey the given area /field and prepare the drawing sheet - Minimum Five Station		**08**
IV	Perform temporary adjustments of Level	**04**	
	Take and record the level reading in the level book	**04**	
	Determine Reduced level using both methods by applying checks	**04**	
	Carry out fly levelling in different field conditions.	**04**	
	Carry out profile levelling in different field conditions	**04**	
	Project in Profile Levelling: Carry out the levelling survey on an undulated ground and prepare the drawing sheet (minimum area under survey 100m X 60 m)		**12**
V	Set plane table by different orientation methods on given survey station	**04**	
	Project in Plane Table Survey: - Prepare map of open vacant land (min 1000 sq.m) using any plane table method		**12**
VI	Demonstrate use of Global Positioning System (GPS)	**04**	**--**
	Total(84)	**52**	**32**

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.

	Unit No.	Student Activities
1	I	Prepare a list of tools and equipment used in chain and Tap survey
2	II	Interpret the old map/drawing prepared using compass survey
3	III	Practice for temporary adjustment of Level
4	IV	Read and interpret the old field book data of fly levelling survey
5	V	Handle the GPS under supervision of teachers

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

a. Lecture cum demonstration of handy tools of surveying
b. Field demonstration
c. Hands on experience
d. Case study of old survey maps and contours

9. SUGGESTED LEARNING RESOURCES

A. List of Books:

S. No.	Title of Books	Author	Publication
1	Surveying and levelling Vol-I	T. P. Kanetkar & S. V. Kulkarni	Puna Vidyarthi Griha Prakashan
2	Surveying and Levelling Vol-I	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd.
4	Surveying and Levelling Vol-I	Hussain & Nagrani	S. Chand New Delhi
5	Surveying	Mimi Das Saikia	PHI Learning Pvt. Ltd
6	Fundamentals of Surveying	S. K. Roy	PHI Learning Pvt. Ltd
7	CD Programme on GPS and GIS	Learning Materials Development Project	NITTTR, Taramani, Chennai

B. List of Major Equipment/Materials:

i. Metric Chain, Tapes, Open Cross staff, Optical Square, Prismatic Compass,Surveyor's
ii. Compass, Dumpy Level, Tilting Level, Auto Level, Levelling Staff, Target Staff, Plane Table And its accessories, GPS, other misc. equipments, etc.

C. List of Software/Learning Websites

i. www.Autodesk.com
ii. www.drawingnow.com
iii. www.learn-to-draw.com

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. **Dr. K. G. Mehta,** Principal, Merchant Engg. College,Visnagar
2. **Prof. Prakash Kalyani,** L.C.E, Tolani FG Polytechnic, Adipur
3. **Prof. Prakash D. Gohil,** L.C.E, Sir B. P. T. I., Bhavanagar
4. **Prof. Vyom B. Pathak,** L.C.E, BVPIT (DS) Umarakh Ta-Bardoli

Coordinator and Faculty Members from NITTTR Bhopal

1. **Dr. J. P. Tegar,** Professor & Head Department of Civil and Environment Engineering
2. **Dr. K. K. Pathak,** Professor, Department of Civil and Environmental Engineering

BRANCH CODE:06 DIPLOMA PROGRAMME IN CIVIL ENGINEERING										
SEMESTER - IV										
COURSE CODE	COURSE TITLE	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	P	CREDITS (L+T+P)	THEORY MARKS		PRACTICAL MARKS		GRAND TOTAL
						ESE	PA	ESE	PA	
3340601	STRUCTURAL MECHANICS-II	3	0	2	5	70	30	20	30	150
3340602	ADVANCED SURVEYING	3	0	6	9	70	30	60	90	250
3340603	BASIC TRANSPORTATION ENGINEERING	3	0	2	5	70	30	20	30	150
3340604	WATER RESOURCES MANAGEMENT	3	0	2	5	70	30	20	30	150
3340605	SOIL MECHANICS	3	0	2	5	70	30	20	30	150
3340606	COMPUTER AIDED DRAWING	0	0	4	4	---	---	40	60	100
TOTAL		**12**	**0**	**18**	**33**	**350**	**150**	**180**	**270**	**950**

ESE : END SEMESTER EXAM ESE for Practical includes VVa/Practical exam/Performance etc.
PA: PROGRESSVE ASSESSMENT : PA for Practicals includes TW/Report writing/Mini Project/Seminar etc. related to practicals PA for Theory includes Written Exam /Assignment/Tutorial Work/Mini Project/Quiz/Presentation
L: LECTURE
P: PRACTICAL
T: TUTORIAL

Any suggestion please write to Mr. B. G. Rajgor, Email id :- bgrstrengg@yahoo.com with copy to cdc@gtu.edu.in

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

COURSE TITLE: STRUCTURAL MECHANICS-II (Code: 3340601)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	4th Semester

1. RATIONALE

Knowledge and understanding of Structural Mechanics is very important for engineers in order to make Civil Engineering Structures safe and serviceable. The Structural Mechanics –II subject is taught in 4th sem. to develop the concept of analysis of determinate structures under various types of transverse &/or direct loading. Analysis of industrial trusses is also incorporated to give an idea of typical structure to the students. In this course, analysis of indeterminate structures under transverse loading, along with analysis of members under direct loading is to be studied. Analysis of structural members under the effect of principal stresses & strains is also incorporated to give an exposure of compound stresses to the students. At diploma level students are expected to study about these aspects of analysis and design of various structures so as to develop their understanding in order to apply their knowledge in construction industry.

2. COMPETENCY

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

- **Analyze various types of beams & Evaluate the Structures.**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Analyze various types of statically indeterminate beams.
ii. Compute slope and deflection in statically determinate beams.
iii. Evaluate the structures under direct and eccentric axial loading.

4. 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	
03	00	02	05	70	30	20	30	150

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

5. COURSE DETAILS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I **Fixed Beam**	1a. Distinguish between determinate and indeterminate structures 1b. Draw Shear Force & Bending Moment Diagram for Fixed Beams	1.1 Different types of Determinate & Indeterminate Structures & Structural Components/Elements 1.2 Advantages of fixed beam over simply supported beam 1.3 Concept of analysis by Area Moment method 1.4 μ and μ' diagram 1.5 Numerical for SF & BM diagrams for 1.6 fixed beam with central point load &/or 1.7 UDL over Full Span
Unit – II **Slope & Deflection**	2a. Compute deflection & slope induced in Statically Determinate Beams 2b. Draw deflection curve in different types of beams under different loads and support conditions.	2.1 Slope & Deflection 2.2 Formulae of Slope & Deflection for Cantilever Beam subjected to Point Load at free end , point load not at free end and with UDL along full Span 2.3 Formulae of Slope & Deflection for S.S Beam subjected to Central Point Load and with UDL along full Span 2.4 Numerical problems on Slope and Deflection for 2.2 & 2.3
Unit – III **Continuous Beam**	3a. Calculate Shear Force & Bending Moment Diagram for Continuous Beam using Theorem of Three Moment 3b. Draw Shear Force & Bending Moment Diagram for Continuous Beam using Theorem of Three Moment 3c. Draw Shear Force & Bending Moment Diagram for Continuous Beam using Moment Distribution Method	3.1 Statically Indeterminate Beam Like Propped Cantilever , Continuous Beam with or without Over Hang Define Free Moment & Fixed End moment diagrams 3.2 Theorem of Three Moment (Clapeyron's Theorem) 3.3 Formulae to find B.M of a continuous beam using theorem of Three Moment Method 3.4 Point of Contra-flexure & its importance 3.5 Numerical to draw S.F & B.M Diagram for two or three span continuous beams having end supports as overhang , fixed and / or hinge and subjected to Central Point Load and/ or U.D.L over full span using Theorem of Three Moment 3.6 Stiffness, flexibility, carry over Factor & Distribution Factor 3.7 Moment Distribution Method 3.8 Numerical to draw S.F & B.M Diagram of two or three span continuous beams having end supports as overhang , fixed and / or hinge and subjected to Central Point Load and/ or U.D.L over full span using Moment Distribution Method

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – IV Combined Direct & Bending Stresses	4a. Calculate Direct & Bending Stresses of various structural components 4b. Check stability of Retaining wall & Dam 4c. Draw stress distribution diagram in retaining wall and dams under different types of loads	4.1. Eccentricity 4.2. Formula for combined Direct & Bending Stresses 4.3. Limit of Eccentricity 4.4. Core of section for Rectangular & Circular (Hollow & Solid) 4.5. Formulae for combined stresses on sections subjected to eccentric loads considering Uniaxial & Biaxial eccentricity 4.6. Stress distribution diagrams 4.7. Application of concept of combined stresses to find pressure at base & stability check of Retaining Wall & Rectangular & Trapezoidal Dam 4.8. Numerical for 4.6 & 4.7
Unit – V Principle Stresses & Principle Planes	5a. Calculate Principal Stresses & Principal Plane on a plane in a Strained structural Material	5.1 Formulae for Normal , Tangential & Resultant Stresses due to Direct Orthogonal Stresses & Shear Stress 5.2 Numerical based on 5.1 5.3 Formulae for Principal Stresses and for Location of Principal Planes 5.4 Numerical based on 5.3 5.5 Mohr's Circle and its application for 5.1 & 5.3 5.6 Numerical based on 5.1 , 5.3 Graphically

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Fixed Beam	06	01	02	04	07
II	Slope & Deflection	04	01	02	04	07
III	Continuous Beam	12	04	03	14	21
IV	Combined Direct & Bending Stresses	08	03	04	07	14
V	Principle Stresses & Principle Planes	12	02	05	14	21
Total		**42**	**11**	**16**	**43**	**70**

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

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hrs. Required
1	I	Solve at least five real life problems pertaining to Unit – I	02
2	II	Perform Deflection test on a Simply Supported beam with different sectional properties (material, c/s dimensions etc)	02
3	II	Perform Deflection test on a cantilever beam with different sectional properties (material, c/s dimensions etc)	02
4	II	Perform Deflection test on a fixed beam with different sectional properties (material, c/s dimensions etc)	02
5	II	Solve at least three real life problems pertaining to Unit – II	02
6	II I	Solve at least Six real life problems pertaining to Unit-III	06
7	IV	Solve at Least four real life numerical Problems of Unit-IV	04
8	V	Solve at least Eight real life problems pertaining to Unit – V	08
		Total Hours	**28**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Conduct a mini project in which a group of students will practically verify the effect of cross section , end conditions on the deflection of beams .
ii. Site Visit to understand Retaining Wall structure , Dam and indeterminate structures

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Demonstration of Models & Charts of Indeterminate Structures , Dams & retaining wall & field Visits
ii. Show video films/animations to explain failure of various structures under different load conditions.

10. SUGESSTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1.	Strength of Material & Mechanics of Structures	Dr. B C Punamia	Standard Publication
2.	Strength of Material	S RAMAMURTHAN	Dhanpat Rai Publication
3.	Strength of Material	Timo Shanko	Tata Mcgraw Hill
4.	Theory of Structures	R S KHURMI	S Chand
5.	Theory of Structures – vol I & II	S B Junarkar H J Shah	Charotar Publication

B. List of Major Equipment/Materials

1. Cantilever Beam, Fixed & Simply Supported Beam Model to measure deflection

C. List of Software/Learning Websites

i. www.csiberkeley.com
ii. www.gtstrudl.gate
iii. www.ramint.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B G Rajgor,** H.O.D, App. Mech. , BBIT , V V Nagar
- **Prof. K. Venkateshwarlu** , H.O.D , T F G , Adipur
- **Prof. B. G. Bhankhar**, H.O.D, App. Mech. G.P.Ahmedabad
- **Prof. J. H. Gabra**, I/C H.O.D , App. Mech. , G.P , GODHRA
- **Prof. C. H. Bhatt**, DR. S.&S.S. Ghandhy College, Surat
- **Prof. K. K. Patel**, H.O.D , G . P. Rajkot

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal**, Associate Professor, Civil & Environmental Engineering Department.
- **Dr. V.H. Radhakrishnan,** Professor, Civil & Environmental Engineering Department.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: ADVANCED SURVEYING
(Code: 3340602)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering, Transportation Engineering	4th Semester

1. RATIONALE

Field survey is the basic requirement for preparing any engineering maps or drawings. Field survey can be professionally carried out only when various steps involved in the survey work are known with skills of operating modern survey equipments. At diploma level, students are expected to study about these aspects so as to develop their understanding, performance oriented abilities in order to apply their knowledge in construction industry.

2. COMPETENCIES

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

- Prepare survey maps/drawing after carrying out different kinds of field surveys using advance surveying equipments.
- Find out various physical quantities like length, area, volume, elevations, angles, latitude, departure, etc by interpreting survey drawings.

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Use Theodolite for the measurement of horizontal and vertical angle
- Calculate the height of objects through a trigonometrical levelling.
- Explain the principles and various methodologies involved in techeometry
- Retrieving the data and generate the drawings using advanced surveying equipment & application software.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	6	9	70	30	60	90	250

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

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Theodolite**	1a. Explain the basic function of different parts theodolite. 1b. Operate theodolite and read horizontal and vertical angle. 1c. Determine the altitude and departure of given points on the ground.	1.1 Introduction to theodolite 1.2 Uses of theodolite 1.3 Sketch and parts of Transit Vernier theodolite 1.4 Reading of main and vernier scale on horizontal and vertical plate 1.5 Temporary adjustment of a theodolite 1.6 Permanent adjustment of theodolite (Fundamental axis of theodolite and their relationship) 1.7 Definitions and various technical terms 1.8 Methods of measuring horizontal angles and vertical angles 1.9 Use theodolite for measuring a magnetic bearing, prolong a line, ranging a line 1.10 Measuring direct and deflection angles 1.11 Errors in theodolite work 1.12 Theodolite Traversing 1.13 Traverse computations 1.14 Closing errors, Balancing the traverse 1.15 Gale's Traverse Table 1.16 Related examples
Unit – II **Trigonometrical Levelling**	2a. Determine relative elevations and angular measurements for given different conditions of instruments. 2b. Calculate the height of objects through a trigonometrical levelling.	2.1 Introduction 2.2 Methods of observations (Direct and Reciprocal) 2.3 Methods of determining the elevation of a particular point 2.4 when base of the object is accessible 2.5 when base of the object is inaccessible 2.6 Related examples using all methods
Unit – III **Tacheometry**	3a. Explain the principles and various methodologies involved in techeometry. 3b. Calculate R.L. and horizontal distance	3.1 Introduction 3.2 Purpose and Principles of tacheometric surveying 3.3 Instruments used in Tacheometry 3.4 Theory of Stadia Tacheometry 3.5 Anallatic Lens, advantages & disadvantages. 3.6 Methods of determining constants of a

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	between object and instruments.	Tacheometer 3.7 Related examples on tacheometer constants 3.8 Methods of Tacheometry (Stadia & Tangential) 3.9 Method of Fixed Hair : - When line of sight is horizontal and staff held vertically - When line of sight is inclined and staff held vertically (Angle of Elevation & Depression) 3.10 Advantages and disadvantages of Tangential method 3.11 Related examples of Tacheometer using all methods.
Unit – IV **Curves**	4a. Describe different elements of curves. 4b. Calculate necessary data required to setting out curve on field.	4.1 Introduction 4.2 Types of circular curves 4.3 Definitions and notations 4.4 Designation of curve 4.5 Relation between Radius and degree of curve 4.6 Elements of simple circular curve 4.7 Setting out simple circular curve 4.8 Methods of setting out simple circular curves 4.9 Transition curves - Requirements and purpose of it. 4.10 Vertical curves 4.11 Related examples of curves.
Unit – V **Advanced Survey Equipments**	5a. Explain the principles of total station. 5b. Record data on total station as well as on computer. 5c. Retrieving the data and generate the drawings using application software.	5.1 Introduction 5.2 Basics of Digital Theodolite 5.3 Introduction and Principles of E.D.M. 5.4 Introduction and Basics of Total station - Parts of Total station - Advantages, disadvantages and uses of Total Station - Types of Total Station - Advancement in Total Station Technology - Automatic Target Recognition ATR 5.5 Surveying using Total Station - Flow chart of data collection - Fundamental Parameters of Total Station 5.6 Precautions to be taken while using Total Station 5.7 Field equipments 5.8 Set up of Total Station

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		- Centering, Levelling , back-sight, Azimuth Marks 5.9 Measurement with Total Station 5.10 Total Station Initial Setting 5.11 Field Book recording 5.12 Radial Shooting 5.13 Total Station Traversing 5.14 Survey Station description 5.15 Occupied Point Entries 5.16 Data Retrieval 5.17 Field Generated Graphics 5.18 Construction layout using Total Station 5.19 Overview of Computerized Survey Data System 5.20 Equipment Maintenance 5.21 Maintaining Battery Power 5.22 Total Station Job Planning and Estimating 5.23 Total Survey system errors Sources and how to avoid them 5.24 Controlling errors

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Theodolite	**12**	05	05	11	21
2	Trigonometrical Levelling	**06**	02	02	05	09
3	Tacheometry	**08**	04	06	06	16
4	Curves	**08**	03	04	07	14
5	Advanced Survey Equipments	**08**	03	03	04	10
Total		**42**	**17**	**20**	**33**	**70**

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

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise/Project (Outcomes in Psychomotor Domain)	Approx. Hrs. for Practical	Approx. Hrs. for Project
1	I	Theodolite: (1) Identify various parts of the theodolite (2) Measure the hori. angle by Repetition, Reiteration (3) Measure the vertical angle (4) Measure the deflection angle (5) Calculate the data for Gale's table Theodolite Traversing: - To Carry out the project for a closed traverse 4 to 5 stations and prepare the drawing sheet using Gale's Table	04 08 02 02 02	06
2	III	Tacheometry: (1) Determine the tacheometric constant (2) Determine the distance and R.L. of a point when line of sight is horizontal. (3) Determine the distance and R.L. of a point when line of sight is inclined for an angle of elevation (4) Determine distance and R.L. of a point when line of sight is inclined for an angle of depression Tacheometry Survey: - To Carry out the project for a 3 to 4 stations for closed traverse on undulating/hills regions and prepare the drawing sheet	02 04 04 04	12
3	IV	Curve : (1) Determine the elements of simple circular curve (2) Determine the data for setting out curve from offset of long Chord	02 02	

S. No.	Unit No.	Practical/Exercise/Project (Outcomes in Psychomotor Domain)	Approx. Hrs. for Practical	Approx. Hrs. for Project
		(3) Determine the data for setting out curve By Rankine (one theodolite) method	02	
		Curve Setting: - To carry out the project by Rankine's methods		04
4	IV	Total Station: (1) Identify the parts of the Total Station (2) Set out the total station on a station (3) Set out station by setting up a back sight (4) Set out station by setting up a Azimuth Mark (5) Measure the horizontal Angle (6) Measure the vertical angle (7) Measure the deflection angle	02 02 02 02 02	
		Total Station survey: - To carry out the project for small traverse on a ground and prepare the drawing sheet	04 04	06
		Total	56	28

8. 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.

S. No.	Unit No.	Student Activities
i.	I	Comparison between different angular measurement equipments
ii.	IV	Visit the area having horizontal and vertical curves
iii.	V	Collecting, transferring and processing field data and preparing drawings through computer software.

9. SPECIAL INSTRUCTIONAL STRETEGIES (If any)

i. Lecture cum demonstration of equipments of advanced surveying
ii. Field demonstration
iii. Software based preparing of maps.

10. SUGGESTED LEARNING RESOURCES

1. List of Books:

S. No.	Title of Books	Author	Publication
1	Surveying and levelling Vol-I & II	T. P. Kanetkar & S. V. Kulkarni	Pune Vidyarthi Griha Prakashan
2	Surveying and Levelling Vol-I & II	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd.
3	Surveying and Levelling Vol-I & II	S.K.Hussain, M.S. Nagaraj	S. Chand and Co.
4	Surveying and Levelling Vol-I & II	S. K. Duggal	Tata Mc Graw Hill
5	Surveying and Levelling	N. N. Basak	Tata Mc Graw Hill
6	Fundamentals of Surveying	S. K. Roy	PHI Learning Pvt. Ltd
7	CD Programme on EDM and Total Station	Learning Materials Development Project	Taramani, Chennai NITTTR, Bhopal

(B) List of Major Equipment/Materials:

i. Transit Theodolite,
   a. Digital Theodolite,
ii. Levelling Staff,
iii. Techeometer,
iv. Total Station and its accessories,
   a. other misc. equipments, etc.

(C) List of Software/Learning Websites

i. www.Autodesk.com
ii. www.drawingnow.com
iii. www.learn-to-draw.com
iv. www.sitetopo.com
v. www.surfer.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B. V. Modi**, Principal – BVPIT(DS) Umarakh Ta-Bardoli
- **Prof. P. D. Gohil**, Sr. L.C.E. - Sir B. P. T. I., Bhavanagar
- **Prof. H. K. Rana**, L.C.E. - Government Polytechnic, Valsad

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr Subrat Roy**, Professor Department of Civil and Environmental Engineering
- **Dr J.P Tegar,** Professor and Head Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: BASIC TRANSPORTATION ENGINEERING
(Code: 3340603)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	4th Semester

1. RATIONALE

As we know that the economy of any country is widely dependent either direct or indirect way on the transportation of various commodities which in turn dependent upon the "How efficiently the transportation system of the country is functioning."
Therefore, knowledge and understanding of various design, construction and maintanance aspects of roads, railways and bridges are very important for engineers working at site in order to make transportation system safe and efficient. At diploma level, students are expected to study about these aspects of raods, railways and bridges so as to develop their understanding in order to apply their knowledge in improving civil infrastructure for transportation.

2. COMPETENCY:

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

- **Supervise construction and maintenance of roads, railways and bridges.**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Explain the importance of transportation system and its geometrical aspects
ii. Comprehend the concept of construction and maintenance of roads, railways and bridges.
iii. Perform the tests on the various materials used in the construction work of roads, railways and bridges.

4. TEACHING AND EXAMINATION SCHEME

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

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

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Introduction and Road Geometric**	1a. Discuss various Modes of transportation 1b. Explain the various components of a road section. 1c. Demonstrate the basic requirement of road alignment. 1d. Dsecribe various terms used in road geometry.	. 1.1 Importance & Classification of roads 1.2 Modes of transportation. 1.3 Requirements of good roads 1.4 and its advantage. 1.5 Road alignment and their types 1.6 Importance of road alignment. 1.7 Factors affecting the alignment. 1.8 Cross section of road showing its component as per IRC. 1.9 Function of each component. Terms used in road geometry Camber, sight distance, Super elevation, Widening of Road. 1.10 Transition curve and Road Gradient.
Unit – II **Road materials and its construction aspects**	2a. Describe various types of road construction methods. 2b. Explain various types of failures and maintenanceof road. 2c. Explain various types of tests on road materials.	2.1 Types of Pavement. 2.2 Necessity of Soil Stabilization and its methods. 2.3 Types of materials used in road Construction 2.4 Various tests on Aggregate and bitumen. 2.5 Construction of Flexible and Rigid Pavement. 2.6 Types of Failures in roads 2.7 Maintenance of roads and its components
Unit – III **Drainage system.**	3a. Explain importance of drainage and its maintenance	3.1 Importance of drainage. 3.2 Purpose of drainage. 3.3 Methods of Surface and Sub-surface drainage. 3.4 Maintenance of drainage system.

Unit – IV **Introduction to Permanent way.**	4a. Describe the basic parts of railway track and its functions. 4b. Explain the Joints and Gauge. 4c. Explain basic knowledge of points and Crossing.	4.1. Typical cross section of various permanent way as per IRS. 4.2. Function of Various Components. 4.3. Method of fixing the rails with slipper. 4.4. Function of Rail joints. 4.5. Railway gauge , Types of Rail gauge and uniformity of gauge. 4.6. Function of point and crossing. 4.7. Factors affecting point and crossing. 4.8. Components of Turn outs and types of crossing.
Unit – V **Yards and Maintenance of railway track**	5a. Discuss the function of various yards. 5b. Explain requirement of track Maintenance	5.1 Classification of Yards. 5.2 Function of Various Yards. 5.3 Requirement of Track Maintenance. 5.4 Daily and periodical Maintenance. 5.5 Maintenance of Alignment, Drainage, Track Material and its components, Point and crossing and level crossing.

Unit – VI Introduction, Investigation and Maintenance of BridgeS.	6a. Discuss the function of various parts of bridge. 6b. Explain terms related to bridge. 6c. Explain reqauirment of an ideal bridge 6d. Carry out the maintenance report	6.1. Importance and term used in Bridge. 6.2. Component of Bridge and its function 6.3. Requirement of an ideal bridge 6.4. Classification and types of bridge. 6.5. Bridge Site Characteristics 6.6. Factor affecting the selection of Bridge Site. 6.7. Explain following terms: Scour, Afflux, Runoff, Economic Span, Clearance, Freeboard. 6.8. Classification of Cause Way and its limitations. 6.9. Routine and in depth inspection. 6.10. Requirements of Inspection Report. 6.11. Maintenance of Steel Bridge, Masonry Bridge, Cause Way, Piers, Pilebents, Abutment, Wing Wall, Road Surface, Drainage, Parapet Wall and Bearing.

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction and Road Geometric	8	2	3	5	10
II	Road materials and its construction aspects	9	4	4	7	15
III	Drainage system	4	2	3	5	10
IV	Introduction to Permanent way.	8	2	3	5	10
V	Yards and Maintenance of railway track	5	2	3	5	10
VI	Introduction, Investigation and Maintenance of Bridge.	8	2	5	8	15
Total		42	14	21	35	70

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

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise/Project (outcomes in psychomotor domain)	Hrs.
1	**I**	Draw the dimensional sketches of cross section of road (with function of each part of road) , road junction, road curve and widening	**6**
2	**II**	Carry out the following tests. - On Aggregate 1. Impact test. 2. Crushing test. 3. C B R test. - On Bitumen 1. Flash &Fire test. 2.Softening point 3. Penetration test	**10**
3	**IV**	Draw the dimensional sketches of cross section of permanent way & points & crossing (with function of each part of road).	**6**
4	**V**	Prepare a brief report after visit to Railway track & yards.	**3**
5	**VI**	Draw the sketches of various bridges after visiting the bridges in nearby locations.	**3**
		Total	**28**

8. 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.

S. No.	Unit No.	Student Activities
1	I	Comparison of different types of Roads
2	IV	Comparison and uniformity of various Guages
3	VI	Comparison of different types of Bridges

9. SPECIAL INSTRUCTIONAL STRETEGIES (If any)

i. Lecture cum demonstration of various types of equipments used in construction of Road , Bridges and Railways (show video clips)
ii. Field demonstration about the maintenance of Roads , Railways and Bridges
iii. Show video films/ clips about different features of road, rail and bridge constructions.

10. SUGGESTED LEARNING RESOURCES

List of Books:

S. No.	Title of Books	Author	Publication
1	Highway Engineering	S K Khanna & Justo	Khanna publication, Delhi
2	Highway Engineering	S P Bindra	
3	Highway Engineering	L R Kadiyali	
4	Highway Engineering	S C Rangwala	
5	Transport engineering	Vazirani & Chandola	
6	Road Railway Bridges & Tunnel Engineering	T D Ahuja & Birdie	
7	Road Railway Bridges & Tunnel Engineering	B L Gupta & A K Gupta	

(B) List of Major Equipment/Materials

---No equipments or Materials required------

(C) List of Software/Learning Websites

i. www.waterbouw.tudelft.nl/
ii. www.learnrstv.com
iii. www.shiksha.com , IIT, Roorkee
iv. www.blackwellpublishing.com
v. www.hrpwa.org
vi. www.creativeworld9.com
vii. nptel.iitm.ac.in
viii. www. Indian rail. com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. N. J. Patel** Lecturer in Civil Engineering, Shri K J Polytechnic Bharuch
- **Prof .D. P. Rao** Lecturer in Civil Engineering, Dr. S & S S Gandhi Engg. College Surat

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Subrat Roy**, Professor, Department of Civil and Environmental Engineering
- **Prof M. C. Paliwal,** Associate Professor, Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: WATER RESOURCES MANAGEMENT
(Course Code: 3340604)

Diploma Programme in which this course is offered	Semester in which offered
Civil engineering	4th Semester

1. RATIONALE:

Knowing extremity of water crisis, we must appreciate water as "Nature's greatest gift". Our water requirement is rapidly increasing due to vast industrial development, population growth and changing life style. We are mostly dependent on rains as a predominant source of water. The other important source of water is the ground water which also depends to great extent on rainfall in previous years. We know that ground water table is declining rapidly due to its excessive use and misuse and also due to insufficient rainfall every year. To stress upon the concept of water management and simultaneously to create the awareness about the proper use and conservation of water, this course is specially designed for the students of Diploma in Civil Engineering. An attempt has been made to develop theoretical knowledge with emphasis on certain aspects of water resources management. The topics viz. hydrology, runoff, watershed management, recharging etc. have been specifically dealt in the curriculum.

2. COMPETENCY:

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

- **Design the appropriate rain water harvesting scheme and required structures for managing water resources under given conditions**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Discuss basic concepts of "Water Resources Management".
- Estimate the surface runoff from given precipitation data.
- Describe various types of survey investigations for reservoir planning
- Design the appropriate rain water harvesting scheme and required structures for given conditions.

4. SCHEME OF STUDIES AND EXAMINATIONS:

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

5. COURSE DETAILS

Unit	Major Learning outcomes (in cognitive domain)	Topics and Sub Topics
Unit- I Introduction	1a. Discuss the concepts and importance of Water Resources Management (WRM). 1b. Identify various agencies associated with Water Resource Management.	1.1 Scope of W.R.M. 1.2 Necessity of W.R.M. 1.3 Role of various agencies in W.R.M.: - Agriculturists - Meteorologists - Geologists - Industrialists - Scientists - Biologists - Water quality Control (Authority) - Mechanical Engg. - Electrical engg.- Economists - Social workers- NGO's - Politicians - General Public
Unit-II Hydrology	2a. Explain Hydrological cycle. 2b. Describe various forms and types of precipitation. 2c. Explain various types of rain gauges. 2d. Compute average precipitation by various methods. 2e. Compute runoff using empirical formula. 2f. Describe evaporation process and factors	2.1 Define Hydrology 2.2 Hydrological cycle 2.3 Forms of precipitation 2.4 Precipitation occupancy & its types. 2.5 Measurement of rain fall 2.5.1 Rain gauges Non Recording Recording - Float type - Tipping bucket - weighing bucket 2.5.2 Methods of determining average rainfall b. Arithmetic average method

	affecting it.	c. Theissen polygon method d. Isohytel method 2.5.3 Determine optimum no. of rain gauges for given catchment area. 2.6 Runoff 2.6.1 Factors affecting runoff 2.6.2 Runoff calculation using empirical formula only 2.7 Evaporation, Transpiration & Evapo - transpiration 2.7.1 Factors affecting evaporation.
Unit-III **Ground Water**	3a. Identify various sources of water. 3b. Describe various terms related to "ground water" 3c. Explain various types of wells with their features. 3d. Discuss necessity of recharging ground water. 3e. Describe various methods of recharging ground water.	3.1 Sources of water 3.2 Importance of ground water and present scenario 3.3 Terms related to groundwater engineering: Aquifer, Aquiclude, Aquifuge, Aquitard, porosity, Specific yield, Specific retention, storage coefficient, coefficient of permeability, coefficient of transmissibility, Yield, specific yield 3.4 Types of well - Open, Tube and flowing well - concept, location and importance 3.5 Necessity of recharging 3.5.1 Artificial recharging as today's need. 3.5.2 Types of artificial recharge - Spreading method. - Pit method / khet-talavadi - Induced recharge method - Recharge well method. - Sub-surface dam. - Check dam series - Ponds - Unlined canals
Unit-IV **Storage Works**	4a. Describe various surveys / investigations to be carried out in storage works including their classification.	4.1. Survey and investigations. a. Investigations for hydrologic data b. Geological data. c. Topographic investigations. d. Collection of legal data, water right.

	4b. Compute reservoir capacity and losses. 4c. Discuss purpose of various storage zones of reservoir. 4d. Draw cross-sections of gravity and earthen dam at various points.	e. Investigation of reservoir site, land acquisition Environmental considerations f. Economical data - Benefit cost atio. 4.2. Site selection for reservoir 4.3. Methods of estimating reservoir capacity 4.4. Storage zones 4.5. Reservoir losses 4.6. Reservoir sedimentation and its control 4.7. Classification of storage works . 4.8. Factors for selecting type of dam 4.9. Concept of low and high dam 4.10. Component parts of gravity and earthen dam
Unit-V **Distribution Works**	5a. Explain purpose of distribution works 5b. Differentiate between barrage and weir by means of a diagram 5c. Describe silt control structures 5d. Classify canals based on their functions. 5e. Explain factors affecting canal alignment 5f. Discuss suitable construction techniques, materials & equipments for "canal lining." 5g. Explain the causes, effects & prevention of water logging.	5.1 Purpose of distribution works 5.2 Component parts & sketches. 5.3 Barrage. 5.4 Weir 5.4.1 Comparison of weir and barrage. 5.4.2 Causes of failure of weir and remedial measures 5.5 Safe exit gradient 5.6 Control of silt entry Scouring sluices, silt excluder, silt ejector, head egulator. 5.7 Classifications of canal -Ridge and contour Functions of each according to network. Line diagram of network of canal. 5.8 Canal Alignment Factors influencing canal alignment . 5.9 Regime & semi-regime conditions. 5.10 Canal lining. a. Advantages. b. Types of canal lining materials c. Methods of canal lining. 5.11 Regulation works. 5.12 C.D. Works. -Types , functions & sketches 5.13 Outlets. - types, situation, functions & sketches 5.14 Water-logging, effects, causes &

		prevention
Unit –VI Watershed Development	6a. Describe important characteristics of "water shed". 6b. Evolve strategies of enhancing people's participation in watershed management.	6.1. Concept of 'watershed' 6.2. Characteristic of watershed, size, shape, physiography, slope, climate, drainage, land use, vegetation, geology, hydrology, hydrogeology, socio-economics. 6.3. Watershed management & people's participation.. 6.4. Role of co-operative society in watershed management.
Unit-VII Water Harvesting Structures	7a. Describe necessity and importance of rain water harvesting . 7b. Discuss various 'rain water harvesting' methods, structures and their suitability in various conditions.	7.1 Necessity of Rain water harvesting 7.2 Importance of Rain water harvesting 7.3 Rain water harvesting methods - Check dams. - Nala / Gully plugging - Percolation tank. - Khet-talawadi - Roof harvesting - Vegetation and plantation

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

Unit	**Unit Title**	**Teaching Hours**	**Distribution of Theory Marks**			
			R Level	**U Level**	**A Level**	**Total Marks**
I.	Introduction	3	2	3	2	7
II.	Hydrology	8	4	3	7	14
III.	Ground Water	7	3	5	6	14
IV.	Storage Works	8	3	4	7	14
V.	Distribution Works	6	2	2	3	7
VI.	Water Shed Development	6	3	2	2	7
VII.	Water Harvesting Structures	4	3	2	2	7
		42	**20**	**21**	**29**	**70**

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

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (Outcomes' in Psychomotor Domain)	Approx Hrs. Required
1		**Draw the following Sketches :**	
	II	Hydrological Cycle	16
	II	Types of Precipitation	
	II	Rain gauges	
	III	Various methods of artificial recharge	
	IV	Component parts of earthen and Gravity dam	
	V	Diversion head works	
	V	Cross Drainage Works	
	VII	Various types of rainwater harvesting structures	
2		**Solve Numerical from given data:**	12
	II	Calculate average precipitation for given catchment area using various methods.	
	II	Calculate Runoff for given catchment area using empirical formula.	
	II	Compute optimum number of rain gauges for given catchment area.	
	III	Compute yield of a well	
	VII	Design a check dam	
3		**Field Visit and Report :**	08
	I	Arrange field Visit to irrigation / W.R.I department for collecting existing W.R. data of your district with respect to Importance and necessity of WRM	

S. No.	Unit No.	Practical/Exercise (Outcomes' in Psychomotor Domain)	Approx Hrs. Required
	II	Visit to meteorological department, collect precipitation data, observe, and interpret.	
		Collect data of your district regarding various types of water sources available and prepare a report	
		Suggest various methods of Artificial recharge of ground water in your district	
		Collect data of various storage works in your district	
		Visit to water harvesting Structure nearby your polytechnic and prepare a report	
4.		**Seminar**	04
	I to VII	Select one topic as a Seminar and present it using modern teaching aids before teachers & students.	
Total Hours			40

8. SUGGESTED STUDENT'S ACTIVITIES

i. Prepare prototype/ model of rainwater harvesting structure in the polytechnic/ suggested premises.

9. SPECIAL INSTRUCTIONAL STRETAGIES (If Any)

i. Show the video/animation films of various types of dams and their structures.
ii. Arrange visit to nearby water bodies

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1.	Irrigation, Water Resources & Water Power Engg.	Dr. P.N. Modi	Standard Book House, Delhi.
2.	Hydrology & Water Resources	R.K. Sharma	Dhanpat Rai & Sons, Delhi.
3.	Ground water assessment, Development & management	K.R. Karanth	Tata Mc Graw Hill Pub. Co. Ltd., New Delhi.
4.	Ground water	H.M.Ragunath	New Age international Ltd., New Delhi.
5.	Hydrology & Water Resources Engg.	S.K.Garg	Khanna Pub., Delhi.

6.	Watershed management in India	J.V.S. Moorthy	Willey Eastern Ltd.
7.	Design of small dams.	U.S.B.R.	
8.	Irrigation theory & practice	A.M.Mitchel	Vikas Pub. House Pvt. Ltd, Delhi.
9.	Water vision 2050 Narmada	W.R. & water supply deptt., Gandhinagar	
10.	Water Resources Engg-Principles & Practice	C. Satyanarayan Murthy	New Age International Ltd., New Delhi
11.	Relevant IS codes		

(B) List of Major Equipment/Materials:

i. Rain gauge
ii. Working models of storage works
iii. Models of cross drainage works
iv. Models of rain water harvesting structures.

(C) List of Software/Learning Websites

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. S. M. Mistry**, H.O.D.Civil Engg., Dr. S. & S. S. Ghandhy College of Engg and Tech., Surat
- **Prof. P. N. Patel**, Sr.Lecturer, Civil Engg., Deptt., G. P. Dahod
- **Prof. A. K. Popat**, Sr.Lecturer, Civil Engg., Deptt., G. P. Dahod
- **Prof. D. V. Jariwala**, Lecturer, Civil Engg., Deptt., G.P.Valsad

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. V. H. Radhakrishnan**, Professor, Department of Civil and Environmental Engineering
- **Prof M. C. Paliwal,** Associate Professor, Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: SOIL MECHANICS
(Code: 3340605)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering, Transportation Engineering	4th Semester

1. RATIONALE

Knowledge and understanding of soil and its engineering properties are very important for engineers working at site in order to make Civil Engineering Structures safe and serviceable. In INDIA, from region to region soil varies in properties and characteristics. Under different loading conditions soil is subjected to various stresses and problems like water logging, liquefaction of soil, seepage through soil and settlement. At diploma level students are expected to study about these aspects of soil so as to develop their understanding in order to apply their knowledge in construction industry

2. COMPETENCY

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 competency:

- Conducting different laboratory tests for determining engineering properties / parameters of a soil, evaluate engineering properties / characteristics of soil for their suitability to construction of engineering structures

3. COURSE OUTCOMES:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Explain various engineering properties / characteristics of soil with respect to construction and engineering applications
- Conduct different laboratory tests for determining engineering properties /parameters of a soil.
- Evaluate engineering properties / characteristics of soil for their suitability to construction of engineering structures.
- Explain essential features and requirements of site investigation with respect to soil.

4. 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	
03	00	02	05	70	30	20	30	150

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

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Introduction**	1a. Discuss soil formation cycle & general characteristics of soil. 1b. List structures where soil is used as Construction material. 1c. Describe soil-formation in Geological cycle 1d. State the types of failures due to soil in Civil Engineering structure	1.1 History 1.2 List structures where soil is used as construction material 1.3 Soil-formation in Geological cycle 1.4 State the types of failures due to soil in Civil Engineering structure 1.5 General characteristics of different types of soils 1.6 Overview of different types of soils in Gujarat / India.
Unit – II **Index Properties & Interrelationship**	2a. Explain phase diagram of Soil 2b. Discuss various index properties of soil for the purpose of their classification & Use 2c. Describe interrelationship between different index properties	2.1 Three phase diagram 2.1.1 State three constituents of soil 2.1.2 Sketch showing three i. phases of soil 2.1.3 Assumptions in drawing a ii. phase diagram 2.2 Properties of soil like Density, Field density, Dry density, Saturated density, Void ratio, Porosity, Specific Gravit , Degree of saturation,Moisture conten , Density Index 2.3 Derive the following relations for a soil sample from fundamentals 2.3.1 e= n/n-1, n=e/1+e 2.3.2 $w \times G = e \times s_r$ 2.3.3 $\Upsilon_{d=} \Upsilon b/1+w$ 2.3.4 $\Upsilon_b=(G+e.s_r)\Upsilon_w/(1+e)$ 2.3.5 $\Upsilon_{sat=} (G+e)\Upsilon_w/(1+e)$ 2.3.6 $\Upsilon_{d=}$ G $\Upsilon_w/1+e$ 2.4 Numerical on 2.3

Unit – III **Soil Classification**	3a. Discuss methods of Classification 3b. Describe method of I.S. Classification of Soil 3c. Classify Soil based on Consistency Limits	3.1 Classification of soil (Grain size) as per Indian Standard 3.1.1 Basis /criteria of classification i. of soils ii. Three main categories of soils iii. Scale for classifying soil iv. on the basis of grain size 3.2 Mechanical Analysis of soil 3.2.1 Difference between course grained and fine grained Soil on the basis of range of grain size and engineering properties 3.2.2 Sieves designation as per i. I.S. code 3.2.3 Coarse & Fine Sieve analysis, b. sedimentation analysis 3.3 Grading Curves and different coefficients i.e. CU and CC a. Clay, silt, sand and gravel as per particle size b. Consistency Limits like Liquid limit, Plastic limit, Shrinkage 3.4 Limit and Plasticity Index`
Unit – IV Compaction	4a. Comprehend the principle and methods of compaction of soil 4b. Differentiate between compaction and consolidation with examples 4c. Determine MDD & OMC of soil by conducting appropriate test	4.1. Compaction and its Application 4.1.1 Effects of compaction on different soil properties like permeability, shear strength, soil settlements-stability of embankments. 4.2. Maximum dry density and O.M.C. 4.2.1 Typical compaction curve 4.2.2Optimum moisture content (OMC), Maximum dry density (MDD) 4.3. Proctor test 4.3.1 Light compaction 4.3.2 Heavy compaction test 4.3.3 Light compaction test on a given soil sample 4.4. Factors affecting compaction like water content, nature of soil (fine or course grained), Grading of soil, compaction energy, thickness of layer 4.5. Compaction and Consolidation 4.6. Role of O.M.C in the field 4.7. Methods of Field Compaction & various Equipment for compaction

Unit – V **Permeability & Seepage**	5.a Explain concept of permeability & its implications with respect to use of soil. 5.b Determine 'permeability' of given soil. 5.c Comprehend the concept of Seepage Analysis in relation to 'quick sand condition' with examples.	5.1 5.1 Permeable and Impermeable soils 5.1.1 Permeability and Impermeability 5.1.2 Flow of water through pipe and Through soil 5.2 Factors affecting the permeability 5.2.1 The factors affecting permeability of soil i. 5.2.2 Factors used to control the permeability of soil to desired extent in various Civil engineering structures 5.3 Methods to find Coefficient of Permeability 5.3.1 Constant Head Method 5.3.2 Falling Head Method 5.4 Coefficient of permeability 5.4.1 Numerical based on $K=(Q\times L)/(t\times h\times A)$ $K= (2.3\times a\times L)/(A\times t)\log_{10} h1/h2$ 2 55 Seepage pressure 5.1 Seepage pressure. 5.2 Quick sand condition. 5.3 Flow net, its characteristics and application.
Unit-VI **Shear Strength**	6a. Explain different terms used in the context of 'shear strength' of soil. 6b. Evaluate shear parameters of various types of soil, with their practical significance	6.1. Definition 6.1.1 Define: (a) Cohesion (b) internal friction (c) Shear strength 6.1.2 Coulomb's law for shear strength $S = C+ \sigma_n \tan\varphi$ 6.2. Shear strength of soil 6.2.1 Different shear tests used to determine shear strength of soil in laboratory 6.2.2 Procedure of direct shear test (Box shear test) 6.3. Types of soil C-soil, φ-soil, C-φ soil. 6.3.1 Draw failure envelope by drawing Mohr's circle from the data obtained during direct shear test 6.3.2 Calculate the values C and φ i. from the failure envelope of ii. direct shear test on soil

VII **Bearing Capacity of soil**	7a. Explain concept of bearing capacity of soil. 7b. Describe various methods to determine bearing capacity of soil. 7c. Explain the concept & occurrence mechanism& effect of 'Liquefaction' of soil.	7.1 Bearing capacity of soil 7.1.1 Net Bearing capacity 7.1.2 Safe Bearing Capacity 7.1.3 Ultimate Bearing Capacity 7.1.4 Bearing Capacity of various soil 7.2 Methods – Plate Load Test, Penetration Test & using C – Φ parameters for determining bearing capacity of soil and to improve bearing capacity of soil 7.2.1 Foundation on soils of various bearing Capacity 7.3 Liquefaction 7.4 Definition 7.5 Occurrence & effect Effects of Liquefaction Remedial for Liquefaction
VIII **Soil Investigation & Exploration**	8a. Discuss various methods & appropriate use for investigation & exploration of soil.	8.1 Purposes of exploration of soil. 8.2 Planning of exploration program 8.3 Soil samples and collection. 8.4 Field penetration Test:SPT 8.5 Introduction to geophysical methods

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	02	02	00	00	02
II	Index Properties & Interrelationships	07	02	04	08	14
III	Classification of Soil	07	04	02	08	14
IV	Compaction of Soil	06	03	03	04	10
V	Permeability & Seepage	06	03	03	04	10
VI	Shear Strength	05	02	02	03	07
VII	Bearing Capacity of soil	05	02	02	03	07
VIII	Soil Investigation & Exploration	04	02	01	03	06
Total		**42**	**20**	**17**	**33**	**70**

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

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

Sr. No.	**Unit No.**	**Practical/Exercise** (Outcomes' in Psychomotor Domain)	**Approx Hrs Required.**
1	I	Determine field moisture content of soil	02
2	I	Determine bulk density and dry density of soil by core cutter method	02
3	I	Determine specific gravity of sand by pycnometer	02
4	I	Determine bulk density and dry density of soil by sand replacement method	04
5	I	Conduct Sieve analysis of given soil for its classification	04
6	I	Determine consistency Limits i.e. Liquid limit, Plastic limit, Shrinkage limit	04
7	V	Determine permeability of soil by constant head method	02
8	V	Determine permeability of soil by falling head method	02
9	V	Determine shear parameters of soil by box shear test	02
10	I	Determine OMC and MDD by Proctor Test	04
Total Hours			**28**

8. **SUGGESTED LIST OF STUDENT ACTIVITIES**
   i. Collect few samples & find out different characteristics/properties of Soil from nearby site
   ii. Undertake site visit related to road compaction& consolidation and prepare report
   iii. Undertake site visit related to SPT on field & prepare report
   iv. Visit to Soil Testing Laboratory for awareness related to other Soil Testing Equipment, Soil Testing Report.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)
   i. Show Video Clips of Soil Testing and interact with students by asking questions
   ii. Show Picture Clips through Power Point regarding Testing of soil and its. commercial report
   iii. Video programs on soil engineering tests – by NITTTR – Bhopal
   iv. Video/animation films on soil behavior during earthquake

10. SUGGESTED LEARNINRESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1.	Soil Mechanics & Foundation	Dr. B C Punamia	Standard Book House
2.	Modern Geo Technical Engineering	Dr. Alam singh	Jodhpur University
3.	Textbook of Soil Mechanics & Foundation Engineering	V N S Murthy	UBS Publisher
4.	Soil Sampling & Testing Manual	Dr A K Duggal	NITTTR , Chandigardh
5.	IS 2720 , IS 1892 , IS 2132 & IS 2809	----	BIS , New Delhi

B. List of Major Equipment/Materials

i. Core Cutter
ii. Hot Air Oven
iii. Sand Pouring Cylinder
iv. Pyconometer Bottle
v. Permeability Apparatus
vi. Set of IS Sieves
vii. Casgrande Apparatus
viii. Direct Shear Apparatus
ix. Electronic Weighing Balance
x. Heavy & Light Proctor Test Apparatus

C List of Software/Learning Websites

i. www.issnge.org
ii. www.springer.com
iii. www.britannica.com
iv. www.trb.org

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B. G. Rajgor**, H.O.D, App. Mech. , BBIT , V. V. Nagar
- **Prof. K. Venkateshwarlu** , H.O.D , T F G Polytechnic, Adipur
- **Prof. C. H. Bhatt**, Lecturer Dr. S. & S.S. Ghandhy College, Surat
- **Prof. K. K. Patel**, H.O.D, G. P Rajkot

SCoordinator and Faculty Members from NITTTR Bhopal

- **Dr. V H Radhakrishnan** , Professor, Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: COMPUTER AIDED DRAWING
(Code: 3340606)

Diploma Program in which this course is offered	Semester in which offered
Civil Engineering, Transportation Engineering	4th Semester.

1. RATIONALE

Computer Aided Design (CAD) is a good example of technological innovation that has had a significant impact on the drawing preparation and in civil engineering industry and other fields. Drawing is the tool by which civil engineer can express engineering detailing like layout of site, plan , elevation, section with interior details and design output to be used by marketing office , client , concern authority for execution , approval and for other works.

Formerly, such drawing were prepared manually, which resulted in time consuming process, repetition of work for editing again resulted in wastage of stationary and time of human resources.

Due to advancement in computer and development of versatile software like AutoCAD, civil engineers and architects are using computers and graphical software to generate necessary drawings with high precision and using less time compared to manual drafting and it has therefore became a necessity to have CAD skills among the engineers to improve the efficiency of drafting procedures. Keeping this in mind, the curriculum is framed to develop basic skills and competency required.

2. COMPETENCY

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

- **Prepare detailed engineering and construction designs and drawings required for civil engineering activities using advanced CAD software.**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Apply basic CAD command to develop 2D and 3D drawings of residential & commercial building using AutoCAD.
ii. Prepare detailed engineering and construction drawings and designs required for civil engineering activities.
iii. Use advanced CAD commands for edit/modification of existing drawings as per needs and suggestions and print the same.

4. 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	
00	00	04	04	00	00	40	60	**100**

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

5. COURSE DETAILS

Note: There are no separate classes for theory as given below. The relavant theory has to be discussed before the practical during the practical sessions**.**

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I **Introduction to AutoCAD**	1a. Demonstrate the basics of AutoCAD software and its important commands 1b. Prepare a simple building drawing file using basic draw and modify commands	1.1 File menu of AutoCAD with New, Open, Save, Save as and Close 1.2 Basic 2D commands like Line, Circle, Ellipse, Multi Line ,Construction Line, Polyline, Point, Donut, Ellipse, Polygon, Rectangle, Arc 1.3 Erase, Snap, Redraw, Regenerate , Zoom, Pan
Unit – II **Editing of AutoCAD Drawing**	2a. Explain the applications of Edit commands 2b. Modify existing AutoCAD Drawing 2c. Apply advanced command for edit /modification of drawing	2.1 Modify Properties of Drawing Entity 2.2 Copy, Move, Rotate, Mirror , Offset , 2.3 Array, Scale, Stretch, Lengthen, Trim, 2.4 Extend , Break, Chamfer , Fillet 2.5 Block, WBlock, Insert and Explode , Area 2.6 and Volume with Civil Engineering 2.7 Application
Unit – III **Advanced 2DCommands**	3a. Prepare typical Drawings using Different Layers 3b. Develop final Drawings with Dimension and Text and Hatching	3.1 Application of LAYER command in Civil Engineering 3.2 Layer command with its all sub commands, Line type, Color 3.3 Dimension command – linea , aligned, arc length, radius, Diameter, Centre, Leader, Baseline and Continuous Dimensioning,tolerance, override and Dimension updates Text and DTEXT commands with Text Style Hatch command
Unit – IV **3D Commands of AutoCAD**	4a. Use 3D commands to generate 3d view from 2D drawing 4b. Prepare 3D Drawings using 3D Commands of AutoCAD 4c. perform rendering/shading on 3d drawing	4.1 Units, Elevation, Thickness, UCS and UCS Icon 4.2 Viewports , Extrude , 3D Solids – Sphere, Box, Cylinder, Cone, Wedge, Interference 4.3 3D Surface – Revolved, Tabulated and Ruled Surfaces 4.4 Hide, Render and Shade of 3D drawings

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – V Plot of 2D & 3D Drawings	5a. Setup printer , plotter for printing of drawings 5b. Plot 2D and 3D Civil Engineering Drawings as per requirement on different scale and sizes	5.1 PLAN , ELEVATION and 3D Views of Residential and Commercial Building 5.2 PLOT and its Sub Command for Plotting Drawing on A1, A2 and A3 Size Paper using Printer and / or Plotter

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

Not Applicable

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx Hours Reqd.
1	I	Draw Basic 2D objects such as line circle, polygon - (at least 04 objects)	04
2	II	Draw simple plan of a rectangular room or layout of given dimensions -- 02 drawings	08
3	III	Draw a drawing of a plan of two BHK house	14
4	IV	Draw Four 3D Geometrical Figures	12
5	V	Develop PLAN , ELEVATION and 3D Views of One Residential and One Commercial Building	18
Total Hours			**56**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Visit to architect/civil engineering firm for understating the CAD and its applications and study of typical drawings prepared by AutoCAD

ii. Collect different types of civil drawings in hard copy from architects , builders, and practicing engineers for preparing the same using CAD software

9. SPECIAL INSTRUCTIONAL STRETAGIES (If Any):

i. Use projector to explain and demonstrate the use of AutoCAD commands. and students must have computer with software
ii. CAD tutorial can be given to the students (available on internet)
iii. Collect and provide different drawings prepared through AutoCAD and will show to students to motivate to prepare such type of Drawings.

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

S. No.	Title of Books	Author	Publication
1.	AutoCAD Manual	-----	Microsoft AutoDesk
2.	AutCAD – A problem solving Approach – 2013 & Beyound	Shamtikoo	AutoDesk
3.	Mastering AutoCAD	George Omura	Wily India
4.	AutoCAD	Rubenstein	Delmar

B. List of Major Equipment/Materials

i. Computer system -Intel Core 2 Dual with 32 MB RAM 200mb hard disk and Mouse and Key Board
ii. Printer and/or Plotter as per printing requirement

C List of Software/Learning Websites

i. Authentic AutoCAD version 2006 or Higher can be down loaded from AICTE website
ii. Autodesk web site

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B. G. Rajgor,** H.O.D, App. Mech., BBIT , V. V. Nagar
- **Prof. Ravi R. Gurnani,** Lecturer in Civil, T F G, Adipur
- **Prof. C. H. Bhatt,** Dr. S. & S.S. Ghandhy College, Surat
- **Prof. K. K. Patel,** H.O.D, G. P. Rajkot

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. J. P. Tegar,** Professor and Head Dept. of Civil and Environmental Engineering
- **Dr. Subrat Roy,** Professor, Dept. of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNVERSITY

BRANCH CODE:06 DIPLOMA PROGRAMME IN CVIL ENGINEERING

SEMESTER - V

COURSE CODE	COURSE TITLE	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	P	CREDITS (L+T+P)	THEORY MARKS		PRACTICAL MARKS		GRAND TOTAL
						ESE	PA	ESE	PA	
3350601	DESIGN OF STEEL STRUCTURE	3	0	4	7	70	30	40	60	**200**
3350602	CONCRETE TECHNOLOGY	3	0	2	5	70	30	20	30	**150**
3350603	WATER SUPPLY & SANITARY ENGGINEERING	3	0	2	5	70	30	20	30	**150**
3350604	ESTIMATING , COSTING & VALUATION	3	0	4	7	70	30	40	60	**200**
	ELECTIVE-I(ANY ONE)	3	0	2	5	70	30	20	30	**150**
3350609	PROJECT-I	0	0	4	4	---	---	40	60	**100**
TOTAL		**15**	**0**	**18**	**33**	**350**	**150**	**180**	**270**	**950**

ELECTIVE-I	
3350605	ADVANCE CONSTRUCTION TECHNOLOGY
3350606	HIGHWAY ENGINEERING
3350607	IRRIGATION ENGINEERING
3350608	ENVIRONMENTAL ENGINEERING &POLLUTION CONTROL

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

ESE for Practical includes VVa/Practical exam/Performance etc.
PA for Practicals includes TW/Report writing/Mini Project/Seminar etc. related to practicals
PA for Theory includes Written Exam /Assignment/Tutorial Work/Mini Project/Quiz/Presentation or

For Any suggestion please write to Mr. B. G. Rajgor, Email id :- bgrstrengg@yahoo.com with copy to cdc@gtu.edu.in

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: DESIGN OF STEEL STRUCTURE
(COURSE CODE: 3350601)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5th Semester

1. RATIONALE

Civil Engineering structures are normally made up of either Steel Sections or of Reinforced Cement Concrete. Normally, industrial structures are constructed using steel sections.
In industry, to cover wider area without any obstruction at floor level due to columns etc., normally steel roof truss is provided and hence Load calculation using IS 875 is required for such trusses.

Using our previous semester study of Structural Analysis and design provisions as per IS-800-2007, in this subject, students will analyse and design different components of steel structure.

In Steel Structure, Rolled Steel Sections are used and its connections at different stages on site is highly important for the safety of Structure and hence, study of Connection through Welding or Bolting is important. This course is therefore an important course for civil engineering students.

2. LIST OF COMPETENCY

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

- **Design of Tension & Compression members of Steel Structure along with Foundation, Steel Beam and Welded and Bolt Connection as per IS 800-2007**
- **Structure Detailing of Steel Roof Truss and Different Steel Structure Component**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Calculate Dead Load , Live Load and Wind Load on panel points of a Roof Truss as per IS-875-1984
ii. Design Bolt Connection of Angle Section to Gusset Plate & Welded Connection of Angle Section to Gusset Plate , Lacing System (Single or Double) for Built up Column , Batten System for Built up Column , laterally Restrained Simply Supported beam, Purlin made up Angle Section , Slab Base Foundation under Axially Loaded Column made up of Single H Section
iii. Analyze and Design Axially Loaded Tension Member made up of Angle Section , Strut made up of Angle Section , Axially Loaded Column

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (InHours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
03	00	04	07	70	30	40	60	200

Legends:L- Lecture;**T-** Tutorial/TeacherGuidedStudentActivity;**P -** Practical; **C -**Credit; **ESE**-End Semester Examination; **PA**-Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I **Calculation of Load on Roof Truss**	1a. Calculate Dead Load , Live Load and Wind Load on panel points of a Roof Truss 1b. List types of Truss	1.1 Rolled Steel Section – ISA, I & H Section, Channel Section and its application in Steel Structure 1.2 Types of Truss, Pitch of Truss, Rise, Spacing of Truss, Purlin, Principal Rafter, Main Tie, Sag Tie, Members of Truss , Roofing material- GI and AC Sheets 1.3 Dead Load of Truss per panel point- Self Weight , Weight of Purlin , Wind Bracing , Weight of Roofing Material 1.4 Live Load per panel point in Truss as per IS – 875 – Part II -1984 when access is not provided 1.5 Wind Load per panel point in Truss using IS – 875 – Part III -1984

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – II **Bolt and Welded Connection**	2a. D Design Bolt Connection of Angle Section to Gusset Plate 2b. D Design Welded Connection of Angle Section to Gusset Plate 2c. C Solve Numerical on Bolted Connection of Angle Section to Gusset Plate and for Efficiency of Joint having Chain Bolting 2d. C Solve Numerical on Welded Connection of Angle Section to	2.1 Rigid Connection, Pinned Connection, Semi Rigid Connection, Black Bolts, Turned Bolts, HSFG Bolts, Grade of Bolts 2.2 Lap and Butt Joint, Minimum and Maximum Pitch, Tack Bolting, Edge Distance, Gauge Distance,Bolt Hole 2.3 Shear Capacity of Bolt – Vdsb, Bearing Capacity of Bolt – Vdpb as per IS-800-2007, Bolt Value, Efficiency of Joint 2.4 Numerical on Bolted Connection of Angle Section to Gusset Plate and for Efficiency of Joint having Chain Bolting 2.5 Types of Weld, Fillet Weld and
Unit – III **Tension Member**	3a Analyze and Design Axially Loaded Tension Member made up of Angle Section 3b Solve Numerical for Analysis & Design type based on 1.2 for Single and Double Angle Sections on same side and either side of Gusset Plate	3.1 Examples of Tension Members in Civil Engineering Structures 3.2 Design Strength of Tension Member, Design Strength due to Yielding of Gross Section, Design Strength due to Rupture of Critical Section for Angle Section ,Design Strength due to Block Shear in Angle Section as per IS – 800-2007 3.3 Slenderness ratio of Tension Member as per IS – 800 – 2007 3.4 Numerical for Analysis & Design type based on 1.2 for Single and Double Angle Sections on same side and either side of Gusset Plate

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – IV **Compression Member Strut & Column**	4a Analyze and Design Strut made up of Angle Section 4b Analyze and Design Axially Loaded Column 4c Solve Numerical on Column made up of ISHB , ISHB with Flange Plate , Double Channels Back to Back and Toe to Toe 4d Solve Numerical on Strut made up of Single Angle, Double Angle same and either side of G.P as per 1.2 & 1.3 Built up Column , Effective Length of Column as per Table 11, IS-800-2007	4.1 Strut , Maximum Slenderness Ratio, Classification of Cross – Sections and Buckling Class as per IS-800-2007 4.2 Angle Strut as per Cl. 7.5 , IS-800-2007 4.3 Design Compressive Stress – fcd according to Tables of IS-800-2007 4.4 Numerical on Strut made up of Single Angle , Double Angle same and either side of G.P as per 1.2 & 1.3 Built up Column , Effective Length of Column as per Table 11 , IS-800-2007 4.5 Design Compressive Stress – fcd according to Tables of IS-800-2007 4.6 Numerical on Column made up of ISHB, ISHB with Flange Plate, Double Channels Back to Back and Toe to Toe
Unit – V **Lacing & Battens**	5a Design Lacing System (Single or Double) for Built up Column 5bDescribe Objective of Lacing , Single Lacing , Double Lacing , Batten 5c Design Batten System for Built up Column	5.1 Objective of Lacing , Single Lacing , 5.2 Double Lacing 5.3 IS – 800-2007 requirements for Lacing System as per Cl. 7.6 5.4 Numerical on Single and Double Lacing as per 1.2 5.5 Objective of Batten , Batten 5.6 IS – 800-2007 requirements for Batten System as per Cl. 7.7 5.7 Numerical on batten as per 2.2
Unit – VI **Lateral Restrained Beam & Purlin**	6a Design of laterally Restrained Simply Supported beam 6b Design of Purlin made up Angle Section	6.1 Main Beam , Secondary Beam , Standard I Sections , Laterally restrained and unrestrained beam 6.2 Plastic Section Modulus – Annexure –H , IS-800-2007 , Section classification as per Table 2 – IS-800-2007 , Shear buckling , Shear Strength and Bending Strength of Section as per Cl. 8.4.1 and Cl. 8.2.1.2 of IS-800-2007 , Deflection as per Table-6 of IS-800-2007 , Shear Leg Effect , Web Crippling

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit-VII **Slab Base Foundation**	7a Design of Slab Base Foundation under Axially Loaded Column made up of Single H Section 7b Solve Numerical on Slab Base Foundation under Column made up of Single H	7.1 Slab Base , Gusseted Base , Base plate and its Thickness as per IS-800-2007 , Concrete Block , SBC of Soil , Anchor Bolt , Cleat and Dummy Angle 7.2 Numerical on Slab Base Foundation under Column made up of Single H Section

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Calculation of Load on Roof Truss	08	02	00	09	11
II	Bolted and Welded Connection	06	01	02	04	07
III	Tension Member	06	00	02	05	07
IV	Compression Member Strut & Column	06	02	02	06	10
V	Lacing & Batten	04	01	02	04	07
VI	Laterally Restrained Beam & Purlin	08	02	04	08	14
VII	Slab Base Foundation	04	02	00	05	07
	Sketches As Mentioned In Drawing Work	00	03	04	00	07
Total		42	13	16	41	**70**

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

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hrs. Required
1	I	Find Forces in given Truss Members using Graphical Method due to D.L , L.L and W.L and Design Forces in the Members – Drawing Sheet – No: 01 ,A1 Size	08
2	II , III , IV	Draw Plan & c/s Elevation of Eaves Level Joint , Ridge Joint and Two Other Joints of a Truss Selected in Sheet No:01 with all design details like Size of Angle Section , G.P , Connection Details , Purlin , Roofing Material – Drawing Sheet – No: 02 , A1 Size	10
3	**IV , VII**	Draw Plan and c/s Elevation of Built up column made up of Double Channel provided back to back with Single or Double Lacing Draw Plan and c/s Elevation of Slab Base Foundation under column made up of H section Sheet No:03 – A1 Size	08
4	----	Prepare following Neat sketches in Sketch Book Different Types of Truss Truss Details – Spacing of Truss , Principal Rafter, Main Tie, Members, Ridge, span, Roof Covering, Purlin etc… Eaves Level Joint of Truss Ridge Level Joint of Truss Beam to Beam Connection at Same Level Beam to Beam Connection at Different Level Column to Beam Seated Connection (Weld & Bolt Connection) Column to Beam framed Connection (Weld & Bolt Connection) Gusseted Slab Base Foundation	14
5	I , II , III , IV , V, VII	Prepare a Report File related to Calculation work of Drawing Sheet No: 1 , 2 & 3	**10**
6		Site Visit of Industry Truss , Steel Structure Railway Platform – Report , Photographs	**06**
		Total Hours	**56**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Collect the Photographs of nearby Typical Roof Trusses and from Internet
ii. Collect the Photographs of Elevated Steel Structure Water Tank
iii. Collect the Photographs of Steel Columns with Lacing and / or Batten

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Site Visit must be arranged for Industrial Truss to explain Truss terminology and Connection Details

ii. Show video of Fabrication work using Bolt and Weld

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

*** Students are permitted to appear in theory & practical examination with these books (highlighted and under lined)

S. No.	Title ofBooks	Author	Publication
1.	***IS-800 – 2007	-----	Bureau of Indian Standard
2.	***Handbook on Steel – SP-6	-----	Bureau of Indian Standard
3.	***IS – 875 – 1984 , Part - III	----	Bureau of Indian Standard
4.	Design of Steel Structures (By Limit State Method As Per Is: 800—2007)	S S Bhavikatti	I. K. International Pvt Ltd
5.	Design of Steel Structures	K. S. Sai Ram	Pearson Education India
6.	Design of Steel Structures: Theory And Practice	N. Subramanian	Oxford University Press (2010)
7.	Limit State Design of Steel Structures	S . K Duggal	Tata Mcgraw Hill Education Private Limited

B. List of Major Equipment/Materials

i. Drawing Hall having Drawing Facilities
ii. Models of Truss , Built up column , Beam and Column Connection

C List of Software/Learning Websites

i. http://nptel.iitm.ac.in - Lecture series from IIT , Guwahati
ii. elearning.vtu.ac.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

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- **Prof. B. G. Bhankhar ,** H.O.D , App. Mech., GP , Ahmedabad
- **Prof. K. K. Patel,** H.O.D , App. Mech. , GP , Rajkot
- **Prof. C. H. Bhatt,** LAM, DR. S & S. S. Gandhi Engg. College , Surat
- **Prof. Bhruguli H Gandhi ,** LAM , GGP , Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K. K. Pathak,** Professor Department of Civil and Environmental Engineering
- **Dr. M. C. Paliwal,** Associated Professor, Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: CONCRETE TECHNOLOGY
(COURSE CODE: 3350602)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering/ Transportation Engineering	5th Semester

1. RATIONALE:

Cement mortar and concrete are the most widely used and versatile construction materials. It is the material of choice where strength, impermeability, durability, performance, fire resistance and abrasion resistance are required.

Concrete is generally a site-made material unlike other materials of construction and as such can vary to a great extent in its quality, properties and performance owing to use of natural materials except cement. The knowledge of concrete and its properties in the plastic condition and in hardened condition are highly important in order to make Civil Engineering Structure safe and serviceable. This course focuses on students' acquisition of knowledge, skills & practices in concrete works. The knowledge and application of such aspects is essential in developing a good technician who should be conversant with the tests of various components of concrete and site practices to maintain quality of concrete works.

2. LIST OF COMPETENCIES

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

- Determine various properties/ characteristics & parameters of concrete with respect to Construction and Engineering Applications
- Evaluate Engineering Properties / characteristics of concrete for their suitability for Engineering Structures

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Evaluate physical properties of cement, sand and aggregates.
ii. Describe proper method for making and curing of concrete.
iii. Measure important properties of fresh and hardened cement concrete including NDT.
iv. Explain properties of various types of Admixtures and their utility
v. Design Concrete Mix as per IS method
vi. Explain various types of special concrete and their use.
vii. Explain methods to prevent and repair different types of the crack
viii. Prepare summary of at least one research paper on concrete from any journal of civil engineering

4. 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	
03	00	02	05	70	30	20	30	150

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

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (Outcomes in Cognitive Domain)	Topics and Sub-topics
Unit-I **Materials for Concrete**	1a. Evaluate physical properties of cement 1b. Evaluate Physical Properties of sand and aggregates used in concrete 1c. Test quality of water used in Concrete	1.1 Importance of cement in preparation of concrete, Chemical compound of ordinary Portland cement, Bougue's compounds and its functions 1.2 Types and Grades of cement and its uses 1.3 Physical properties- Fineness, consistency of Cement, IST & FST, Soundness & Compressive Strength of cement and its I.S. Requirements, Its Importance &their related Test as per Indian Standards 2.1 Role of Coarse & Fine Aggregates in Concrete, Classifications of aggregate on the basis of its size, shape, texture and weight Sieve Analysis, Water Absorption Specific Gravity of Fine Aggregate & Coarse Aggregate, Coarse Aggregate Impact Value, Crushing Value & Abrasion Value, Flakiness & Elongation Index, its importance & their related Test as per Indian Standards 1.1 Requirements of quality for water in concrete.

Unit	Major Learning Outcomes (Outcomes in Cognitive Domain)	Topics and Sub-topics
Unit-II **Fresh Concrete**	2a. Evaluate workability , harshness, segregation and bleeding properties of fresh concrete 2b. List the factors affecting workability 2c. Describe methods of measurement of workability , slump test & compaction factor test 2d. Describe methods of mixing of concrete 2e. Describe methods of compaction of concrete 2f. Describe methods of Curing 2g. List Effect of curing on development of strength of concrete	2.1 Fresh concrete and its properties - Workability, harshness, Segregation and bleeding 2.2 Factors affecting workability 2.3 Methods of measurement of workability Slump Test & Compaction Factor Test 2.4 Relation between workability and strength of concrete 2.5 Methods of mixing of concrete – Hand & Machine Mixing and its Transportation and Placing 2.6 Methods of compaction of concrete and its suitability 2.7 Factors affecting compaction 2.8 Curing and its importance , its methods and suitability 2.9 Effect of curing on development of strength of concrete
Unit-III **Admixures**	3a Explain properties of various types of Admixtures and their utility	3.1 Admixtures and its benefits , Types of Admixtures - Accelerator and Retarder Plasticizer and Super Plasticizer Water roofing and Air entraining admixture 3.2 Utility of Admixtures
Unit-IV **Hardened Concrete**	4a Evaluate Properties of Hardened Concrete 4b Describe the steps to conduct Non Destructive Test of Concrete	4.1 Hardened Concrete and its Properties 4.2 Compressive Strength ,Tensile Strength, Bond Strength, Flexure Strength Durability, impermeability 4.3 Factors affecting Compressive Strength 4.4 Creep of Concrete & its effect , factors affecting Creep 4.5 IS Test Procedure to find Compressive & Tensile Strength of Concrete, Acceptance Criteria , Mean Strength & Standard Deviation 4.6 Durability of Concrete & factors affecting it 4.7 Economy of Concrete & factors affecting it 4.8 Methods of Non Destructive Test of Concrete Rebound Hammer Test, Ultrasonic Pulse Velocity Test 4.9 Importance of NDT

Unit	Major Learning Outcomes (Outcomes in Cognitive Domain)	Topics and Sub-topics
Unit-V **Concrete Mix Design**	5a Design Concrete Mix as per IS method	5.1 Factors affecting quality of concrete, Advantages of Quality control. 5.2 Concrete Mix Design and its importance. 5.3 Nominal Mix and Design Mix. 5.4 Factors affecting concrete mix design. 5.5 Different methods of Mix Design and its suitability. 5.6 I.S. method to design a Concrete Mix As per IS 10262-2009. 5.7 Example of Mix design as per I.S. method
Unit - VI **Special Concrete & Concreting Techniques**	6a Explain various types of special concrete and their use.	6.1 Light weight concrete 6.2 Plum concrete 6.3 Fibre reinforced concrete 6.4 Polymer concrete 6.5 High density concrete 6.6 No fines concrete 6.7 Ferro cement 6.8 Fly ash concrete 6.9 Pumped Concrete 6.10 Ready mix concrete
Unit -VII **Prevention & Repair Techniques For Cracks**	7a Explain various types of cracks in concrete structures and their causes. 7b Explain methods to prevent and repair the cracks.	7.1 Deterioration of concrete and 7.2 Corrosion of reinforcement 7.3 Types of deteriorations and its effects 7.4 Prevention of concrete deterioration 7.5 Effect of corrosion of reinforcement in concrete and remedial 7.6 Types ,causes and remedies of concrete cracks before hardening 7.7 Types ,causes and remedies of concrete cracks after hardening 7.8 Prevention of cracks 7.9 Materials for repair of cracks 7.10 Methods used for repair of cracked Concrete
Unit-VIII **Modern Trend And Research Development In Concrete Technology**	8a Explain about latest Developments in the field of concrete works. 8b Prepare summary of at least one research paper on concrete during the course from any journal of civil engineering	8.1 latest research and development in the field of concrete technology 8.2 Journals available in the library, its publishers, Editors and place of publications. 8.3 The various authorities in the field of concrete technology and their field of specialization.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS& MARKS (Theory)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Materials for Concrete	08	3	8	3	14
II	Fresh Concrete	08	2	2	8	12
III	Admixures	03	2	1	2	05
IV	Hardened Concrete	08	2	2	8	12
V	Concrete Mix Design	05	1	2	6	09
VI	Special Concrete &Concreting Techniques	04	1	2	4	07
VII	Prevention &Repair Techniques For Cracks	04	1	2	4	07
VIII	Modern Trend And Research Development in Concrete Technology	02	1	1	2	04
Total		**42**	**13**	**20**	**37**	**70**

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy **)**
Note: This specification table shall be treated as general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured. Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.*

S. No.	Unit No.	Practical/Exercise (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1.	I	Test the cement for soundness	02
2.	I	Grade Aggregate into Fine and Coarse	02
3.	I	Determine Flakiness and Elongation Index	02
4.	I	Test Crushing Value for Aggregate	02
5.	I	Test Impact Value for Aggregate	02
6.	I	Determine Aggregate Abrasion Value	02

7.	II	Measure Workability (Slump, Compaction Factor Test)	02
8.	IV	Plot the effect of W/C ratio on Compressive Strength of Concrete	04
9.	IV	Conduct Split Cylinder Test	02
10.	IV	Conduct Pull Out Test to determine Bond Strength	02
11.	IV	Demonstrate Non-destructive Tests of Concrete	02
12.	IV	Project :- Concrete Mix Design as per I. S. Method	04
		TOTAL HOURS	**28**

FIELD VISIT: Arrange field visit to cement factory and Ready Mix concrete plant and prepare a report which should be a part of term work

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Collect few Samples from nearby site & find out different Properties of concrete
ii. Undertake visit to construction site and prepare the report
iii. Visit to concrete Testing Laboratory for awareness related to other concrete Testing Equipment, concrete Testing Report

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Show Video Clips of Concrete Testing, interact with students by asking questions
ii. Show Picture Clips through Power Point regarding Testing of Concrete and its Commercial report
iii. Video program on concrete tests – NPTEL & NITTTR - Bhopal

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

No.	Title	Author	Publisher
1	Concrete Technology	M.S. Shetty	S.Chand& co.Ltd
2	Concrete Technology	M.L.Gambhir	Tata McGraw Hill Ltd.
3	Properties of Concrete	A.M.Neville	Pitman
4	Concrete Technology	Dr. K.T. Krishna swami	Dhanpatrai &sons
5	Concrete Technology	R.S. Vashney	Oxford &IBH Publishing co, Bombay

LIST OF RECOMMENDED I.S. PUBLICATIONS:

I.S. 269	Specifications for O.P.C.
IS.12269	Specifications for O.P.C.53 Grade
I.S. 383	Specifications for coarse and fine aggregates
I.S. 516	Methods of tests for strength of concrete
I.S. 2386 Part I to VIII	Methods of tests for aggregate for concrete
I.S.456	Code of practice for plain and R.C.C.
I.S. 2340	Methods for sampling of aggregates for concrete
Sp 23	Handbook for concrete Mix Design
I.S.4031	Methods of physical tests on Hydraulic cement

I.S. 13311	Methods of non destructive testing of concrete
I.S. 1199	Methods of sampling and analysis of concrete
I.S. 10262- 2009	Recommended guidelines for concrete mix design

…

B. List of Major Equipment/Materials

(i) Ennore sand of 3 grades (ii) Cube Moulds of size 7.07cm (iii) Mortar Mixer (iv) Compression Testing m/c (v) Le-chatlier mould (vi) Water bath (vii) I.S sieve sets (viii) Moulds for Aggregate Crushing and Impact Test (ix) Impact test Apparatus (x) Thickness and Length gauge (xi)Cube Moulds of size 15cms (xii) Slump cone (xiii) Compaction factor Apparatus (xiv) Schmidt Rebound Hammer (xv)Table Vibrator.

C List of Software/Learning Websites

i. www.issnge.org
ii. www.springer.com
iii. www.britannica.com
iv. www.trb.org
v. www.nptel.ac.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. BG Rajgor**, H.O.D, App. Mech. , BBIT, V Vnagar
- **Prof. B G Bhankhar**, H.O.D, App. Mech., GP , Ahmedabad
- **Prof. K K Patel**, H.O.D, App. Mech. , GP, Rajkot
- **Prof. C H Bhatt**, Lam, Dr. S & S S Gandhi Engg. College, Surat
- **Prof. Bhruguli H Gandhi**, LAM, GGP, Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M C Paliwal**, Associated Professor, Department of Civil and Environmental Engineering.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: WATER SUPPLY & SANITARY ENGGINEERING
(COURSE CODE: 3350603)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5th Semester

1. RATIONALE:

Water is very important element in civilization. Social life from the ancient times developed on the bank of water-sources. If society wants to make remarkable growth, the mental as well as social health play vital role. For that purpose and to maintain the hygiene Pure, potable and palatable water needs to be supplied to the society. Water must be collected and disposed off in nature by giving proper treatment, so the natural flora and fauna will not get affected by sewage disposal.
This course focuses on students' acquisition of knowledge, skills & practices in water supply and sanitary engineering .Knowledge about domestic water supply & sanitation system (external & internal) and house drainage& disposal facilities is imparted. The technician must know about the quality of domestic water to be supplied to the society and treatment of waste water. The knowledge and application of such aspects is essential in developing a good technician who should be conversant with the collection, conveyance, treatment, maintenance and disposal of waste water.

2. LIST OF COMPETENCIES:

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

- Design, construct, operate and maintain water conveyance system
- Design, construct, operate and maintain sanitation system
- Maintain the treatment and recycle system of waste water, sewerage and solid waste

3. COURSE OUTCOMES:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Select appropriate treatment to raw water useful for domestic as well as construction purpose.
ii. Maintain the pipe-network for water supply and Sewage disposal effectively.
iii. Calculate and Estimate the impurities present in water used for domestic as well as construction works.
iv. Prepare lay out plan and maintain water distribution and sewer-networks.
v. Test raw water as per the standard practices
vi. Plan and implement house plumbing work effectively.

4. SCHEME OF STUDIES AND EXAMINATIONS:

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

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

5. COURSE CONTENT DETAILS:

Unit	**Major Learning outcomes** (In Cognitive Domain)	**Topics and Sub Topics**
Unit-I Sources, Quality and Demand of water	1a. Explain Importance of water supply engineering 1b. Identify sources of water for potable use 1c. Calculate water demand for future population 1d. Enlist factor affecting water demand 1e. Determine various impurities found in water source 1f. List Standards of quality of water with their permissible limits	1.1 Importance and necessity of water supply Engineering 1.2 Sources of water 1.3 Suitability of water 1.4 Choice of source 1.5 Types of demand 1.6 Population forecast 1.7 Computation of quantity of water 1.8 Fluctuation in demand 1.9 Factors affecting demand 1.10 Impurities in water 1.11 Collection of water sample 1.12 Physical Chemical and Biological tests 1.13 Standards of quality of water
Unit-II Treatment of Water	2a. State objectives of water Treatment 2b. Describe principles used in water treatment. 2c. Explain function of various stages of treatment of influent water	2.1 Objectives of water treatment 2.2 Location of water treatment plant 2.3 Layout of water treatment plant 2.4 Basic principles of working of treatment plant 2.5 Various stages of treatment of influent water i. Functioning of Coagulation treatment plant ii. Sedimentation iii. Filtration iv. Disinfection

		v. Water Softening
Unit-III Conveyance of Water	3a. List various materials used for pipe 3b. Explain various pipe joints in Distribution system 3c. List different valves and fittings used in pipe network 3d. Describe working principle of Laying of Pipes for Conveyance of Water 3e. Explain necessity of maintenance of water supply mains 3f. Describe Measures for conservation of water	3.1 Types of pipes used for conveyance 3.2 Pipe joints 3.3 Laying of Pipes 3.4 Distribution system 3.5 Types of valves 3.6 Types of Meters 3.7 Pipe fittings and fixtures 3.8 Necessity 3.9 Methods to prevent leaks 3.10 Measures for conservation of water
Unit-IV Sanitation System	4a. State objectives of sewage disposal 4b. Discuss methods of sewage collection 4c. Describe Conservancy system & Water carriage system 4d. Describe sewer appurtenances 4e. Explain Testing and maintenance of sewer 4f. Explain ,requirement and procedure for maintenance of sewerage system 4g. Explain functions of maintenance equipments and tools 4h. Describe Safety measures for sewer-men & Explosives in sewers	4.1 Sanitation System 4.2 Objective of sewage disposal 4.3 Methods of sewage collection 4.4 Conservancy system 4.5 Water carriage system 4.6 Classification of Drains 4.7 Sewer section 4.8 Sewer joint 4.9 Manhole 4.10 Flushing tank 4.11 Catch basin 4.12 Laying of sewer 4.13 Appurtenances and its locations 4.14 Hydraulic testing of sewer pipe 4.15 Maintenance of sewer 4.16 Procedure for maintenance of sewerage system 4.17 Causes of trouble and odor 4.18 Sewer cleaning operations 4.19 Requirements of maintenance 4.20 Functions of each maintenance equipments and tool 4.21 Selection of equipment for given maintenance job. 4.22 Explosives in sewers. 4.23 Safety measures for sewer-men
Unit-V Sewage Treatment and Disposal	5a. List the Characteristics of sewage 5b. Explain sewage treatment process & testing – sampling, B.O.D. Test, C.O.D. test 5c. Explain methods of sewage disposal	5.1 Characteristics of sewage 5.2 Sampling of sewage 5.3 Treatment of sewage 5.4 B.O.D. Test, C.O.D. test 5.5 Methods of sewage disposal
Unit-VI House Plumbing	6a Explain house plumbing system 6b Describe plumbing practice and safety precautions 6c list sanitary fittings used in house plumbing & tools used	6.1 Plumbing terms 6.2 Plumbing tools 6.3 Pipes and pipe fittings 6.4 Fixing and jointing pipes and

		accessories 6.5 Traps 6.6 House drainage plant 6.7 Plumbing practice and operations 6.8 Safety and precautions 6.9 Sanitary fittings
Unit-VII Recycling of Waste Water and Solid Waste	7.a Explain different methods of recycling waste water 7.b Explain management and utilization of solid waste generated from society	7.1 Different recycling method with respect to quality of waste water 7.2 Utilization and management of 7.3 solid waste

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Sources, Quality and Demand of water	6	3	4	3	10
II	Treatment of Water	7	3	2	6	11
III	Conveyance of Water	7	2	4	5	11
IV	Sanitation System	9	4	5	6	15
V	Sewage Disposal	6	2	4	4	10
VI	House Plumbing	3	0	2	3	5
VII	Recycling of Waste Water and Solid Waste	4	3	2	3	8
	Total:	**42**	**17**	**23**	**30**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers.
The actual distribution of marks in the question paper may vary slightly from above table

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills **(Course Outcomes in psychomotor and affective domain)** so that students are able to acquire the programme outcomes. Following is the list of practical exercises for guidance.
Note: *Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme.*
Faculty should refer to that common list and should ensure that students also acquire those programme outcomes/course outcomes related to affective domain.

No	Unit No	Practical/Exercise (Outcomes in psychomotor Domain)	Approx Hours
1.		**Numerical Example**	**Home Assignment**
	II	Predict Population for given situation by various methods	
	II	Calculate hardness of water for data of given sample	

2.		**Prepare Sketches of following**	**Home Assignment**
		1 Layout of Water treatment plant 2 Layout of Sewage treatment plant 3 Sedimentation tank 4 Filters 5 Pipe Joint 6 Distribution System 7 Pipe Fittings 8 Manholes 9 Flushing Tank 10 Catch basin 11 Sanitary fittings 12 Water sampler 13 Aeration tank 14 Activated sludge process 15 Trickling Filter 16 House Drainage Plan	
3.		**Design:**	**02**
		1 Design septic tank (Student will be given data, I.S. 2470(II) and handouts on septic tank, and should be asked to design the septic tank.)	
4.		**Laboratory Experiments**	**14**
		1. Determine pH value 2. Determine Hardness of potable water 3. Determine Residual chlorine from given sample of water 4. Determine Turbidity of water sample 5. Determine B.O.D. of wastewater sample 6. Determine C.O.D. of wastewater sample 7. Determine S.V.I.&S.D.I. using Imhoff cone for wastewater	
5.		**Visit following and prepare a detailed report**	**06**
		1. Water Treatment Plant 2. Sewage Treatment Plant **3.** Maintenance work of water supply mains and sewage system	
6.		**Present Seminar on a relevant topic:**	**06**
		The topic for the seminar should be given to the group of three students and they shall be asked to defend the seminar in presence of teacher and other students.	
Total Hours			**28**

8. SUGGESTED STUDENT'S ACTIVITIES

i. Prepare a model of septic tank for given number of residents.

ii. Prepare model/chart of Water/ wastewater treatment plant for given residential society/village

9. SPECIAL INSTRUCTIONAL STRETAGIES (If Any)

i. Arrange visit to local/nearby Influent treatment, Effluent treatment, Sewage Treatment plants.
ii. Demonstrate water distribution system, sanitation systems and solid waste disposal systems by arranging visit or showing video films, NPTEL lectures.

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

No	Name of book	Author	Publisher
1	Text book of water supply & Sanitary Engg.	S.K.Hussain	Oxford & IBH
2	Elements of Public Health Engineering	K.N.Duggal	S.Chand & Co.
3	Water supply & Sanitary Engg.	Vazirani & Chandola	Khanna Publishers
4	A Text book of water supply & Sanitary Engg.	S.K.Garg	Khanna Publishers
5	Water supply & Sanitary Engineering	Birdie G.S.	Dhanpatrai &Sons
6	A Text book of water supply engineering	V.N. Gharpure	Allied Book Stall, Baroda
7	A Text book of sanitary engineering	V.N. Gharpure	Allied Book Stall, Baroda
8	Water pollution & Disposal of Waste Water on Land	U.N.Mahida	Tata McGraw Hill
9	Municipal and Rural Sanitation	Ehlers & Steel	Mc Graw hill book
10	Water and Waste water Engineering	Gorden, Fair& Gayer Okun	John willey& Sons

(B) List of Major Equipment/Materials:

i. Spectrophotometer
ii. Water Analysis Kit
iii. B.O.D. Incubator
iv. Reflux apparatus
v. Various model of Fitting and Fixtures

(C) List of Software/Learning Websites

See NPTEL website

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty members of Polytechnic

- **Prof. S. M. Mistry**, H.O.D.Civil Engg., Dr. S. & S. S. Ghandhy College of Engg and Tech., Surat
- **Prof. R.M. Patel,** Sr. Lecturer Civil Engg. Government Polytechnic , Dahod
- **Prof. A.K. Popat,** Sr. Lecturer Civil Engg. Government Polytechnic , Dahod

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal,** Associate Professor,Department of Civil and Environmental Engineering
- **Dr. J. P. Tegar,** Prof & Head**,** Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: ESTIMATING, COSTING & VALUATION
(COURSE CODE: 3350604)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5th Semester

1. RATIONALE

Building Estimation and Costing is a vital part of Civil Engineering. No project can begin without the total Building Estimation and Costing done by the Engineer. The entire Cost of construction and the infrastructure used for the purpose of construction is estimated and the final costing is done on the basis of which a certain percentage of the Project cost is paid to the Engineer, the Architect and other consultants involved in the project. Valuation is one such important part of Building Estimation and Costing. Valuation is done after the project is complete on the latest trends of the land prices in the market. Therefore, this course has been designed so that the diploma civil engineer is able to prepare estimate and cost of a civil engineering project.

2. LIST OF COMPETENCY

The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:-

- **Prepare estimate and cost of a civil engineering project**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Explain types of estimate and duties of an Estimator
ii. Undertake rate analysis of civil engineering works
iii. Determine the rates of various items of civil works
iv. Calculate estimated cost of civil construction projects
v. Evaluate the actual value of any property.

4. 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	
03	00	04	07	70	30	40	60	200

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

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.

5. COURSE DETAILS

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
Unit– I Estimation and Modes of Measurement	1a. Explain types of estimate and duties of an Estimator 1b. Distinguish the terms: Overhead charges, contingencies, water charges, provisional sum, prime cost, provisional quantities, spot items, day work.	1.1 estimating 1.2 Types of estimate and Data required 1.3 Overhead charges, contingencies, water charges, provisional sum, prime cost, provisional quantities, spot items, day work. 1.4 General rules for the measurements and its units of different items of civil engineering work.
	1c. Describe various terms used in estimation work	1.5 Quality and duties of good estimator
Unit– II Specifications of Civil Works	2a. Write specification for various items of civil works.	2.1 Importance specification 2.2 Types of specification 2.3 Principle of writing specification
	2b. Estimate the various types of civil engineering works	2.4 Specification of Earthwork in Excavation, cement concrete, Brick masonary, R.C.C. Work, Plastering Work, Painting, Flooring
Unit– III Rate Analysis of Civil Works	3a. State the factors affecting task work 3b. Differentiate between labour rates and market rates of materials	3.1 Task Work and Factors affecting it 3.2 Labour required for different works and Labour rates 3.3 Market rates of construction materials
	3a. Explain the concept of schedule of rates and the purpose of rate analysis 3b. Compare the rate analysis of various types of work and SOR	3.4 Schedule of Rates (SOR) 3.5 Rate analysis and factors affecting it rate analysis 3.6 Rate analysis for earthwork in excavation, C.C.Work, Brick masonry Work, R.C.C. Work, Plastering, flooring work.

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
Unit- IV Estimation of Civil Works	4a. State the various methods of detailed estimation 4b. Estimate the cost of one/ two room building 4c. Estimate the cost of two storied building	4.1 Methods of detailed estimation 4.2 One/ two room building 4.3 Two storied buildings (RCC footings, Column, beams, slab)
	4a. Estimate the cost of RCC retaining wall/ Culverts 4b. State the methods of calculating earthwork for roads and canals	4.4 RCC retaining wall/ Culverts 4.5 Methods of calculating earthwork quantities for roads and canals
Unit– V Valuation of Civil Engineering projects	5a. Differentiate between cost, price and value 5b. Differentiate between depreciation and obsolescence	5.1 Cost, Price and Value 5.2 Types of property and Objects of valuation 5.3 Depreciation and Obsolescence
	5a. Describe different forms of value 5b. Evaluate the actual value of any property. 5c. Describe the procedure for fixing the standard rents.	5.4 Different forms of Value 5.5 Valuation tables and Valuation methods for property and land 5.6 Types of rents and fixing standard rents

6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Estimation and Modes of Measurement	08	06	08	00	14
II	Specifications of Civil Works	04	02	02	03	07
III	Rate Analysis of Civil Works	04	02	02	03	07
IV	Estimation of Civil Works	16	06	08	14	28
V	Valuation of Civil Engineering projects	10	04	04	06	14
Total		**42**	**20**	**24**	**26**	**70**

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

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

7. SUGGESTED LIST OF EXPERIMENTS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills ***(outcomes in psychomotor and affective domain)*** so that students are able to acquire the competencies/course outcomes. Following is the list of practical exercises for guidance.

Note*: outcomes in psychomotor domain are listed here as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty members should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes

S. No.	Unit No.	Practical Exercises (Major Outcomes in Psychomotor Domain)	Approx. Hrs. Required
1	I	Interpret civil engineering drawings	02
2	I	List of various items to be provided to learn the modes of measurements according to prevailing IS 1200	02
3	II	Collect specifications for at least 10 items of construction work	7
4	III	Analyze rate for at least 10 items of residential building construction	7
5	IV	Estimate in detail for load bearing structure, RCC retaining wall, RCC culverts, earthwork for road works, etc.	28
6	V	Solve at least 10 examples related to various form of value, depreciation, loan amount, annual rent, capitalized value, year purchase, etc.	10
		Total Hours	**56**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

S. No.	Unit No.	Student Activities
i.	III	Compare the actual analysis rates of items with the S.O.R. of P.W.D.
ii	IV	Take measurements of any existing building and calculate its present value.

9. SPECIAL INSTRCTIONAL STRATEGY (If Any)

i. Some live examples of estimation
ii. Visit to architectural firms

10. SUGGESTED LEARNING RESOURCES

A List of Books

S.No.	Title Of Books	Author	Publication
1	Estimating and Costing in Civil Engg.	B.N.Dutta	Ubspd, New Delhi
2	Estimating and Costing in Civil Engg.	S.C.Rangwala	Charotar Publication, Anand,Gujarat
3	Estimating and Costing	M.C.Chakraborty	
4	A textbook of Estimating and Costing	G.S.Birdie	
5	Estimating and Costing	Vazirani and Chandola	

B. List of software

i. Estimator
ii. MS Project.

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. Bhavesh V. Modi**, Principal B.V.P.I.T. (D.S.), Umrakh, Bardoli.
- **Prof. Krishnaraj A. Khatri**, Lecturer in Civil Engg. Deptt. B.V.P.I.T. (D.S.), Umrakh, Bardoli.
- **Prof. Anil K. Popat**, Lecturer in Civil Engg. Deptt. Government Polytechnic, Dahod.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Subrat Roy**, Professor, Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: ADVANCED CONSTRUCTION TECHNOLOGY
(COURSE CODE: 3350605)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5th Semester

1. RATIONALE

As a prerequisite to this course, it is expected that students have already learnt some basic concepts, principles and important aspects of construction technology in the third semester course (Code: 3330602).Now in this course of 'Advance Construction Technology', some advance aspects of construction technology will be covered. In today's times the construction activities is undergoing lots of changes/developments due to internal andglobalised market demands of quality and faster completion of project works using modern techniques, use of modern and waste materials, and through mechanized construction. Today, we require high capacity machines with better output and greater efficiency to make construction process less stressful. This course has been designed so that diploma engineers would be able to used advanced construction technology

2. LIST OF COMPETENCY

The course content should be taught and learning imparted with the aim to develop in students' construction technology related advanced knowledge and skills so that they are able to:

- **Use advanced construction technologies**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course learning outcomes:

Select appropriate equipment/machines for different construction activities with right choices of techniques for a given application.

i. Report the important operations of construction activities they visited where new techniques, machines and equipment are used.
ii. Describe important aspects , operations and safety points pertaining to:
    a. 'Deep Excavations';
    b. Pile foundations ;
    c. Coffer Dams;
    d. Caissons;
    e. Drilling and Blasting
iii. Discuss purpose, types, materials, design issues, and erection of temporary structures for construction activities.

iv. Describe equipment and tackles used , problems encountered and their solutions in erection of steel structures

4. TEACHING AND EXAMINATION SCHEME

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

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

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.

5. COURSE DETAILS

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
Unit – I Modern Materials and Equipment used in Special Constructions	1a. escribe the features of special types of civil engineering structures 1b. iscuss properties of advance materials and byproducts such as fly ash, red mud, furnace slag and their suitability to civil works.	1.1 Features and functions of the special types of civil engineering structures: Multistoried building, Chimney, Elevated service reservoir, Dams and retaining walls, Bridges and hydraulic structures, Industrial structures, Marine and offshore structures, Tall structures. 1.2 Effect of lateral forces on building like Wind, Water and Earthquake 1.3 Admixtures and its Classification 1.4 Use of Waste products and Industrial Byproducts in bricks, blocks, concrete and mortar.
	1c. Discuss main features of hauling equipment and hoisting equipment. 1d. State the factors affecting the selection of of hauling equipment and hoisting equipment.	1.5 ***Hauling equipment***: Trucks, Wagon, Dumpers, Scrapers and rippers. 1.6 ***Hoisting equipment***: Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Gentry crane, Tower crane, Lattice Girder, Winches, Elevators, ladders.

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
	1e. Discuss main features of hauling equipment and hoisting equipment. 1f. State the factors affecting the selection of hauling equipment and hoisting equipment.	1.1 ***Conveying equipment***: Belt conveyors, Buckets, Chutes 1.2 ***Pumping equipment***: Water pumps and concrete pumps.
	1g. Discuss main features of compacting and pile driving equipment. 1h. State the factors affecting the selection of compacting and pile driving equipment.	1.9 ***Compacting equipment***: Rollers (earth compaction), Smooth surface roller, sheep foot roller, pneumatic rollers, tamping roller, vibrating roller and compactors. 1.10 ***Pile Driving Equipment*** including types of hammer driving, drilling equipment with types of drill.
	1i. Discuss main features of vibrators and crushers. 1j. State the factors affecting the selection of vibrators and crushers.	1.11 ***Vibrators***: for concrete consolidation: Internal, Needle, Surface, Platform and form vibrators. 1.12 ***Crushers and other Equipment:*** used for Production of aggregate Jaw crusher, Gyratory crusher, Roll crusher, Cone crusher, Rod and ball mill, screens, Log washer.
	1k. Discuss main features of bituminous road construction and dredging equipment. 1l. State the factors affecting the selection of bituminous road construction and dredging equipment	1.13 Bituminous road construction Equipment 1.14 Equipment for large concrete works 1.15 Dredging equipment
Unit– II Excavation and related Equipment	2a. Differentiate between shallow and deep excavation with examples/sketches. 2b. Explain timbering operation in trenches. 2c. Explain the dewatering procedure	2.1 Shallow and deep excavation. 2.2 Dewatering situations, necessity and method of dewatering. 2.3 Dewatering
	2d. Discuss main features of excavation machinery and earth moving vehicles. 2e. State the factors affecting the selection of excavation	2.4 ***Excavations Machinery***: Power Shovel, Drag line, Calm Shell, Scoop, Trenching equipment, Wheel mounted belt loaders.

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
	machinery and earth moving vehicles 2f. Discuss main features of earth moving machinery.	2.5 ***Earth moving Vehicles***: Tractors, Boulders, Graders, Scrapers, Rippers.
	2g. State the factors affecting the selection of Earth moving machinery.	2.6 ***Earth moving machinery***: Handling, Hoisting, Conveying, Pumping, and Compacting, Pile driving, Drilling equipment, Plants for Grouting, Guniting and Hot Mix Plant, Concrete Mix Plant, Ready Mix Plant
Unit– III Pile Foundation	3a. Classify pile foundations. 3b. Explain the factors affecting the selection of types of piles. 3c. Justify the use of pile foundation for a given situation. 3d. Describe the features of the equipment, tools and method of construction of under reamed piles. 3e. Describe pile driving method. 3f. Discuss efficiency of group of piles.	3.1 Pile foundations, Classification. 3.2 Sheet piles based on materials. 3.3 Classifications of piles based on materials like concrete, steel, timber, composite, sand, concrete (pre-cast, Cast –in – situ, Pre-stressed) including cased and uncased with advantages and disadvantages. 3.4 Selection of type of piles. 3.5 Pile accessories and tools. 3.6 Pile driving methods. 3.7 Failure or settlement of piles. 3.8 Under reamed piles including method of it' construction. 3.9 Group action of piles and its efficiency.
Unit-IV Coffer Dams and Caissons	4a. Explain purpose, use and principles of working of coffer dams. 4b. Describe the major features of types of coffer dams with sketches. 4c. State the selection criteria of types of coffer dams 4d. State the leakage points and suggest leakage prevention in coffer dams.	4.10 ***Coffer dams:*** Types, requirements, Selection criteria, Design features, Leakage points and leakage prevention in coffer dams.
	4e. Differentiate between Coffer dams and caissons 4f. Describe the uses of caissons.	4.11 ***Caissons:*** Materials used, Sinking loading of caissons

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
	4g. Classify the types of caisson. 4h. Explain method of sinking of caissons. 4i. State the problems and suggest suitable solutions in well sinking	
Unit-V Drilling and Blasting	5a. Classify various types of Drilling and their suitability. 5b. Describe drilling operations 5c. Justify with example the necessity of drilling at construction site.	5.1 ***Drilling:*** Types, Drilling requirements, 5.2 Selecting the drilling pattern for blasting 5.3 Effect of air pressure on drilling operation 5.4 Betonies/mud slurry in drilling 5.5 Factors affecting the selection of drilling method and equipment
	5d. Describe the step-by-step blasting process of using explosives with safety precautions. 5e. Explain the precautions required in blasting and drilling operations , in storage and in handling of explosives	***Blasting*** 5.6 Explosives for blasting: Dynamite, Blasting caps Prime line, Safety fuse ,Stemming, Blast hole, Prime detonators 5.7 Process of using explosive 5.8 Types of blasting, Precautions 5.9 Storage of explosives 5.10 Features of magazine building
Unit-VI Erection of Steel Structures	6a. Describe various types of formworks with its advantages 6b. Discuss the principles of using slip formwork 6c. Describe cantilever method of Pre-stressed concrete bridge Construction 6d. Sketch the formwork for columns, beams and slabs and others for given problem situation with labels	6.1 Formwork: Requirements of a good form work, Loads, guiding points for design 6.2 Column form work 6.3 Slab and beam formwork 6.4 Slip from work 6.5 Hanging form works and Trestles 6.6 Form work for domes and arches. 6.7 Cantilever method of Pre-stressed concrete bridge construction
	6e. Describe problems faced and solutions adopted in erection of various types of steel structures such as roof truss, bridge girders. 6f. Discuss various types of equipment and tackles used in 6g. erection of various types of steel structure	6.8 Roof truss: erection problems Building / Industrial component, Equipment and tackles used for erecting these 6.9 Plate girder Launching a portion of bridge Girder, Large span lattice girder 6.10 Erection of chimney

Unit	Major Learning Outcomes (Major outcomes in cognitive domain)	Topics and Sub-topics
		Erection of overhead tank.

6.0 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
I	Modern Materials and Equipment for Special Constructions	10	08	06	05	19
II	Deep Excavation	04	03	02	02	07
III	Pile Foundations	08	06	04	02	12
IV	Coffer Dams and Caissons	08	06	04	04	14
V	Drilling and Blasting	04	03	02	01	06
VI	Erection of steel structures	08	06	04	02	12
	Total	**42**	**32**	**22**	**16**	**70**

Legends: R = Remember U = Understand; A = Apply and above levels (Bloom's revised taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7.0 SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop abilitiesand skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire and demonstrate the course learning and programme outcomes. Following is the list of practical exercises for guidance.

Note*: Here performance outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed and demonstrated appropriately, they would contribute to the development of demonstrated learning in behavioral terms in affective domain. As a whole, the total approach towards acquisition of knowledge, skills, abilities and behaviorand demonstration of the same would lead to the development of* ***Course Outcomes.*** *Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical Exercises (outcomes in Psychomotor Domain)	Approx Hours. Required
		Part-A (Sketches With Nomenclature and Short Details-Study and Information Based in Sketch book)	**08 hrs**
1	**II**	**Plants And Equipment Used In Construction** a. Earthmoving machineries b. Equipment for excavation c. Handling equipment d. Hoisting equipment e. Conveying equipment f. Pumping equipment g. Compacting equipment h. Concrete vibrating equipment i. Pile driving equipment j. Plants for Grouting, Guniting. k. Drilling equipment l. Concrete and mixing plant	
	III	Various types of timbering.	
	III	Dewatering methods.	
	III	Different types of shallow and deep foundations.	
	IV	Different types of pile foundations.	
	V	Different types of coffer dams.	
	VI	Different types of caisson.	
	VI	Slip form work	
	V	Blast hole	
	VI	Slab and beam formwork	
	VI	Column formwork	
	VI	Crib and Trestle	
		PART-B (Site Visit And Preparation Of Detailed Report Recording Main Operations (May Be With Photos) As Observed And Discusssed With Site Officers, Of Atleast One Visit)	**08 hrs**
2	**II**	Prepare a site visit report regarding your visit in which construction work is going on with advanced equipment's stating list of equipment including its selection criteria and its advantages.	
	III/IV	Prepare a site visit report regarding your visit in which deep foundation work is going on including type of deep foundation selection criteria.	
	V	Prepare a site visit report regarding your visit in which cassion / cofferdam construction work is going on.	
	VI	Prepare a site visit report regarding your visit in which	

S. No.	Unit No.	Practical Exercises (outcomes in Psychomotor Domain)	Approx Hours. Required
		drilling/ blasting work is going on.	
	VI	Prepare a site visit report regarding your visit in which erection of steel structure work is going on.	
		Part-C (Seminar Presentation)	**06 hrs**
3	I to VI	Topic of Seminar shall be given to a group of students. The students are required to submit and present / defend the Seminar in presence of students and teachers and report including PowerPoint presentation to be attached with submission. Each individual student's contribution in group work need to be made explicit.	
		Part-D –Prepare A Case Study (Any One)	**06 hrs**
4	I to VI	Based on advanced construction technology curriculum, on any one related topic narrating the case with specific operations/ problems faced/resolved from nearby construction work area with short details.	
		Total Hours	**28 rs**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Prepare experimental journals based on practical performed in laboratory.
ii. Assignments on solving field problems of construction or numerical problems
iii. Prepare chart displaying various types of pile foundation, coffer dams, caissons, etc.
iv. Prepare the schematic diagram for various types of plants.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

(i) Arrange visit to nearby following sites and write visit report
  (a) For a High Rise Building, Docks, Jetties, Pile driving sites, etc. those who are using all kind of advanced equipment.
  (b) For a Hot Mix Plants, Concrete Mix Plants, RMC, Aggregate Crusher site, etc.

10 SUGGESTED LEARNING RESOURCES

A) List of Books

Sr. No.	Title of Book	Author	Publication
1.	Building construction	S.P. Arora and S.P. Bindra	Dhanpat Rai
2.	Building Construction Engineering	Gurcharansingh	Jain Book Agency
3.	Construction, planning	Robert L. Peurifoy	Mc Graw Hill India

Sr. No.	Title of Book	Author	Publication
	equipment and methods		
4.	Building Construction	Sushil Kumar	Standard Publishers
5.	Learning from failures	R.N. Raikar	Structural Designers and Consultants, New Delhi
6.	Durable structure through planning for preventive measures	R.N. Raikar	Structural Designers and Consultants, New Delhi
7.	Diagnosis and Treatment structure in Distress	R.N. Raikar	Structural Designers and Consultants, New Delhi
8.	Building structures	James Abrose.	Wiley Publishers
9.	Standard handbook of civil engineering	Gurcharansingh	S P P
10.	Building construction	B.C. Punmia	Laxmi Publication, New Delhi
11.	Building construction	S.C. Rangwala	Charotar Publishing House Pvt. Ltd. Anand
12.	Civil Engineering Practice (I,II,III)	Kaushik, Asawa and Ahuja	Publishing House, New Delhi
13.	Civil Engineering Construction	Antill and Ryan	Angus and Robertson
14.	Pile Foundations	Tomlinson	Longman Group, U. K.
15.	Relevant IS codes	-	BIS, New Delhi

B) List of Major Equipment/ Instrument with Broad Specifications: (Teachers are requested to provide here a sample list)

C) List of Software/Learning Websites

i. www.sskphdmm.com

ii. www.nptel.iitm.ac.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. P. D. Gohil**, Sr. Lecturer in Civil Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof A. K. Popat** Sr. Lecturer in Civil Engineering , Government Polytechnic, Dahod
- **Prof. D. V. Jariwala Sr.** Lecturer in Civil Engineering , Government Polytechnic, Bharuch
- **Prof. H.K.Rana Sr.** Lecturer in Civil Engineering , Government Polytechnic, Valsad

Coordinator and Faculty Member from NITTTR Bhopal

- Dr. V H Radhakrishnan, Professor,Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: PROJECT-I
(COURSE CODE: 3350609)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5th Semester

1. RATIONALE

One of the important criteria of "Project " is to develop the ability of "learning to Learn " on its own. This would go a long way helping the students in keeping pace with future changes in technology and in the acquisition of knowledge and skills as and when needed. The course of the "Project" is designed with an aim to all these requirements of the students. Which will include planning of the Programme, which must be completed within the time allocated.

The Project should never have a single solution and process of arriving at a particular solution, the student must be required to make number of decisions after study information as he has gathered from experiments, surveys, analysis etc.

The Project is also included with Seminar with the aim to develop certain set communication skills (preparation of report, writing survey report writing lab. experiment results writing conclusions of the work done and physical phenomenon observed, participating in group discussions, verbally defending the project in the form of Seminar etc.)

The curricula for each course make specific mention of some of the major aims and objectives of the programme as a whole, these should be assigned due importance in the planning of teaching methodologies,

The programme aims at developing in the student, knowledge and skills to match the current and projected needs of industry/ user systems, social awareness and professional attitudes. In relation to the course and topics to be taught, the student will have to constantly update himself and keep pace with the changing technologies and the current and projected needs of user systems. Another important aspect is the development of the attitude of enquiry, the inculcation of sound study and work habits, side by side with the development of the overall personality. as well as positive attitudes .

2. COMPETENCY

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:

1 To develop of inquisitive russ, innovative skill and confidence to work independently
2. To participate effectively in group work
3. To collect relevant data
4. To plan and organize the work
5. To analyse and synthesise the data
6. To relate knowledge various courses in lacking a live problem
7. To make appropriate decision
8. To conduct a survey and investigation
9. To solve industry problems
10. To develop ability during field project work

11. To develop cost consideration
12. To design the components on broad lines
13. To prepare a drawings and plans for works
14. To assess the financial implication and feasibility of the scheme
15. To prepare the technical reports

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.
The students will be able to

- Know the questions to which he is finding answers through experimental work.
- Perform the practical work with appropriate accuracy.
- Reduce the experimental readings to the form of answers required.
- Understand clearly what the reader will want to know.
- Give brief but clear answers.
- Convince the reader that the answers are valid.
- Present a reasoned discussion of the significance of the answers he offers.

4. 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	0	4	4	00	00	40	60	100

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

5. COURSE DETAILS

During the semesters, Students will have to write two types of reports.

1. Course-work reports : i.e. reports for communication with your tutor or guide , Technical reports to communicate with a specific individual who might be a 'senior' person in the formats specified by Gujarat Technological University.
2. A summary of work carried out , the readings, calculations, results and answers in numerical or graphical form, and a discussion of the results, answers and conclusions.

The format must include following contents as a guideline, but should be strictly include all essential contents mentioned as per prevailing guidelines of Gujarat Technological University.

- The Certificate format should be as per the format prescribed by GTU time to time.
- The Report will include the following:

1) Certificate (in the Format given in this document below)

2) Acknowledgements

3) Abstract (In One paragraph not more than 150 words)

4) Index

5) Chapter-1 Introduction of the industry

6) Chapter-2 Problem Identification and Definition, process modification; a Literature Survey and Prior Art Search

7) Chapter-3 The description of the Industrial Process/ Product and problem analysis

8) Cgapter-4 The Outline of the solution (with details including drawings, circuits , software, used for or developed for the solution etc. in detail)

9) Chapter-5 For the **Semester V - Project Report**

- One self appraisal form should be attached at the end by the student in his favour regarding the claim of his work relevance , utilities and materialization as well as the gain in terms of cost – benefits , so that teacher can have ease of evaluation.
- The Report should be submitted well before the Exam.

Guideline for the Project– I for Diploma Engineering

Each final year (Fifth and Sixth Semesters) Project will be a Major Project.
It will be divided into two Semesters

Project – I: (Marks: 200) , Credits : 0 – 0 – 4

- Out of 200 marks, 100 marks are to be given as Progressive Assessment as per scheme suggested.
- The college, through Progressive Assessment , will assess the Industry Defined problems, submitted by students as per time limit prescribed by the university in the fifth semester.
- The remaining 100 marks are for the practical exam- ESE which shall be conducted by the GTU.
- Each defined project needs to be from Industry/Research organization/Govt. organization/ socio-technical issues and according to the need of time for solving real life problems.
- Project identification should be based on "Shodh-Yatra" carried out by the students, during summer, just after completion of the 4th Semester Diploma Engineering exam conducted by GTU. The Shodh Yatra should be completed by the end of the first week from the commencement of the fifth semester.
- Problem definition for the project needs to be submitted by every student within prescribed time limit specified by concern project guide as per the submission time limit specified by GTU to the respective faculty guide.
- Each definition will be evaluated and corrected if required by the faculty guide and the consolidated report should be prepared branch wise, in the prescribed format of GTU, by the College.
- Every College should send all the Problem Definitions in the specified format to GTU within prescribed time limit specified by GTU without fail.
- The selection of the topic for the project work must strictly related to the Elective Subjects/ Elective Group taken for the study and exam for 5th and 6th semester, failing to such selection , strict actions may be taken as prescribed and decided by the University.

- The HOD should send all the **Reports on the Problem Definition** to GTU, without delay, in a CD or online ,viewing all aspects and prevailing guidelines.
- Once the Problem is defined and submitted to GTU, the students will start working on the Problem. They have to undergo a rigorous process of Understanding and Analyzing the problem, conducting **a Literature and Prior Art Search through studying patent literature**, Deriving, Discussing and Designing the problem solution. The Implementation part will be completed in Sixth Semester.
- At the end of Fifth Semester , the student will prepare a **'Semester V Project Report'** of the work done during the Semester. An examination will be conducted. **The Principal will invite the industry mentor (in case the project is not based on a UDP) to the examination.** The HOD should send all the **Semester V Project Reports** to GTU, without delay, in a CD or online .

Certificate Format

This is to certify that Mr./Ms._____
From _____College having Enrolment No: _____
has completed **Report on the Problem Definition/ Semester V Project Report/ Final Project Report**
having title _____,
individually/ in a group consisting of _____ persons under the guidance of the Faculty Guide
_____.
The mentor from the industry for the project:
Name: Industry:
Contact Details:

SUGGESTED TYPES OF PROJECTS :

Definition of a project:

" A project should enable a student to exercise some of the knowledge and/or skills developed during programme (upon the time that the particular project is initiated) to a new situation or problem for which there are a number of engineering solutions. The project will include a planning of the programme, which must be completed within the time allocated, the maintenance of a logbook and the preparation of a report. The project should not have a single solution and in the process of arriving at a particular solution, the student must be required to make a number of decisions after studying information he has accumulated from experiments, analysis, survey, etc. The report should contain the reasons for all decisions taken."

Characteristics of project work:

1. Student centered teaching.
2. Active student participation
3. Full freedom with minimum teacher's direction
4. No unique, defined solution.

Types of project:

In general, projects are of the following types;

1. Feasibility study
2. Design

3. Market survey
4. Design, make, test and evaluate
5. Advanced experimental work requiring the development of existing equipment to be used
   and developed.
6. Field work – This could include surveys, using equipment or charting data and information from visual observation.

SUGGESTED TITLES FOR PROJECTS:

1. Water supply project
2. Sanitary project
3. Road project
4. Irrigation project
5. Housing colony project
   · Village planning
   · Village improvement
   · Slum clearance
   · Sector planning…

Assessment criteria for Effective Evaluation of the project:

The Diploma 5th Semester students are to be evaluated for the IDP Part-I (Final Year Project) as per the scheme suggested .

100 Marks are for Progressive Assessment to be evaluated by Institute concern Faculty / Guide for the Part-I only based on following criteria.

Sr. No.	Description	Marks
1.	Innovation / New Technique adopted	16
2.	Utility of the Project for industry/ Academia	08
3.	Related survey (Industrial Shodh Yatra) of Industry / Society / Institutes for Problem Identification	16
4.	Identification of thrust area and defining objectives with outcome	16
5.	Methodology Related Study, literature review adopted	16
6.	Presentation of work Plan / Action Plan and identification of Project	12
7.	Report writing / Documentation of IDP	08
8.	Preliminary Question - Answer and communication Skill	08
TOTAL		100

The Diploma 5th Semester students are to be evaluated for the IDP Part-I (Final Year Project) as per the scheme suggested for 100 Marks for ESE by External GTU appointed Examiner for the Part-I only.]

Sr. No.	Description	Marks
1.	Approach to identify problem, Tools and techniques used	**20**
2.	Quality of idea, Utility, Planning and work distribution	**20**
3.	Complexity of problem, Implementation feasibility	**10**
4.	IDP statement, Expected outcome of design and survey	15
5.	Presentation, Technical knowledge, Involvement of individual, Reporting and documentation	15
8.	Viva Voce – Question & Answer	**20**
TOTAL		**100**

Note:

- The project/ problem wise feedback form prescribed by the Gujarat Technological University should be submitted immediately after evaluation of the project/ problem by the external faculty appointed by the university.
- The above suggested evaluation scheme can be changed by the external faculty accordingly to problem / project following University guidelines.
- The project / problem selected should strictly related to the Elective courses or the group taken for the study and exam in semester 5^{th} and 6^{th} by the student , failing to such selection report must be made by the external faculty to university immediately after conducting exam .

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

NOT APPLICABLE

Legends: R = Remember U = Understand; A = Apply and above levels (Bloom's revised taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

SUGGESTED LIST OF EXERCISES/PRACTICALS

NOT APPLICABLE

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

7. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof A.K.Popat** Sr.lecturer in Civil Engineering , Government Polytechnic, Dahod
- **Prof R.M.Patel** Sr.lecturer in Civil Engineering , Government Polytechnic, Dahod

BRANCH CODE:06 DIPLOMA PROGRAMME IN CVIL ENGINEERING										
SEMESTER - VI										
COURSE CODE	COURSE TITLE	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	P	CREDITS (L+T+P)	THEORY MARKS		PRACTICAL MARKS		GRAND TOTAL
						ESE	PA	ESE	PA	
3360601	DESIGN OF REINFORCED CONCRETE STRUCTURES	3	0	4	7	70	30	40	60	200
3360602	CONSTRUCTION QUALITY CONTROL & MONITORING	3	0	2	5	70	30	20	30	150
3360603	CONSTRUCTION PROJECT MANAGEMNET	3	0	2	5	70	30	20	30	150
	ELECTIVE-II (FIRST SUBJECT FROM ANY ONE GROUP)	3	0	2	5	70	30	20	30	150
	ELECTIVE-III (SECOND SUBJECT FROM SAME GROUP)	3	0	2	5	70	30	20	30	150
3360613	PROJECT-II	0	0	6	6	0	0	40	60	100
TOTAL		**15**	**0**	**18**	**33**	**350**	**150**	**160**	**240**	**900**

ELECTIVE-II,III(ANY ONE GROUP)	
GROUP - A	
3360604	BUILDING SERVICES
3360605	MAINTANANCE & REHABILATION OF STRUCTURES
GROUP - B	
3360606	RAILWAY , HARBOUR & TUNNEL ENGINEERING
3360607	TRAFFIC ENGINEERING
3360608	PAVEMENT DESIGN
GROUP - C	
3360609	GROUND WATER ENGINEERING
3360610	ADVANCE HYDROLOGY
GROUP - D	
3360611	SOLID WASTE MANAGEMENT
3360612	WATER AND WASTE WATER MANAGEMENT

*Students shall opt only elective group which students had opted in FIFTH Semester

*In Elective Group B , out of mentioned three subjects.students shall opt for any two subjects out of three mentioned subjects.

ESE : END SEMESTER EXAM
PA: PROGRESSVE ASSESSMENT

L: LECTURE

P: PRACTICAL

T: TUTORIAL

ESE for Practical includes VVa/Practical exam/Performance etc.

PA for Practicals includes TW/Report writing/Mini Project/Seminar etc. related to practicals

PA for Theory includes Written Exam /Assignment/Tutorial Work/Mini Project/Quiz/Presentation or Combination of all with prior intimation to the students at beginning of term

For Any suggestion please write to Mr. B. G. Rajgor, Email id :- bgrstrengg@yahoo.com with copy to cdc@gtu.edu.in

prior intimation to the students
at beginning of term

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: DESIGN OF REINFORCED CONCRETE STRUCTURES
(COURSE CODE: 3360601)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	6th Semester

1. RATIONALE:

Most of the civil Engineering structures are normally made up of either Steel Sections or of Reinforced Cement Concrete. In Fifth Semester, Design of Steel Structure has been covered and in this course Design of reinforced Concrete Structures will be taught as per IS 456 – 2000.
Most of the residential buildings, Commercial and Public Buildings are designed using R. C. C. due to their long durability and flexibility in size and shape of structures and its members. So, Design of R.C.C. components like slab, beam, column and footing using Limit State Method is required to be understood. Also precise and correct detailing of reinforcement in structure drawing is also required in order to execute smooth construction of RCC structures. Hence this course will provide a detailed knowledge of reinforcement as per IS 456-2000, SP 34 and SP 16.

2. COMPETENCY:

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

- **Analyse RCC building structure/element for various application.**
- **Provide a design and detailed drawing of analysed structure/element using Limit State Method as per code of practice IS 456 -2000, SP 34 and SP 16.**

3. COURSE OUTCOMES (COs) :

The theory should be taught and exercises should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Develop methods of RCC design using concrete and steel properties
ii. Analyse & Design Singly Reinforced Rectangular Section (SRRS) under Flexure
iii. Design Stirrups for R.C Rectangular Beam
iv. Apply design conditions of IS 456-2000 for various elements of structures
v. Perform analysis for Tee Beam for Flexure, R. C. C. Column and Isolated Footing

4. 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	
03	00	04	07	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

5. COURSE CONTENT DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT – I Limit State Method	1a Explain Limit State Method and its types 2a Explain concrete and steel for its Design compressive and tensile strength and Limit State Load	1.1 Reinforced Cement concrete, necessity of steel in concrete, normal location of Tension steel in beams, slabs &in footing 1.2 Limit State, Limit State of Collapse – Flexure, Shear, Compression, Torsion, Limit State of Serviceability- Deflection, Cracking. 1.1 Characteristic Strength of Concrete and Steel, Partial Safety Factor for Concrete and Steel 1.2 Characteristic or Working Load, Partial Safety Factor for Load, Limit State or Factored Load

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT – II **Limit State of Collapse: Flexure**	2a Analyse & Design of Singly Reinforced Rectangular Section (SRRS) under Flexure 2b Analyse SRRS for flexure using SP-16. 2c Analyse & Design Doubly Reinforced Rectangular Section 2d Analyse flanged beam for Flexure	2.1 Assumptions for Limit State of Collapse due to Flexure 2.2 Stress and Strain Diagram of SRRS 2.3 Equation (No Derivation) related to maximum depth of N.A- Xumax, Actual Depth of N.A- Xu , Limiting Moment of Resistance- Mulim , Actual Moment of Resistance- Mu , maximum % limiting steel – Ptlim as per IS 456-2000 & Design Aid SP-16 2.4 Balance Section, Under Reinforced Section, Over Reinforced Section 2.5 Minimum and Maximum steel in beam and in slab and clear cover as per IS 456-2000(Clause 26.4, 26.5, Table 16) 2.6 Design problem to find size of SRRS Beam and steel area for limit state Bending Moment 2.7 Numerical related to 1.6 to 1.9 using SP-16-Flexure Chart and Flexure Table. 2.8 Condition for Doubly Reinforced Section 2.9 Equation stated in SP-16 for D.R.S. 2.10 Conditions for the beam to act as Tee 2.11 Beam. 2.12 Width of Flange as per IS 456-2000 (Clause 23.1.2) 2.13 Equation regarding Tee Beam from IS 456-2000 (Annexure G). 2.14 Numerical to find Limiting Moment of Resistance of Tee Beam using equation of IS 456-2000 and using Flexure Table of SP-16 regarding Tee beam.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT – III Design of Slab	3.a Design Slab for Spanning under Dead Load & Live Load 3.b Design & Detail Cantilever Slab , One Way Simply Supported Slab , One Way Continuous Slab & Two Way Simply Supported Slab	3.1 Slab –Spanning in Shorter Span, Steel for Bending Moment, Distribution Steel, Depth of Slab as per Deflection, Effective span as per IS 456-2000 (Clause 22.2), Dead Load, Live Load on Slab, Shear and Cracking in Slab. 3.2 Numerical to design and detail Simply Supported One Way Slab for Bending Moment , Shear , Deflection , Cracking for the assigned Floor Finish & Live Load. 3.3 Numerical to design and detail One Way Continuous Slab for Bending Moment, Shear, Deflection, Cracking for the assigned Floor Finish & Live Load using IS 456 -2000 B.M and S.F coefficients(Table 12 & 13) 3.4 Numerical to design and detail Two Way Simply Supported Slab with and without Torsion Steel for Bending Moment, Shear, Deflection, Cracking for the assigned Floor Finish & Live Load using IS 456 -2000 B.M coefficients (Annexure D)*** Numerical in 2.1 to 2.4 , use of SP-16 is permitted

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT – IV **Limit State of Collapse: Shear**	4a Design Stirrups for R.C Rectangular Beam 4b Apply shear requirements of IS 456-2000 to Designed Slab	4.1 Diagonal Tension Crack in Beam due to Shear 4.2 Equation related to Limit State of Collapse due to Shear as per IS 456-2000 (Clause 40). 4.3 IS 456-2000 clauses(26.5.1.5 & 1.6) related to Minimum and Maximum Spacing of Stirrups , minimum shear reinforcement 4.4 Clauses (40.2) related to Limit State of Collapse due to Shear for Slab in IS 456-2000 4.5 Numerical to check the slab for shear
UNIT – V **Limit State of Serviceability**	5a Apply Deflection clauses of IS 456-2000 to Slab & Beam 5b Apply Cracking clauses of IS 456-2000 to Slab & Beam Apply Development Length clauses of Is 456-2000	5.1 Span to effective depth ratio, Modification factor for SRRS as per IS 456-2000(Clause 23.2.1, 24.1) 5.2 Numerical to check Slab & Beam for Deflection 5.3 Maximum and Minimum spacing of Main steel and distribution steel in slab, Maximum and minimum spacing of bars in beam (Clause 26.3) 5.4 Numerical to check spacing of steel in slab for cracking 5.5 Equation to find Development Length of IS 456 -2000(Clause 26.2.1,) 5.6 Anchoring reinforcing bars in Tension and in Compression (Clause 26.2.2) Clauses related to Lap Length of Is 456-2000 (Clause 26.2.5.1)

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT – VI **Axially Loaded Short Column and Isolated Footing**	6a Analyse and Design axially Loaded Short Column 6b Design Isolated Slope and Pad Footing and provide reinforcement details of footing	6.1 Column , slenderness Limit for Short & Long Column , Minimum Eccentricity in column , condition for axially loaded column , equation for axially loaded short column of IS 456-2000(Clause 25 & 39.3). 6.2 Clauses(26.5.3.1, 26.5.3.2(C ,1-2)) of IS 456-2000 related to % compression steel , numbers of compression bars and its spacing, lateral ties – diameter and pitch. 6.3 SBC of Soil, Types of Footing like Isolated foundation, combined footing, raft Foundation, pile foundation. 6.4 Numerical to design & to detail Isolated Pad and Slope Foundation for assigned limit state compression load of column and SBC of soil for Bending Moment, One Way Shear, Punching or Double Shear, Load Transfer from Column to Footings (Clause 34).

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Limit State Method	03	02	02	00	**04**
II	Limit State of Collapse : Flexure	16	04	06	12	**22**
III	Design of Slab	08	02	04	08	**14**
IV	Limit State of Collapse: Shear	04	02	02	04	**08**
V	Limit State of Serviceability	03	02	02	02	**06**
VI	Axially Loaded Short Column and Isolated Footing	08	02	06	08	**16**
Total		**42**	**14**	**22**	**34**	**70**

Legends: R = Remember, **U** = Understand, **A**= Apply and above Level (Bloom's revised taxonomy)

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Note*: Here only outcomes in psychomotor domain are listed as practical. However, if these practical are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

Sr. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hours Required
1.	III	Draw One Way Simply Supported Slab in Plan and in Longitudinal cross section along shorter spanwith reinforcement and its bent up details in A2 Size	06

		Drawing Sheet	
2.	III	Draw One Way Continuous Slab in Plan and in Longitudinal cross section having five equal spans with reinforcement and its curtailment and its bent up details in A2 Size Drawing Sheet	06
3.	III	Draw Two Way Simply Supported Slab with Torsion Steelin Plan having longitudinal cross sections along shorter and longer span with reinforcement , bent up bars details in A2 Size Drawing Sheet	06
4.	II,IV,VI	1. Draw Plan and Cross Section Elevation of RCC Column having Isolated Slope Foundation with reinforcement details. 2. Draw Longitudinal Cross Section Elevation and a Section along Length of Doubly Reinforced Beam with shear reinforcement (Above two in A2 Size Drawing Sheet)	06
5.	---	Prepare following sketches in sketch book: 1. Longitudinal and cross section elevation along Length of Singly Reinforced Simply Supported Beam 2. Longitudinal and cross section elevation along Length of Cantilever Beam 3. Longitudinal and cross section elevation along Length of Simply Supported Tee Beam 4. Plan & c/s elevation along shorter span of One Way Simply Supported Slab 5. Plan & c/s elevation along shorter span& Longer span of Two Way Simply Supported Slab without torsion steel 6. Plan of Circular Slab with reinforcement 7. Column and Beam ductile connection 8. Column to Column Connection when size of Upper column is reduced 9. Circular Water Tank with flexible joint 10. Cantilever Retaining Wall 11. Reinforcement details of Shear Wall 12. Reinforcement details of R C C Dome 13. Dog Legged Stair Case	12
6.	---	Prepare design report having designs of First, Second, Third & of Fourth Sheet.	12
7.	--	Visit nearby residential and commercial construction and prepare brief having sketches/photographs of site including reinforcements, structure drawing of site, concrete work etc.	08
Total Hours			**56**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Visit a typical building/construction site and collect details of design.
ii. Collect typical photographs of building elements under different stage of construction.
iii. Collect the Photographs/drawing sheets of reinforcement of Elevated Water Tank
iv. Collect the Photographs /drawing sheets of typical staircases under construction having reinforcement details

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Site Visit must be arranged for Residential & Commercial Buildings to show reinforcement, cutting and laying of reinforcement, professional structure detail drawings
ii. Show video of concrete work being carried out in slab, beam, column and in footings of different type and size.
iii. Arrange lecture of practicing structural engineers on complex issues related to design.

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

Sr.	Title of Books/standards	Author	Publication
1.	***IS-456 – 2000	-----	Bureau of Indian Standard
2.	***Design Aid – SP - 16	-----	Bureau of Indian Standard
3.	R C C Detailing – SP - 34	-----	Bureau of Indian Standard
4.	Ductile Detailing 13920	-----	Bureau of Indian Standard
5.	Reinforced Concrete	Dr. H J shah	Charotar Publication
6.	Limit State Design of Reinforce Concrete	Dr. Punamiya, A K Jain, Arun K Jain	Laxmi Publications
7.	R C C design and drawing	Neelam Sharma	S K Kataria and Sons
8.	Illustrated Reinforced Concrete Design	Dr. V L Shah &S R Karve	Structures Publication
9.	Limit State Design of Reinforced Concrete	Vaghrese P C	PHI Learning Pvt. Ltd.
10.	R C C Design & Drawing	M I Ohri	Tech India Publication Series

*** students are permitted to appear in theory & practical examination with these standards (highlighted and under lined)

B. List of Major Equipment/Materials

i. Drawing Hall having Drawing Facilities
ii. Models of one way slab , two way slab, different types of columns and footings

C List of Software/Learning Websites

i. https://www.sefindia.org/
ii. www.slideshare.net/asif108/
iii. www.youtube.com/watch?v=2L1DTLV8bQk
iv. www.nptel.ac.in
v. www.civilengineersforum.com

11. COURSE CURRICULUM DEVELOPMENT

COMMITTEE Faculty Members from Polytechnics

- **Prof. B G Rajgor**, H.O.D, App. Mech., BBIT, Vallabh Vidya Nagar
- **Prof. B G Bhankhar**, H.O.D, App. Mech., Government Polytechnic, Ahmedabad
- **Prof. K K Patel**, H.O.D, App. Mech., Government Polytechnic, Rajkot
- **Prof. C H Bhatt**, Lecturer, App. Mech., Dr. S &S S Gandhi Engg. College, Surat
- **Prof(Ms.) Bhruguli Gandhi**, Lecturer, Government Polytechnic for Girls, Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering
- **Dr. K. K. Pathak**, Professor, Department of Civil and Environmental Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: CONSTRUCTION QUALITY CONTROL & MONITORING
(COURSE CODE: 3360602)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering/Transportation Engineering	Sixth

1. RATIONALE

Developing countries like India where lots of infrastructure development is undergoing, knowledge and understanding of quality control & monitoring in construction work is very important in order to achieve good quality product within the stipulated time period. For any civil construction work, day to day monitoring and inspection plays a very important role for durable and sustainable structure. Good quality control and monitoring may increase lives of civil structures by 40 to 50 years without much increase in cost of construction. Lots of infrastructure development works are underway and construction resource materials are depleting, under this circumstances, proper use of natural resources are very essential and necessary. Therefore the study of green building concepts and quality control aspects are essential for diploma students to perform their job, duties in the field efficiently and effectively. This course is more important for diploma engineers since they work in the supervisory capacity and in this capacity it is their main responsibility to ensure quality of construction.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Control and monitor quality in civil construction works effectively and efficiently.**

3. COURSE OUTCOMES (COs)

The theory should be taught and exercises should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Apply total quality management in civil construction.
ii. Check the quality in civil construction works.
iii. Identify the variations in quality of civil works.
iv. Use various standard codes in civil construction works.
v. Design energy efficient buildings.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (InHours)			TotalCredits (L+T+P)	Examination Scheme				
				Theory Marks		PracticalMarks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

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

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit-I **Total Quality Management (TQM) in Construction**	1a. Explain features of TQM 1b. Apply various quality checks. 1c. Distinguish between quality control and quality assurance. 1d. List precautions to be taken for accurate measurement	1.1 Concept of quality control, Quality assurance, Quality management. 1.2 Aims of TQM 1.3 Development and design Concept of TQM 1.4 Accuracy and precision in observation, reading, calibration, testing, measurements, recording of data and information etc. 1.5 Accuracy in calculation, finding area, volume, etc.
Unit-II **Construction Quality Control Inspection Program**	2a. Describe various aspects of QCIP. 2b. Explain QC aspects of various construction activities. 2c. List tests for ensuring quality of cement and bricks. 2d. List tests to ensure the quality of concrete. 2e. List precautions to be taken for ensuring better quality of RCC. 2e. List dos and don'ts for ensuring quality in plumbing and drainage work.	2.1 Duties, responsibilities, qualification of staff in organization. 2.2 Checklists for - Quality of Materials - Masonry - Plastering, - Concrete construction- Batching, Mixing, Transporting, Placing, Compaction, Finishing, Curing - Reinforcement Work - Formwork - Timber & steel construction, - Doors & windows, - Plumbing & drainage.

Unit-III **Statistical Quality Control& Monitoring**	3a. Describe statistical quality control methods. 3b. Explain variables and attributes related to control charts. 3c. Explain SPC and its importance 3d. Describe different types of Attribute-sampling plans. 3e. Explain acceptance sampling. 3f. Interpret different type of charts.	3.1 Statistical Quality Control 3.2 Quality Measurement: Attributes and Variables 3.3 Statistical Process Control (SPC) Methods 3.4 Control Charts for Attributes: p-Charts - Proportion Defective c-Charts - Number of Defects Per Unit 3.5 Control Charts for Variables 3.6 Other Types of Attribute-Sampling Plans 3.7 Acceptance Sampling
Unit-IV **Quality Standards**	4a.Use various quality standard codes from its application point of views. 4b. List important clauses with range of acceptable parameters related to quality of cement, bricks, steel and concrete as given in quality standards. 4c. List important provisions of Indian standards about different construction activities. 4d. Explain the main features of ISO9000 and ISO14000 standards.	4.1 Quality standards in construction related to Building materials and other inputs for construction processes. 4.2 Quality standards for Construction outputs, products and services. 4.3 Indian Standard Code (a) Methods of referring it (b) Use of IS for quality references 4.4 National Building code (NBC 2005) (a) Why to refer & How to refer (b) Methods of referring it & application. 4.5 Study of International Organization for Standardization (ISO) (a) ISO-9000, ISO14000 & certification procedures.

Unit-V **Sustainable Built Environment- Green Building**	5a. Explain concepts and goals of green building. 5b. Describe provisions to be made for green building. 5c. Describe provisions to be made for energy efficiency, material efficiency, water efficiency etc. 5d. Explain the concept of siting and structure design efficiency. 5d. Explain techniques for waste reduction. 5e. Suggest methods for enhancing indoor environmental quality.	5.1 Green building – 5.2 Definition – Green Building, Green Construction, Sustainable building 5.3 Goals of Green building 5.4 Advantages and disadvantages 5.5 Strategies 5.6 Certification Agencies – GRIHA, LEED (Highlights & Criteria) 5.7 Life cycle assessment (LCA) 5.8 Siting and structure design efficiency 5.9 Energy efficiency 5.10 Water efficiency 5.11 Materials efficiency 5.12 Indoor environmental quality enhancement 5.13 Operations and maintenance optimization 5.14 Waste reduction

6. SUGGESTED SPECIFICATION TABLE WITH HOURS&MARKS (Theory)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Total Quality Management (TQM) in Construction	7	4	3	4	**11**
II	Construction Quality Control Inspection Program	10	6	6	5	**17**
III	Statistical Quality Control & Monitoring	10	6	6	5	**17**
IV	Quality Standards	8	6	4	4	**14**
V	Sustainable Built Environment- Green Building	7	4	3	4	**11**
Total		**42**	**26**	**22**	**22**	**70**

Legends: R = Remember**, U =** Understand**, A=** Apply and above Level (Bloom's revised taxonomy)

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

Sr. No.	Unit No.	Practical/Exercises (outcomes in psychomotor domain)	Approx. Hours Required
1	I	Prepare Charts highlighting important features of TQM as applicable to construction.	6
2	II	Prepare various construction check lists for processes as well as for material quality	8
3	III	Solve 8 examples related to statistical quality control and statistical process control	6
4	IV	Prepare charts of important clauses of of NBC & ISO	4
5	V	Visit nearby Green Building & make a visit report comparing it with non-green building	4

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Visit the Civil Material Testing lab & prepare a report on material testing.
ii. Visit ongoing construction site & prepare a report on quality checks.
iii. Prepare a list showing various codes used in civil construction activity.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Arrange site visit to a large construction project and discuss different quality control and monitoring measures being employed.
ii. Show video films on testing of different materials
iii. Arrange expert lectures of reputed contractors/builders/Engineers of Civil departments on quality control issues.
iv. Present case studies of failures in construction projects due to quality problems.

10. SUGGESTED LEARNING RESOURCES

A. BOOKS:

No.	TITLE	AUTHOR	PUBLISHER
1	Total Quality Management	G.Kanji	Springer Science & Business Media
2	Fundamentals of Quality Control and Improvement	Amitva Mitra	Wiley India Private Limited
3	Manual on Quality Control	--	Gujarat Engineering Research Institute
4	Ambuja Technical Literature Series	--	Ambuja Cements
5	National Building Code, ISO 9000/14000 and other standards		

B. Learning Website:

i. www.nptel.ac.in
ii. http://ndrfandcd.gov.in/Cms/NATIONALBUILDINGCODE.aspx
iii. http://en.wikipedia.org/wiki/Green_building_in_India

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculties from Polytechnics, Gujarat

- **Prof. V. K. Shah**, H.O.D., Civil Engg. Deptt., Dr. S. & S.S. Gandhy Engg. College, Surat.
- **Prof. Krishnaraj A. Khatri**, Lecturer in Civil Engg. Deptt. B.V.P.I.T. (D.S.), Umrakh, Bardoli.

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering.
- **Prof. K. K. Pathak**, Professor, Department of Civil and Environmental Engineering.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: CONSTRUCTION PROJECT MANAGEMENT
(COURSE CODE: 3360603)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering/Transportation Engineering	Sixth

1. RATIONALE:

Project management skills are important for overall planning, coordination, and control of a project from commencement to accomplishment of the project efficiently and effectively. The awareness of various project management techniques is very essential to ensure that construction projects are completed within time and budget which is a biggest challenge. For this to achieve project management team has to manage various resources with the objective to complete the construction project with predetermine scope, cost, time and quality, and the constraints imposed on human material and financial resources. This course is therefore designed in such a way that after learning this course the students will be able to plan, organise and control construction operations by using various management techniques and software. Thus students would be able to complete the project in time & budget and as per desired quality. This course is therefore very important course for diploma holders in civil engineering since they have to manage construction projects on their own.

2. COMPETENCY:

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Manage various resources and activities, effectively and efficiently using appropriate techniques and software to complete the construction project within time and budget according to desired quality.**

3. COURSE OUTCOMES (COs)

The theory should be taught and exercises should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe construction management functions, various organisation structures and duties of various construction team.
ii. Explain tendering and accounting process.
iii. Develop the CPM and PERT network of various construction activities.
iv. Show leadership skills required to manage various construction resources and achieve targets.
v. Show professional ethics and concern for safety during various construction works.
vi. Use management information system.

4. TEACHING AND EXAMINATION SCHEME

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

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

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
UNIT-I **Construction Project and Organisation Management**	1a.Describe concept of project management. 1b.Draw the flow chart of an organisation. 1c. Explain the roleof different Construction teammembers. 1d. Describe the causes of project failure.	1.1 Construction Project management- importance, Functions, Scope. 1.2 Organisation-Types, Characteristics, Functions, principles. 1.3 Construction team-Roles, responsibilities and skills of construction team. 1.4 Stages in Construction. 1.5 Causes of Project failure.
UNIT-II **Tendering and Accounting**	2a. Explain various features of Contract document. 2b. Prepare a Tender document for the construction project. 2c. Explain various technical and accounting terms used in government organisations. 2d. Describe methods of execution of works in government organisations.	2.1Contract-Introduction, requirement, types. 2.2Contract documents and conditions of Contract, Contract agreement. 2.3Per-qualification of Contract- Importance. 2.4 Tender-Types, Terms and Conditions, issue procedure, opening, Scrutiny, Acceptance, Rejecting. 2.5 Prepare tender Notice. 2.6Technical terms- Administrative approval, Technical Sanction, Issue rate, Competent Authority, Secured Advance, Mobilization Advance, Heads of accounts in government organization, Original and repair work, Earnest money deposit (EMD) and Securitydeposit(SD), 2.7Accounting terms- Work Abstract, Cash book, Work resister, imprest, accounting for the materials,

		Measurement book, Muster roll, types of bills and recording. 2.8 Methods of getting work done in government organization.
UNIT-III **Construction Planning, Scheduling and Time Management**	3a.Describe various planning methods for construction works. 3b. Prepare Construction schedule. 3c. Draw CPM and PERT network for construction work. 3d. Describe the features of construction planning software.	3.1 Project Planning-methods and factors affecting planning. 3.2 Scheduling and types of Schedules. 3.3 Critical path method-Important terms, Basic Rules, Advantages and disadvantages. 3.4 Examples of CPM network.. 3.5 PERT analysis-Important terms, Advantages and Disadvantages 3.6 Examples on PERT. 3.7 Cost optimization. 3.8Introduction and importance of Primavera and MS Project for Construction Project Management.
UNIT-IV **Construction Resource Management**	4a.Describe features of material, labour and equipment management. 4b. Prepare Job layout. 4c. Proper material, labour and equipment schedule.	4.1 Material management-Purpose, Objective, material Scheduling, material handling, Storage, safety precautions, Economy Order Quantity, inspection and testing. 4.2 Job Layout. 4.3 Labour management-Labour Scheduling, Characteristics, Outputof labours, Wages of Workers, Labour Incentives, Labour Welfare, Trade Unions, Trade union act-1926, Mini Wage act-1948, Contract labour act-1970,etc 4.4 Equipment management- equipment Scheduling, Classification of various equipment, Factor affecting selection of construction Equipment, Owning & operating cost of equipment, Inspection & testing of equipment, Maintenance & repair of equipment.

UNIT-V **Human Resource development (HRD)& MIS**	5a. Explain Supervisor's role in Construction work. 5b.Expaline MIS with example.	5.1Importance of HRD. 5.2Supervisor's role as trainer & Motivator. 5.3Techniques to deal human resources effectively. 5.4 Professional Ethics in Engineering. 55Management Information System- Purpose, need, Types, Characteristics, Implementation and Applications.
UNIT-VI **Safety Management**	6a.Explain need of safety management in Construction. 6b.Discribe Safety measures in Construction as per IS code.	6.1Safety management-requirement, importance. 6.2Causes of accidents and its type. 6.3 Safety precaution-Excavation work, Demolition, Erection. 6.4 Safety measures- Scaffolding, Ladder, Piling, Bituminous works.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS&MARKS (Theory)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction of Construction Project Management	6	04	04	02	10
II	Tendering and Accounting	10	02	06	08	16
III	Construction Planning, Scheduling and Time Management	10	04	06	06	16
IV	Construction Resource Management	6	04	04	04	12
V	Human Resource Development and MIS	6	02	04	04	10
VI	Safety Management	04	02	02	02	06
Total		**42**	**18**	**26**	**26**	**70**

Legends: **R** = Remember, **U** = Understand, **A**= Apply and above level (Bloom's revised taxonomy)

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hours Require
1.	I	List the reasons of project failure from a given case study.	**2**
2.	I	Study given tender documents and formulate report containing terms and conditions.	2
3.	II	Study given contract document & analysis its strengths and weaknesses. (Given contraction documents should be comprehensive covering all terms and conditions).	4
4.	II	Prepare tender notice for given construction work.	2
5.	II	Prepare at least two Bar Charts and prepare CPM and PERT for Project scheduling for given project data.	6
6.	III	Prepare material and labour schedule for given project data.	2
7.	IV	Prepare equipment schedule by using MS Project for given project data.	2
8.	IV	Study different labour laws applicable for construction project and prepare a report.	2
9.	ALL	Prepare a presentation on relevant topic and present in a seminar	6
Total Hours			**28**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Visit to nearby ongoing residential construction site and study management aspect.
ii. Visit to PWD office and Draw Organisation structure.
iii. Visit to PMC.
iv. Visit to construction firm office and discuss for understanding of its accounting

procedure, material purchasing and material handling techniques.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Show CPM/PERT chart of real Construction Project
ii. Show Bar Chart of real Construction Project
iii. Show Schedule of rate book of PWD/CPWD
iv. Show tender document of a construction project and ask students to analyse it.
v. Arrange site visit to office of a large construction firm
vi. Show video films of construction Project
vii. Demonstrate Construction planning software MS Project/Primavera etc.
viii. Arrange expert lectures of reputed contractors/builders/ Engineers of Civil departments on management issues.
ix. Present case studies of success and failures in construction projects and ask students to analyse and comment on them.

10. SUGGESTED LEARNING RESOURCES

A. Books:

No.	Title	Author	Publisher
1	Construction Project Management	K.K.Chitkara	Tata McGraw-Hill
2	Project Planning and Controlling with PERT And CPM	Dr. B.C.Punmia K.K.Khandelwal	Laxmi Publications (P)Ltd.
3	Construction Management and accounts	Harpalsingh	Tata McGraw-Hill
4	Construction of Structures and Management work	S.C.Rangwala	Charotar Publication
5	Construction Management practice	V.K.Raina	Tata McGraw-Hill
6	Construction Equipment and its Management	S.C.Sharma	Khanna Publication
7	Construction Planning and Management	P.S.Gahlot B.M.Dhir	Willey Eastern Ltd
8	Construction Engineering and Management	Seetharaman.S	Umesh Publication

B. List of Recommended I.S. Publications:

IS 4082:1996	Recommendations on stacking and storage of construction materials and components at site
IS 7293:1974	Safety code for working with construction machinery
IS 7969:1975	Safety code for handling and storage of building materials
IS 10067:1982	Material constants in building works
IS 15883-1:2009	Construction project management - Guidelines, Part 1: General
IS 15883-2:2013	Construction project management - Guidelines, Part 2: Time Management
IS 3764:1996	Excavation
IS 4130:1976	Demolition of Building
IS 7205:1974	Erection of steel Structure.
IS 8969:1978	Erection of Concrete Framed Structure.

C. List of Software/Learning Websites

i. Primavera P6b
ii. MS Project
iii. www.slideshare.net
iv. www.civil.iitm.ac.in

11. COURSE CURRICULUMDEVELOPMENT COMMITTEE

Faculties from Polytechnics, Gujarat

- **Prof. Bhavesh V. Modi**, Principal B.V.P.I.T. (D.S.), Umrakh, Bardoli.
- **Prof. Neetu B. Yadav**, Lecturer in Civil Engg. Deptt. B.V.P.I.T. (D.S.), Umrakh, Bardoli.
- **Prof. V.K. Shah**, Head of civil Engg. Deptt, Dr. S& S Gandhi Collage, Surat.

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. J. P. Tegar**, Professor & Head, Department of Civil and Environmental Engineering.
- **Prof. M.C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: BUILDING SERVICES
(COURSE CODE: 3360604)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	Sixth

1. RATIONALE

Building services are the essential services provided in the buildings for improving functioning of the buildings in efficient manner for the desired use of the building. The electrical services, mechanical services such as air conditioning, lighting, ventilation, fire protection, acoustics and sound insulations, elevators, escalators, as well as civil engineering services such as water supply, sanitary services, etc. have become most essential services for residential, industrial, high rise, hotels, motels, monumental buildings.

No building can be put into effective utilisation without all these services. In present scenario the eco friendly designs like green building, grey water management etc. are on demand. The new advanced construction is adopted by creators, engineers, architect, designer and interiors. It is therefore necessary for civil engineering students to understand the basic principles, installations, operations and maintenance of building services.

This course attempts to teach students about these services. However, services such as plumbing as well as sanitary services have been already taught in the course of 'Water Supply and Sanitary Engineering' in fifth semester and hence those are not included in this course..

2. COMPETENCIES

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

- **Plan various types of services required for different types of buildings.**
- **Supervise installation and testing of services such as lift, fire protection, elevators, escalators, acoustic and sound insulations, lightings, air conditioning and allied services.**

3. COURSE OUTCOMES (COs):

The theory should be taught and exercises should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Manage building services provisions in big construction sites.
ii. Synchronize the construction activities with installation of building services.

iii. Select the suitable electrical as well mechanical services for particular requirements of buildings.

iv. Ensure green building applications to the new constructions.

4. TEACHING AND EXAMINATION SCHEME

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

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

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Introduction to Building Services	1a. Describe basics of building services. 1b. Apply various types of services as per needs of building. 1c Apply Lighting and Ventilation provisions	1.1 Definitions 1.2 Objective and uses of services 1.3 Applications of services for different types building considering 1.4 Classification of building services 1.5 Types of services and selection of services 1.6 Natural and artificial lighting- principles and factors 1.7 Arrangement of luminaries, Distribution of illumination, Utilization factors 1.8 Necessity of Ventilation Types – Natural and Mechanical Factors to be considered in the design of Ventilation
Unit – II Electrical Services and Layout	2a. Prepare electrical services requirement and Layout of a given building	2.1 electrical services in the building Technical terms and symbols for electrical installations and *Accessories of wiring* 2.2 Systems of wiring like wooden casing, cleat wiring, CTS wiring conduit wiring 2.3 Types of insulation 2.4 electrical layout for residence, small work shop, show room, school building, etc.

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – III Mechanical Services in Buildings	3a. Identify the services like lift, elevators, conveyors and escalators, etc. 3b. Plan various types of mechanical services as per requirements of building 3c. Select the right type of air conditioning and the position of air conditioning	3.1 Introduction of mechanical services 3.2 **Lift** 3.2 (a) Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts- Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push 3.3 **Elevators & Escalators** 3.3 (a) Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators, 3.3 (b) Uses of different types of elevators Escalators. 3.4 **Dumbwaiters** 3.4 (a) Different types of Dumbwaiters 3.4 (b) Uses of different types of Dumbwaiter. 3.5 **Conveyors** 3.5(a) Different types of Conveyors 3.5(b) Uses of different types of Conveyors 3.7 **Air Conditioning** 3.7(a) Definition, Purpose, Principles, Temperature Control, Air Velocity Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric preceptors, 3.7(b) Types of Air Conditioners, (Central type, Window Type, Split Unit)
Unit – IV Fire Protection, Acoustic and Sound Insulations	4a. Identify the services of Fire 4b. Apply various types of fire services as per requirements of building 4c. Select the suitable type of Fire protection. 4d Provide Acoustic and sound insulation as per needs	4.1 Introduction 4.2 Causes of fire and Effect s of fire 4.3 General Requirements of Fire Resisting building as per IS and NBC 2005 4.4 Characteristics of Fire resisting materials 4.5 Maximum Travel Distance 4.6 Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs 4.7 Requirement of good Acoustic 4.8 Various sound absolvent 4.9 Factors to be followed for noise control in residential building
Unit – V Miscellaneous Services and	5a. Plan for Rain Water Harvesting in the new buildings	5.1 Rain water Harvesting for buildings 5.2 Concept of GREEN buildings 5.3 Components of GREEN building.

Unit	Major Learning Outcomes	Topics and Sub-topics
Green Buildings Provisions	5b. Apply Green Building technology aspects	5.4 Introduction and Significance to Grey water 5.6 Components of Grey water system 5.7 Management of Grey water system

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (Theory)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Building Services	8	2	4	4	10
II	Electrical Services and Layout	10	4	8	8	20
III	Mechanical Services in buildings	10	4	8	8	20
IV	Fire Protection, Acoustic and Sound Insulations	8	2	4	4	10
V	Miscellaneous Services and Green Buildings Provisions	6	2	4	4	10
Total		**42**	**14**	**28**	**28**	**70**

7. SUGGESTED LIST OF EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

Sr. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hours Required
1	II	Prepare electrical layout plan for given building	02
2	V	Prepare rain water harvesting layout plan for a building	02
		Assignment	
3	III	Prepare Lift standards as per norms	02
4	IV	Suggest noise control methods for a given commercial complex	02
5	IV	Prepare a plan for fire safety measures for a given multi story building	02
6	IV	Prepare Lighting plan for a commercial complex	02
7	III	Identify proper locations for Lift/ Escalator/ Elevator in a given commercial complex	02
8	V	Prepare a grey water management for a residential complex.	02
		Site Visit (Any one)	
9	I to V	Visit a residential building & commercial building under construction and prepare layout for electrical, water supply, sanitary and related allied services of civil engineering and prepare site visit detailed report	04
		Case Study	
10	IV	Prepare a case study for the fire fighting services for commercial building in the nearby area.	04
		Seminar	
11	I to V	Topic of seminar shall be given to a group of students not more than three . The students are required to submit and present / defended the seminar in the presence of students and teachers and the report including power point presentation to be attached with submission	04
		Total	**28**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Prepare journal based on site visit, case study as well as on seminar.
ii. Assignments based on the Units topics.
iii. Prepare chart displaying various kinds of building services.
iv. Prepare schematic diagram for various types of services.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any):

i. Arrange expert lectures on different building services.
ii. Discuss case studies of fire in multistoried buildings and lessons learnt from those experiences.
iii. Arrange site visits to building complexes under construction to show different buildings services being installed.
iv. Show video films/photographs etc. related to different building services.
v. Ask students to explore the internet and present in seminar about latest trends in different building services and green building concepts.

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1	A text book on Building Services	R. Udaykumar	Eswar Press, Chennai
2	Building Services	S. M. Patil	Seema Publication, Mumbai Revised edition
3	National Building Code of India - 2005	Bureau of Indian Standards	BIS, New Delhi
4	Building Construction	Dr. B. C. Punmia	Laxmi Publications (P) Ltd., New Delhi
5	Building Construction	P. C. Varghese	PHI Learning (P) Ltd., New Delhi
6	Building repair and Maintenance Management	P. S. Gahlot	CBS Publishers & Distribution(P) Ltd.
7	Green building		

(B) List of Major Equipment/Materials

-----Nil----

(C) List of Software/Learning Websites

www.academia.edu

www.nptel.iitm.ac.in

"http://en.wikipedia.org/w/index.php?title=Dumbwaiter_(elevator)&oldid=621761813"
Categories:
www.bis.org.in/sf/nbc.htm
cpwd.gov.in/Units/handbook.pdf
http://www.civilengineeringnews.tk/2014/07/methods-of-demolition-of-building.html
thecontractor.org

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. **Prof. A. K. Popat,** Lecturer in Civil Engineering , Government Polytechnic, Dahod
2. **Prof. P. D. Gohil,** Lecturer in Civil Engineering , Sir B P T I , Bhavnagar
3. **Prof. H. K. Rana,** Lecturer in Civil Engineering , Government Polytechnic, Valsad
4. **Prof. D K Parmar ,** Lecturer in APP. Mech. , B & B Institute of Tech. , V V Nagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. J. P. Tegar**, Professor & Head, Department of Civil and Environmental Engineering.
- **Prof. M.C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: MAINTENANCE & REHABILITATION OF STRUCTURES
(COURSE CODE: 3360605)

Diploma Programme in which this course is offered	Semesterinwhich offered
Civil Engineering	Sixth

1. RATIONALE

Maintenance of a building is the work done for keeping an existing building in a condition where it can continue to perform its intended functions. Proper maintenance not only improves functional and aesthetic value but also extends the life of building/structure and ensures safety of the users. Normally constructed building remains in a good shape for only for 40 to 50 years and starts deteriorating if not maintained properly. Inadequate maintenance and lack of repair works may lead to limited life span of buildings. However, with regular inspection and maintenance that enable timely identification of deteriorated elements and appropriate remedial measures, the life of normally constructed buildings/structures may be extended up to 100 years.

Most of the modern buildings constructed in India are now becoming old as they have reached the age beyond 40 years and needs maintenance. Thus there is a great demand and employment potential in this area. This course is therefore introduced in the curriculum so that students can also develop competence in this area. The course deals with the maintenance of buildings, concrete repair chemicals, special materials used for repair and repair of various parts of a building, strengthening of reinforced concrete members by shoring, underpinning, plate bonding, RC jacketing, control on termites and fungus in buildings, etc.

Knowledge and skills gained through this course may also prove helpful in upkeep and preservation of historical monuments. Thus this course is an important course for civil engineers.

2. COMPETENCY

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

- **Carry out preventive and corrective maintenance to improve aesthetic and functional value of existing civil structures and to extend their life.**

3. COURSE OUTCOME (COs):

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Assess the health condition of structures.
- Inspect and evaluate damage structures.
- Test the assess the condition of properties of existing concrete structures.

- Implement the techniques for repairing of concrete structures.
- Dismantle and demolish structures which cannot be repaired in an environment friendly, with maximum saving of materials and in a safe way.

4. TEACHINGAND EXAMINATION SCHEME

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

Legends:L- Lecture;**T-** Tutorial/TeacherGuidedStudentActivity;**P -** Practical; **C –**Credit; **ESE**-End Semester Examination; **PA**-Progressive Assessment

5. COURSE CONTENT DETAILS

Unit	Major LearningOutcomes (in Cognitive Domain)	Topics and Sub-topics
Unit-I Maintenance of Buildings	1.1 Explain the requirement of Maintenance in building. 1.2 Explain various types of maintenance in building. 1.3 Assess the quality aspects of existing building.	1.1 Introduction 1.2 Importance of maintenance 1.3 Types of maintenance - daily, weekly, monthly, Annually 1.4 General Maintenance - Painting of Buildings - Home Electricity System
Unit-Ii Repair Strategies	2.1 Explain distress diagnostic techniques 2.2 Carry out inspection and evaluation of damaged structure.	2.1 Causes of distress in structures 2.2 Construction and design failures 2.3 Condition assessment and distress-diagnostic techniques 2.4 Inspection and evaluating damaged structure.
Unit-Iii Durability and Serviceability of Concrete	3.1 Explain concrete properties required for construction work. 3.2 Explain weather effect on structure.	3.1 Quality assurance for concrete construction based on concrete properties like (a) strength (b) Permeability (c) Thermal properties (d) cracking 3.2 Effects due to (a) climate (b) temperature (c) chemicals (d) corrosion 3.3 Design and construction errors 3.4 Effects of cover and cracks

UNIT-IV Materials and Techniques For Repair	4.1 Identify materials for repair in building. 4.2 Explain techniques for Repairs.	4.1 Materials for Repair - Special concretes and mortar - concrete chemicals - construction chemicals - Expansive cement - polymer concrete - sulphur infiltrated concrete - Ferro cement - Fibre reinforced concrete - Rust eliminators and polymers coating for rebars - foamed concrete - dry pack - vacuum concrete - asphalt sheeting 4.2 Techniques for Repairs -Gunniting, grouting and Shotcrete - Epoxy injection

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
		- Jacketing - shoring and underpinning - Methods of corrosion protection (a) corrosion inhibitors (b) corrosion resistant steels (c) coating and cathodic protection
UNIT-V Repair, Retrofitting and Rehabilitation	5.1 Explain the Repair work of various component in existing masonry building 5.2 Explain the Repair work of various component in existing concrete structure 5.3 Discuss principles of Retrofitting and Rehabilitation.	5.1 Repair of - stone, brick and block masonry (Cracks, dampness, efflorescence, joint separation, etc.) - Flooring - Roofs (sloping, flat, pitched, etc.) - Concrete members due to (i) Steel Corrosion (ii) Lack of Bond (iii) shear, tension, torsion, compression failure - Rainwater Leakage in Buildings - Leakage in Basement, toilet area 5.4 Control on Termites (White Ants) in Buildings 5.5 Fungus Decay of wood works

		in Buildings 5.6 Estimation of Repair and retrofitting.
UNIT-VI Demolition and Dismantling Techniques	6.1 Explain demolition techniques for structures. 6.2 Enlist safety measures to be followed during demolition. 6.3 Explain care to be taken in dismantling of buildings so that maximum resale value material is generated.	6.1 Define: Demolition 6.2 Demolition techniques (a) Non Engineering Demolition - Manual Demolition (b) Engineering Demolition - Mechanical Method (i) Wrecking Ball Method (ii) Pusher Arm technique (iii) Thermic Lance Technique (iv) Non – Explosive Demolition (v) Concrete Sawing Method (vi) Deliberate Collapse Method (vii) Pressure Jetting - Implosion - Deconstruction Method 6.4 Safety measures during demolition operation 6.5 Dismantling of buildings and reuse of materials/fittings from environmental and financial point of view.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS(Theory)

Unit	Unit Title	Teaching Hours	Distribution ofTheory Marks			
			R Level	U Level	A Level	Total Marks
I	Maintenance of Buildings	05	3	2	2	**7**
II	Repair Strategies	04	2	3	2	**7**

III	Durability and Serviceability of Concrete	06	3	4	3	**10**
IV	Materials and Techniques for Repair	10	4	6	8	**18**
V	Repair, Retrofitting and Rehabilitation	10	5	5	8	**18**
VI	Demolition and Dismantling Techniques	07	3	3	4	**10**
Total		**42**	**20**	**23**	**27**	**70**

Legends: R = Remember, **U =** Understand**, A=** Apply and above Level (Bloom's revised taxonomy)

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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Note*: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	**Unit No.**	**Practical/Exercise** (outcomes in psychomotor domain)	**Approx. Hours Required**
1	I	Prepare a report on (based on internet search) a.Importance of Maintenance. b. Various routine maintenance works in building	02
2	II	Prepare a report on (based on internet search) a.Causes of distress in structures b.Points to be taken care of during inspection and evaluation of damaged structure	02
3	IV and V	Prepare sketches of equipment/tools for repair works. (Based on internet search and site visits)	06

4	I and II	Study the maintenance of a nearby building/civil structure being carried out (or carried out recently) and prepare a case study on it including financial aspects. (this may includes study of maintenance of cracks)	04
5	VI	Study the Demolition/dismantling work of a nearby building/civil structure being carried out (or carried out recently) and prepare a case study on it (including financial aspects and resale value of materials obtained in dismantling).	04
6	V	Study the guide lines of the Municipal Corporation or R& B department, BIS standards etc regarding declaring buildings/structures unsafe for living/use and based on this identify buildings/structures if any in your locality and prepare a case study on it. OR Study the preservation work of a historical building being carried out by Archaeological department in nearby location and prepare a report on it.	04
7	All	Seminar (Present case studies and reports prepared in above practicals in seminar type situation)	6
Total Hours			**28**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Visit, inspect and evaluate damaged structures and give suggestion about repair techniques.(in a group of 3 to 4)
ii. Prepare estimate for repair the damaged structure visited.
iii. Take photographs of site visit
iv. Each group may prepare a report and give seminar with Power Point Presentation.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Show videos of latest repairing techniques.
ii. Show videos of Dismantling/Demolition of civil engineering structures.
iii. Arrange expert lectures of engineers involved in demolition/dismantling and/or repair/retrofitting of old structures or/and historical monuments.
iv. Show video film or discuss the case of a civil structure which is shifted from one place to another due to need of construction of roads, dams etc. at original position of that structure.

10. SUGGESTED LEARNING RESOURCES

A. BOOKS :

No.	TITLE	AUTHOR	PUBLISHER
1.	Maintenance & Repair Of Civil Structures	B .L.Gupta	STANDARD PUBLICATIONS-
2.	Maintenance, Repair & Rehabilitation and Minor Works of Buildings	P. C. Varghese	PHI
3.	Concrete Structures, Materials, Maintenance and	Denison Campbell, Allen and Harold	Materials, Maintenance and
4.	Building Repair and Maintenance Management	P. S. Gahlot	CBS Publishers and Distributors Pvt Ltd.
5.	Building Construction	Dr. B. C. punamia	Laxmi Publications, New Delhi
6.	Repair of Concrete structures	R.T.Allen and S.C.Edwards	Blakie and Sons, UK
7.	Handbook on Repairs and Rehabilitation of		CPWD,Delhi
8.	Maintenance of Buildings	A.C. Panchdhari	New Age Internationsl
9.	Concrete Technology-Theory and Practice	M.S.Shetty	S.Chand and Compony,New Delhi
10.	Training Course notes on Damage Assessment and Repairs in Low Cost Housing	Santhakumar , A. R.	RHDC –NBO Anna University (July 1992)
11.	Learning from failures-Deficiencies in design, Construction and Service	Raikar R.	R & D centre (SDCPL) ,Raikar Bhavan, Bombay

B. LIST OF RECOMMENDED I.S. PUBLICATIONS:

i.SP:25 Causes, Prevention and Remedies of Cracks in Building

ii.National Building Code of India 2005

C. List of Major Equipment/Materials

i.Crack Gauge and Crack Monitor

ii.Damp meter

D List of Software/Learning Websites

i. www.bis.org.in/sf/nbc.htm

ii. cpwd.gov.in/Units/handbook.pdf
iii. http://www.civilengineeringnews.tk/2014/07/methods-of-demolition-of-building.html
iv. thecontractor.org

11. COURSE CURRICULUMDEVELOPMENT COMMITTEE

FACULTIES FROM POLYTECHNICS, GUJARAT

- **Prof. S. M. Mistry**, H.O.D. Civil Engg Dept., Dr. S& S.S. Ghandhy College of Engg and Tech, Surat
- **Prof. V. K. Shah**, H.O.D. Civil Engg Dept., Dr. S& S.S. Ghandhy College of Engg and Tech, Surat
- **Prof. H. K. Rana**, Lecturer, Governemnt Polytechnic, Valsad
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Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering.
- **Prof. Shashi Kant Gupta,** Professor and Coordinator for State of Gujarat.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: PROJECT-II
COURSE CODE: 3360613

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	SIXTH

1. RATIONALE

One of the important criteria of "Project" is to develop the ability of "learning to Learn" on its own. This would go a long way helping the students in keeping pace with future changes in technology and in the acquisition of knowledge and skills as and when needed. The course of the "Project" is designed with an aim to all these requirements of the students. This will include planning of the Programme, which must be completed within the time allocated.

The Project should never have a single solution and process of arriving at a particular solution, the student must be required to make number of decisions after study information as he has gathered from experiments, surveys, analysis etc.

The Project is also included with Seminar with the aim to develop certain set communication skills (preparation of report, writing survey report writing lab. experiment results writing conclusions of the work done and physical phenomenon observed, participating in group discussions, verbally defending the project in the form of Seminar etc.)

The curricula for each course make specific mention of some of the major aims and objectives of the programme as a whole, these should be assigned due importance in the planning of teaching methodologies,

The programme aims at developing in the student, knowledge and skills to match the current and projected needs of industry/ user systems, social awareness and professional attitudes. In relation to the course and topics to be taught, the student will have to constantly update himself and keep pace with the changing technologies and the current and projected needs of user systems. Another important aspect is the development of the attitude of enquiry, the inculcation of sound study and work habits, side by side with the development of the overall personality as well as positive attitudes.

2. COMPETENCY

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:

1 To develop of inquisitive rush, innovative skill and confidence to work independently
2. To participate effectively in group work
3. To collect relevant data
4. To plan and organize the work
5. To analyse and synthesise the data
6. To relate knowledge various courses in lacking a live problem
7. To make appropriate decision
8. To conduct a survey and investigation

9. To solve industry problems
10. To develop ability during field project work
11. To develop cost consideration
12. To design the components on broad lines
13. To prepare a drawings and plans for works
14. To assess the financial implication and feasibility of the scheme
15. To prepare the technical reports

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.
The students will be able to

- Know the questions to which he is finding answers through experimental work.
- Perform the practical work with appropriate accuracy.
- Reduce the experimental readings to the form of answers required.
- Understand clearly what the reader will want to know.
- Give brief but clear answers.
- Convince the reader that the answers are valid.
- Present a reasoned discussion of the significance of the answers he offers.

4. 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	0	6	6	---	---	40	60	100

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

4. COURSE DETAILS

Each Project batch must not exceed 8 students.

During the semesters, Students will have to write two types of reports.

1. Course-work reports : i.e. reports for communication with your tutor or guide , Technical reports to communicate with a specific individual who might be a 'senior' person in the formats specified by Gujarat Technological University.
2. A summary of work carried out , the readings, calculations, results and answers in numerical or graphical form, and a discussion of the results, answers and conclusions.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the

comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty.

The suggested performance criteria is given below:

a) Punctuality and regularity (Log book - mandatory and produced during IA verification)
b) Initiative in learning/working at site
c) Level/proficiency of practical skills acquired
d) Sense of responsibility
e) Self-expression/Communication skills
f) Interpersonal skills.
g) Report writing skills
h) Viva voce

Some of suggested projects are given below: These are only guidelines, teacher may take any project related to Civil Engineering depending upon the availability of projects. Preference should be given to practical oriented projects. According to the local needs.The following major projects are suggested:

1. Construction of a small concrete road consisting of following activities
   - Survey and preparation of site plan
   - Preparation of drawings i.e. L-Section and X-Section
   - Estimating of earth work
   - Material estimating and costing with specifications
   - Testing of Aggregates
   - Design of Concrete Mix
   - Preparation of sub grade with stone ballast
   - Laying of concrete
   - Testing of slump, casting of cubes and testing
   - Technical report writing
2. Water Supply /Drainage system for a village / Layout
   - Surveying
   - Design of water requirements and water distribution system
   - Preparation of drawing of overhead tank
   - Material estimating and costing
   - Specifications
   - Technical report writing
3. Construction of shopping complex/School Building/Hostel Building/PHC/Residential Complex/Industrial Building/Bridges/Foundations/Flyovers/Under Passes
   Preparation of detailed drawing – Plan, Elevation, section, layout, structural drawing, working drawing Preparation of Detailed and Abstract Estimate, Quantity of Materials
4. Rainwater harvesting and Recharging
   - Assessment of catchment's area
   - Intensity of rainfall
   - Monitoring during rainy season
   - Quality and Quantity analysis

- Collection of water
- Recharge pit design
- Supply of water

5. Water Supply and Sanitary connections for a Multi storied building
   Preparation of detailed drawing – Plan, Elevation, section, layout, working drawing
   Preparation of Detailed and Abstract Estimate, Quantity of Materials
6. Report on Concrete Mix Design with/without Admixtures.
7. Green Buildings
8. Solar Farming
9. Critical Study of existing water supply system
10. Critical Study of existing Sewerage system
11. Solid waste management
12. Bio-medical waste disposal.
13. Flood water management – case study
14. Changes in Rainfall pattern and its impact
15. Traffic Study
16. Noise Study
17. Air pollution Study.
18. Valuation and Rent fixation
19. Water shed management
20. Restoration of Lakes.
21. Repair estimate of existing Buildings

The project report should consist of following items.

1. Introduction
2. Literature survey
3. Study Area
4. Methodology/Design/Tests
5. Result and Discussion
6. Conclusion and scope for future study
7. References.

- One self appraisal form should be attached at the end by the student in his favour regarding the claim of his work relevance , utilities and materialization as well as the gain in terms of cost – benefits , so that teacher can have ease of evaluation.
- The Report should be submitted well before the Exam.

Guideline for the Project– II for Diploma Engineering

1. Project reports should be typed neatly in New Times Roman letters on both sides of the paper with 1.5 line spacing on a A4 size paper (210 x 297 mm). The margins should be: Left - 1.5", Right - 1", Top and Bottom - 0.75".
2. The total number of reports (Soft bound) to be prepared are
   - One copy to the department
   - One copy to the concerned guide(s)
   - One copy to the candidate.
3. Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.
4. Every copy of the report must contain
   - Inner title page (White)
   - Outer title page with a plastic cover
   - Certificate in the format enclosed both from the college and the organization where the project is carried out.
   - An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.
5. The organization of the report should be as follows

1. Inner title page 2. Abstract or Synopsis 3. Acknowledgments 4. Table of Contents 5. List of table & figures (optional)	Usually numbered in roman

- Chapters (to be numbered in Arabic) containing Introduction-, which usually specifies the scope of work and its importance and relation to previous work and the present developments, Main body of the report divided appropriately into chapters, sections and subsections.
- The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.
- The **chapter must be left or right justified (font size 16).** Followed by the **title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified** with **section number and its heading in font size 16** and **subsection and its heading in font size 14**. The **body or the text of the report should have font size 12**.

- The figures and tables must be numbered chapter wise.
- The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

Reference OR Bibliography: The references should be **numbered serially** in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.

1. For textbooks – Dr.V.L.Shah & Veena Gore, Limit State Design of Steel Structures, Structures Publications, 1 Edition, 2009.
2. For papers - Devid, Insulation design to combat pollution problem, Proc of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.

- Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g.
- V = IZ ..... (3.2)
- All equation numbers should be right justified.
- Separator sheets, used if any, between chapters, should be of thin paper

PROGRESSIVE EVALUATION:

I A Marks:

1. First review (During the mid part of VI Th semester) 25 mark
2. Second review (During the end of VI Th semester) 25 mark

TOTAL: 50 mark

I B Marks:

1	**Log record**	**10 marks**
2	**Synopsis& Report**	**20 marks**
3	**Presentation**	**20 marks**
	Total	**50 marks**

TOTAL MARKS : A+ B = 100 MARKS

PROJECT EVALUATION (At the end of 6th semester): (ESE)

1. Relevance of the subject in the present context		20 mark
2. Literature Survey		20 mark
3. Experimental observation		40 mark
4. Results & Discussion		30 mark
5. Presentation (Max of 20 Slides)		40 mark
6. Viva		50 marks
	TOTAL	**200 mark**

CANDIDATE'S DECLARATION

I, ---------- a student of Diploma in ---------- Department bearing PEN ----------of ---------- hereby declare that I own full responsibility for the information, results and conclusions provided in this project work titled **"**---------- ---------- "submitted to **Gujarat Technological University** for the award of Diploma in ----------.To the best of my knowledge, this project work has not been submitted in part or full elsewhere in any other institution/organization for the award of any certificate/diploma/degree. I have completely taken care in acknowledging the contribution of others in this academic work. I further declare that in case of any violation of intellectual property rights and particulars declared, found at any stage, I, as the candidate will be solely responsible for the same.

Date:

Place: **Signature of candidate**

Name: ----------

PEN ----------

CERTIFICATE

Certified that this project report entitled ----------
----------**”**which is being submitted by Mr./Ms. ……..……., Reg. No…..……, a bonafide student of ……in partial fulfillment for the award of **Diploma in Civil Engineering** during the year ……... is record of students own work carried out under my/our guidance. It is certified that all corrections/suggestions indicated for internal Assessment have been incorporated in the Report and one copy of it being deposited in the polytechnic library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said diploma.

It is further understood that by this certificate the undersigned do not endorse or approve any statement made, opinion expressed or conclusion drawn there in but approve the project only for the purpose for which it is submitted.

Guide

Name and signature

Examiners

1

2

Head of Department

Dept. of ----------

ROADMAP FOR PROJECT GUIDES

1. The project work is proposed to be carried out during the V and VI semesters so that learners prepare during the V semester, do some field work based on the preparation during the mid semester vacation and report the analysis and inferences during the VI semester.
2. The learners would reach a level of maturity by the time they reach V semester and so a meaningful project lasting for a year can be executed by them.
3. To execute the project with involvement needs constant guidance and monitoring of the progress of the learners by the guide.
4. This does not mean teacher has to advice learners.
5. Be confident about the ability of the learner and "intellectually provoke" them with challenging questions. These questions should prompt the learners to search information and update themselves (to be carried out during the first two weeks).
6. Do not feed information to learners. Instead crate a 'cognitive dissonance' (a challenging question or situation that the learner is not able to find an immediate answer but feels the need to search for information to find a solution).
7. Defer judgement on learners and give them identified sources if required like a journal article, book or a web site.
8. Even if the learners report their inability to solve do NOT give or prescribe a solution.
9. Be patient and give time for the learner to construct his knowledge.
10. Give corrective feedback to the learner by challenging his solutions so that his logic is questioned and it develops further.
11. This leads to the first activity viz., literature survey and conceiving a project.
12. During this phase meet the project team in a group and create a healthy competition among the learners to search different sources and synthesise their findings in the group.
13. Aim for bringing out a workable innovative project conceived within the first eight weeks as given in the schedule attached.
14. During these two phases and the third phase the teacher should assess the strengths and weakness of the members of the group and allocate differential work to team members on the remaining tasks to be carried out during the next thirty weeks.
15. This is to ensure active participation of all the members of the team.
16. By the end of the twelfth week finalise the project and a schedule of further activities for each member indicating the time frame in which his activities are to be executed may be made ready. A soft copy of this schedule may be collected from each learner by the guide to follow up.
17. This schedule prepared by each learner need to be documented for checking further progress of the project.
18. The next few phases of the project may require active guidance of the guide especially regarding the sources of collecting data, if a sample data is to be collected the number of units has to be decided, collating the data/fabricating, tryout/analysis and finally coming out with meaningful conclusions or models or application.

19. Data like models, designs, technical specifications, source code, protocols and original records need be collected from one authentic source as there will not be any variation. The teacher may guide the learners to authentic source.
20. Data having limited variability like product/service quality, processes and standards, procedures need to be collected from a sample as there is a variation. The number of units from whom (source) the data is to be collected is called sample. The sample needs to be representative of the expected variation. The decision on the size of the sample and the number of units need guidance from the teacher. For example, data regarding the quality of a product/service need be collected from 3 to 5 personnel at different levels of a service provider or dealers of a product. The numbers given are suggestive but a guide based on his experience has to make valid suggestions.
21. Data having a wide range of variation like customer satisfaction where the customers are members of the public need a larger number of units to accommodate the diversity. A tool like questionnaire with predetermined questions need to be prepared, tried out on a small sample and finalise the questions. Data may be collected from at least 30 units. This number is suggested to apply statistical analysis for meaningful conclusions. Guides may decide on the sample size depending on the accessibility of data.
22. The intention of the above three points viz., 19, 20 and 21 is to ensure objectivity in data collection i.e., to reduce the subjectivity of the human mind.
23. All the above activities need to be completed before three to four weeks before the end of V semester (refer the spread sheet related to scheduling).
24. The learners may be instructed to collect data objectively with identified sample during the next 4 to six weeks which includes the mid semester holidays. This would enable the learners to visit the field and collect data without the constraint of reporting to institution and attending classes on a regular basis.
25. The collected data need to be organised and entered to spread sheets or similar formats for analysis. Qualitative data may be converted to quantitative using a rating scale or similar data organisation procedures.
26. The result of most analysis on spreadsheet could be obtained in tables or graphs as per the requirement.
27. Activities mentioned in points 24, 25 and 26 may be carried out by learners during 4 to 8 weeks after commencement of VI semester.
28. Interpretation of the analysed tables and graphs to arrive at meaningful inference. The guide at this stage may defer his ideas on interpretation allowing the learners to do this. In case the learners err in the process they may be given corrective feedback.
29. A report of the whole process of doing the project may be written, word processed and submitted in triplicate.
30. Guides may contact industries and try to solve their problems so that the learners get a field experience and they get ready for the industry.
31. Innovations and innovative practices may be encouraged among the learners to be pursued as a project. Developing prototypes, (in simulation or real) trying out feasibility of new ideas, changing existing systems by adding modules, combining,

assembling new modules and developing new systems may be given higher priority over routine bookish projects.

32. The schedule of events proposed is for an investigative project as a model. Guides may alter the prescribed schedule to suit the kind of innovative projects sited in point No.31 above.
33. Industry personnel may be involved in conceiving, executing and evaluating projects. This gives credibility to the institute and acceptance of learners for absorption into the company.

GUIDELINES TO LEARNERS TO COMPLETE 6th SEMESTER PROJECT

1. On the basis of 5th Sem. Preparation, field work should be done during the mid Semester vacation and reporting of analysis and inferences should be done in the VI semester.
2. You have the ability and the level of maturity needed to conceive an innovative and meaningful project accomplishing which gives you recognition by the industry and empowers you with the power of knowledge.
3. Understand your strength and weakness and make an effort to find the strength and weakness of other peers in the team.
4. Complement each other's strength rather than compete with peers within the team. This will enable you to complete a comprehensive and innovative project relevant to the industrial needs rather than doing a routine copy of what others have done.
5. Seek guidance from the teacher and update him/her about the progress.
6. Be confident about your ability and that of other members of your group. Take extra efforts to collect information, share with your peers and synthesise your knowledge.
7. Question everything including the ideas of your teacher. Accept the ideas and instructions which are internally consistent (logical).
8. Involve actively in group activities and contribute towards the tasks.
9. Do not depend too much on the teacher as a source of information, search on your own and build your knowledge structure. Search for authentic sources like journal articles, books and authentic sites rather than blogs and tweets.
10. Though brief, record your thoughts and activities including searches immediately.
11. Prepare a schedule for your work on a spread sheet and encourage your peers to do the same.
12. Show your schedule and that of others to the teacher and get his feedback.
13. Keep reviewing the schedule every fortnight and take corrective steps if needed. For doing this keep the general guideline schedule given in the curriculum as a backdrop.
14. Tools used for data collection like instruments, testing machines, questions to be asked and software may be tried out and standardised by the twelfth week of the project. Seek the teacher's help who is experienced in doing this.
15. Collect data dispassionately or objectively (without applying your personal prejudice). Complete this task before the VI semester begins.

16. While entering data into the spread sheet ask your peer member to verify. This will ensure accuracy of data entry.
17. Use appropriate mathematics/statistics for calculations. Seek help from external sources (other than your teacher) if required.
18. The results of your analysis need to be graphically represented and documented. You may also add photographs and video clips to increase the validity.
19. This task needs to be completed within 8 weeks after commencement of VI semester.
20. Interpret the data (after analysis) and arrive at meaningful inferences on your own in discussion with your peers. Get it ratified by your teacher. Suggestions from the teacher may be discussed among your peers and incorporated if they are internally consistent.
21. The project report may be word processed (videos, photographs attached in soft copy) and submitted in triplicate two weeks before the end of VI semester.
22. Involve passionately in the team work, make constructive contributions and come out with an industry friendly project which will equip you in your professional development.

COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

(1) Prof. B. V. Modi	**Principal – BVPIT(DS) Umarakh Ta-Bardoli**
(2) Prof. K K Khatry	**L.C.E. - BVPIT(DS) Umarakh Ta-Bardoli**
(3) Prof. S M Mistry	**Head – Dr. S & S.S. Gandhi College Surat**
(4) Prof. V K Shah	**Head – Dr. S & S.S. Gandhi College Surat**