

# Government Polytechnic, Mumbai

(Academically Autonomous Institute of Maharashtra Government)

49, Ali Yawar Jung Marg, Kherwadi, Bandra (E)

gpmumbai@gpmumbai.ac.in

Programme : Civil Engineering

Third Semester

With effect from 2016-17

Course code	Course Title	Teaching Hours				Credits	Examination Scheme					
		L	P	TU	Total		Theory		PR	OR	TW	Total
							TH	TS				
CE16301	Advanced Construction Practice	3	2	---	5	5				50*	25	75
AM16202	Mechanics of structure	3	2	---	5	5	70	30		50		150
CE16204	Hydraulics	3	2	---	5	5	70	30		25*	25	150
CE16205	Highway Engineering	3	2	---	5	5	70	30		25		125
AM16203	Concrete Technology	3	2	---	5	5	70	30		50*	25	175
CE16306	Water Supply Engineering	3	2	---	5	5	70	30		25*	25	150
CE16303	Computer Aided Drafting	1	4	---	5	5			50		25	75
	TOTAL	19	16	0	35	35	350	150	50	225	125	900

Abbreviations: L - Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work

\* Indicates assessment by External Examiner

Academic co-ordinator  
Government Polytechnic Mumbai  
(Dr. R. A. Patil)

Head of Department  
(Civil Engineering)



Principal

Government Polytechnic Mumbai

SHM - 2  
SSC - 2  
MKA - 2



Programme : <b>Diploma in Civil Engineering</b>									
Course Code: <b>CE16301</b>				Course Title: <b>Advanced Construction Practice</b>					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	-	-	-	50*	25	75

\*External Examiner

### Rationale:

The subject stresses on various construction processes like earth, road, and underwater construction. The subject will help students to supervise various construction processes and execute different construction projects.

### Course Outcomes:

Student should be able to

CO1	Understand different construction processes like dredging, roadway construction etc.
CO2	Identify and select appropriate construction equipment or plant depending on project types while executing the project.
CO3	Interpret performance of various equipments.

### Course Content Details:

Unit No	Topics / Sub-topics
1	<b>Soil compaction and stabilization techniques :</b> 1.1 Principle used in compaction, types of equipments used for soil compaction, methods. 1.2 Soil stabilization – concept, methods – Sand drains, use of chemicals, stone columns, rock anchors, foundation grouting. 1.3 Use of Geosynthetics techniques laying in various civil engineering works.
2	<b>Construction in earth :</b> 2.1 Introduction to soil survey and soil investigations prior to construction in Earth. 2.2 Pneumatic drilling equipments, crushers, excavation machinery for heavy & large construction projects.
3	<b>Underwater Construction enabling work:</b> 3.1 Cofferdams, sheet pile, pneumatic sinking using compressed air, dredging Techniques, use of barges, dewatering systems, and diaphragm wall techniques. 3.2 Underwater concreting.
4	<b>High Rise Structures :</b> 4.1 High rise structures and their construction. 4.2 Material movement and construction difficulties. 4.3 Labour safety norms and fire safety norms. Refer IS1893, IS13920, IS 875-III
5	<b>Specialized construction processes :</b> 5.1 Pre stressing operation- Pre-tensioning & Post tensioning. 5.2 Girder launching techniques.

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	5.3 Trench less techniques, micro tunneling, use of tunnel boring Machine in tunneling.
6	<b>Form of concrete construction :</b> 6.1 Vertical slip form 6.2 Self climbing Jumpform method 6.3 Egg shape slip form system 6.4 Conical formwork 6.5 Mivan formwork 6.6 Collapsible formwork
7	<b>Pre Engineered Building :</b> 7.1 Planning for precast/prefab construction 7.2 Selection of equipments for prefabrication 7.3 Transportation, erection, quality control, safety measures, duration

**Suggested Specifications Table with Hours and Marks (Oral):**


Unit No	Topic Title	Teaching Hours	Distribution of Oral Marks			
			R Level	U Level	A Level	Total Marks
1	Soil compaction and stabilization techniques	07	02	03	02	07
2	Construction in earth	07	04	02	-	06
3	Underwater Construction	07	04	04	-	08
4	High Rise Structures	07	04	04	-	08
5	Specialized construction processes	07	04	04	-	08
6	Slip form techniques	08	02	04	02	08
7	Pre Engineered Building	05	02	02	01	05
<b>Total</b>		<b>48</b>	<b>22</b>	<b>23</b>	<b>05</b>	<b>50</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

**List of experiments/Assignments:**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	Prepare a chart showing compaction equipments with reference to capacity, suitability based on type of soil, Technical specifications.	04
2	1	Study of various types of joints in cement concrete road, filler and sealer compounds.	02
3	2	Study of earth moving equipment w.r.t. working, output, common manufacturer, cost, useful life, area of use	02
4	5	Study of Girder Launching Techniques.	04

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6	5	Report on visit to a construction site involving specialized construction process.	04
7	6	Study of slip formwork technique.	04
8		Student should collect information on any of the above topics in form of pamphlets, brochures, internet data, Photographs, videos etc and presentation of the same in power point.	08
<b>Total</b>			<b>32</b>

**References/ Books:**

Sr. No.	Name of Book	Author	Publisher
1	Building Construction	B. C. Punmiya	Laxmi Publication Pvt. Ltd. New Delhi.
2	Construction planning ,methods and applications	Peurifoy	Tata –McGraw Hill
3	Transportation Engineering	Vazirani Chandola	Khanna Publication, Delhi –6
4	www.wikipedia.com		

**Course Curriculum Development Committee:****a. Internal Faculty**

- i. Mrs. S. M. Male
- ii. Ms. M. S. Sorde

**b. External Faculty**

- i. Mr. K. V. Kelgandre (Sr. Lecturer, K.J.S.Polytechnic, Vidya Vihar)

  
Academic Coordinator

(Dr. R. A. Patil)  
21-5-17

  
Head of Department  
(Civil Engineering)

Dr. S. S. Motling

  
Principal

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**Course Name: - Building Construction**

**Course Code: - CE 16201**

**CO Vs PO matrix**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	3	3	1	2	3	1	2	2
CO2	1	1	3	3	1	1	1	1	2	1
CO3	2	1	3	3	1	1	1	2	1	1

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**CO Vs PSO matrix**

CO/POs		PSO1	PSO2	PSO3
CO1	Understand different construction processes like dredging, roadway construction etc.	1	3	3
CO2	Identify and select appropriate construction equipment or plant depending on project types while executing the project.	1	3	3
CO3	Interpret performance of various equipments.	1	3	3

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Soil compaction and stabilization techniques	1,3
2	2	Construction in earth	1,2,3
3	3	Underwater Construction	1,2,3
4	4	High Rise Structures	3
5	5	Specialized construction processes	2,3
6	6	Slip form techniques	2,3



Programme : <b>Diploma in Civil Engineering</b>									
Course Code: <b>AM16202</b>				Course Title: <b>Mechanics of Structures</b>					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70 (3 Hrs.)	30	-	50	-	150

\* TW shall be based on the practicals done during the semester

### Rationale:

Basic concepts and principles involved in the design of various structures are covered in this subject. Analysis of structure needs understanding of mechanical properties of material and their behaviour. The approach of teaching should be to develop critical thinking in students and integrate the knowledge and develop desired skills in students.

### Course Outcomes:

Student should be able to

CO1	Understand the basic principles of behaviour of the material subjected to various loads.
CO2	Apply the principles to field situation.
CO3	Understand the procedure of testing the materials and develop the ability of interpreting results.

### Course Content Details:

Unit No	Topics / Sub-topics
1	<b>Stress and Strain:</b> 1.1 Concepts of elastic, plastic and rigid bodies, concepts of deformation, stresses and strains different material Properties like Ductility, Brittleness, Hardness, Toughness, Malleability, Fatigue etc. 1.2 Axial tensile and compressive loads, Hooke's Law, axial stresses, axial strain, lateral strain, Modulus of elasticity, Poisson's ratio, volumetric strain, problems on bars of uniform cross section and different cross sections (stepped bars). 1.3 Behaviour of mild steel under tensile loading, stress-strain curve, limit of proportionality, yield stress, Ultimate stress, Breaking stress, factor of safety, safe stress, working stress. 1.4 Composite sections under axial load, modular ratio, simple problems on analysis of composite sections 1.5 Concept of bi-axial stresses, tri-axial stresses, equations of total strain in three directions, Equation for Volumetric Strain. Concept of Bulk Modulus. 1.6 Definition of temperature stress, nature of stresses. Simple problems on temperature stresses in homogeneous sections only (No problems on composite sections) 1.7 Concept of shear load, shear stress and shear strain, modulus of rigidity, simple shear, complementary shear stresses, Punching Shear. 1.8 Elastic constants, relation between modulus of Elasticity, modulus of rigidity and bulk modulus. (No derivations of these relations) Numerical problems on all of the above.

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2	<b>Strain Energy:</b> 2.1 Concept of strain energy, types of loading-gradually, suddenly applied and impact loading, stresses due to these three types of loading. 2.2 Strain energy stored due to these three types of loading, Resilience, proof resilience, modulus of resilience. Numerical on above.
3	<b>Moment of Inertia:</b> 3.1 Concept of moment of inertia for plane areas, radius of gyration, expression for moment of inertia about centroidal axes for regular plane areas such as rectangular, triangular, circular and semicircular sections. Section modulus 3.2 Parallel axes theorem, perpendicular axes theorem, polar moment of inertia. Moment of inertia of composite sections. Numerical on above.
4	<b>Shear Force and Bending Moment:</b> 4.1 Concept and definitions of shear force and bending moment, sign conventions, relation between bending moment, shear force and rate of loading. 4.2 Shear force and bending moment diagrams for simply supported, cantilever and overhanging beams subjected to concentrated loads, uniformly distributed load and couples, point of zero shear, Point of contra-flexure.
5	<b>Bending Stresses:</b> 5.1 Concept of pure bending / simple bending, Assumption in the theory of pure bending, stress distribution diagram, Bending or Flexure Equation (Derivation not required), moment of resistance. 5.2 Application of theory of bending, moment of resistance for symmetrical and unsymmetrical sections of beam. Simple numerical problems on standard sections. (No problems on built up sections)
6	<b>Shear Stresses in Beams:</b> 6.1 Shear stress equation (Derivation not required), meaning of terms in equation. 6.2 Shear stress distribution diagrams for solid and hollow rectangular section, solid and hollow circular section, I-section, T-section, channel section. Numerical problems on circular and rectangular section only.
7	<b>Simple Frames:</b> 7.1 Definition of frame, classification of frames-perfect, imperfect, redundant frames, relation between members and number of joints. Assumptions in analysis of frames. 7.2 Method of joints, method of sections and graphical method of analysing simply supported or cantilever perfect frame, nature of forces in members. (No problems on graphical method in theory examination.)

**Suggested Specifications Table with Hours and Marks (Theory):**

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Stress and Strain	12	04	06	06	16
2	Strain Energy	04	02	02	02	06
3	Moment of Inertia	06	02	04	04	10
4	Shear Force and Bending Moment	09	04	04	08	16
5	Bending Stresses	07	02	02	04	08
6	Shear Stresses in Beams	06	02	04	02	08
7	Simple Frames	04	02	02	02	06
Total		48	16	24	30	70



**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

**List of experiments/Practicals:**

Sr. No.	Unit	Experiment	Approx. Hours
1	1	Identify and Observe Functions of different parts of Universal Testing Machine.	2
2	1	Tension test on mild steel or HYSD or TMT steel specimen. Draw Stress Strain curve and show limits (Yield, ultimate, breaking point)	4
3	1	Compression test on aluminium, copper, brass, cast iron ( <b>any two metals</b> )	2
4	1	Compression test on timber ( Along the grains and across the grains)	2
5	3,4,5	Flexural behaviour of timber or steel beam.	2
6	2	Izod Impact test on Aluminium, Copper, Mild Steel, Brass, Cast Iron ( <b>Any two Metals</b> )	2
7	2	Charpy Impact test on Aluminium, Copper, Mild Steel, Brass, Cast Iron. ( <b>Any two Metals</b> )	2
8	3,4	Flexural test on floor tiles./Roofing tiles (Any ONE type of tile)	4
9	1	Water Absorption Test on Bricks and Compression test on Bricks.	4
10	1	Abrasion test on Flooring Tiles or Water Absorption test on Flooring tiles	2
11	1	Shear test on Mild Steel, Aluminium, Copper, Brass, Cast Iron ( <b>Any two Metals</b> )	2
12	7	Analysis of frames by Graphical Method and comparing result with Analytical Method. (Two Problems).	4
<b>Total</b>			<b>32</b>

**Notes:** If possible an industrial visit should be arranged or videos should be shown of different applications of this course.

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**References/ Books:**

Sr. No.	Author	Title	Publisher
1	Beer and Johnson	Mechanics of Materials	Mc Graw Hill
2	Singer and Pytel	Strength of Materials	Harper & Row
3	Ramamrutham	Strength of Materials	Dhanpat Rai and Sons
4	Schaum's outline Series William Nash	Strength of Materials	Mc Graw Hill
5	Timo Shenko and Young	Strength of Materials	CBS Publisher & distributors
6	Buchanan	Mechanics of structure	Rinehart & Winston Inc.
7	Irving H. Shames & Titarress	Introduction To solid Mechanics	Eastern Economy Edition
8	B. K. Sarkar	Strength of Materials	Tata McGraw Hill
9	Y.N. Walavalkar	Mechanics of Structure	Everest Pub – House, Pune 30
10	S.S.Bhavikatti	Strength of Materials	Vikas Publishing House Pvt.Ltd.

**Course Curriculum Development Committee:****a. Internal Faculty**

i. Mrs. S. S. Chavan

**b. External Faculty**

i. Mr. Gaikwad (Lecturer, G.P.Nashik)

Academic Coordinator

Dr. R. A. P. (17)

21-6-17

Head of Department  
(Civil Engineering)

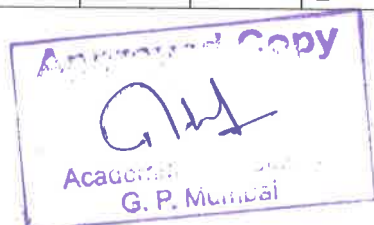
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**Course Name:- Mechanics of structures****Course Code:- AM16202****CO Vs PO matrix**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO 1</b>	3	3	2	1	1	1	2	3	3	3
<b>CO 2</b>	2	2	3	2	2	1	3	2	1	1
<b>CO 3</b>	2	2	2	3	2	1	3	1	1	2



**CO Vs PSO matrix**

	PSO1	PSO2	PSO3
<b>CO 1</b>	1	1	1
<b>CO 2</b>	3	3	2
<b>CO 3</b>	3	2	2

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Stress and Strain	1,2,3
2	2	Strain Energy	1,2
3	3	Moment of Inertia	1,2
4	4	Shear Force and Bending Moment	1,2
5	5	Bending Stresses	1,2
6	6	Shear Stresses in Beams	1,2,3
7	7	Simple Frames	1,2,3





Programme : <b>Diploma in Civil Engineering</b>									
Course Code: <b>CE16204</b>				Course Title: Hydraulics					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70 (3 Hrs.)	30	-	25*	25	150

\*External Examiner

**Rationale:** This course is classified under basic technology course and describes facts, concepts, principles and techniques of scientific investigation in the given field. This subject deals with behavior of static or flowing water which is important liquid to be studied in Irrigation Engineering., Water Supply Engineering., and Transportation Engineering. because its behavior affects design and construction techniques of Civil Engineering structures in Irrigation, Water Engineering. and Highway Engineering.

**Course Outcomes:**

Student should be able to

CO1	Know the fluid and its behaviors.
CO2	Operate various pressure, discharge, velocity measuring devices.
CO3	Select suitable pipes for given conditions of pressure, discharge and velocity
CO4	Design channel section for given conditions of discharge, slope.

**Course Content Details:**

Unit No	Topics / Sub-topics
1	<b>Introduction</b> 1.1 State of matter, definition of fluid 1.2 Definition of Hydraulics, Application of Hydraulics, 1.3 Hydrostatics and Hydro kinematics. Properties of Liquid : 1.4 Properties of water like mass density, specific weight, specific gravity, capillarity, Viscosity, surface tension, 1.5 Newton's law of viscosity, ideal and real liquids
2	<b>Hydrostatics</b> 2.1 Laws of liquid pressure, pascal's law. 2.2 Measurement of pressure: atmospheric pressure, gauge pressure, negative pressure and absolute pressure. 2.3 Pressure measuring Devices: Piezometer, Differential and Inverted U-tube Manometers, Bourdon pressure gauge. 2.4 Hydrostatic forces on surfaces: Total pressure, centre of pressure, total pressure on plane surfaces in horizontal, vertical and inclined position. 2.5 Practical applications of Hydrostatic pressure. (Simple Numerical Problems)
3	<b>Hydrokinematics</b> 3.1 Types of flow: Steady and unsteady, uniform and non-uniform, laminar and turbulent, compressible and incompressible. 3.2 Continuity equation for liquids,

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	3.3 Datum head, pressure head, velocity head, Total head, Bernoulli's Theorem, assumptions made in Bernoulli's equation 3.4 Hydraulic gradient, Energy gradient. 3.5 Modified Bernoulli's equation (Simple Numerical Problems)
4	<b>Measurement of flow</b> 4.1 Flow through sharp edged small orifices, determination of coefficients of discharge, velocity and contraction, flow through large rectangular orifice and submerged orifice, simple problems. 4.2 Flow over notches and weirs of rectangular, Triangular trapezoidal, cipoletti types Francis formula – End Contractions, velocity of approach and their effects. 4.3 Venturimeter: component parts, principle of working, discharge calculation, coefficient of discharge(Simple Numerical Problems) 4.4 Mouthpiece :External and convergent. 4.5 Pitot tube.
5	<b>Flow through pipes</b> 5.1 Losses of head in a pipe: Major head loss, Minor head losses due to sudden expansion and sudden contraction, head loss due to bend, elbow, globe valve, at entrance and exit. 5.2 Hydraulic gradient line and total energy line, Reynold's number. 5.3 Flow through a siphon, flow through pipes in series and in parallel, equivalent pipe, Dupuits equation. 5.4 Concept of Water hammer. (Simple Numerical Problems)
6	<b>Flow through open channels</b> 6.1 Different shapes of artificial channels, wetted perimeter, and wetted area, hydraulic mean depth.comparison flow through pipe and open channel. 6.2 Chezy's formula and Manning's formula for calculation of discharge through an open channel Common values of Chezy's constant and Manning's constants for different types of channel surfaces. Numericals on discharge through rectangular and trapezoidal channel 6.3 Most economical channel section, Expressions for most economical rectangular and trapezoidal channel sections Numericals on discharge through rectangular and trapezoidal channel 6.4Hydraulic jump, locations where hydraulic jump occurs, uses of hydraulic jump

## Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	04	04	02	00	06
2	Hydrostatics	06	04	04	00	08
3	Hydrokinematics	08	02	04	04	10
4	Measurement of flow	10	02	08	06	16
5	Flow through pipes	08	02	02	08	12
6	Flow through open channels	12	04	06	08	18
	<b>TOTAL</b>	<b>48</b>	<b>18</b>	<b>26</b>	<b>26</b>	<b>70</b>



**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

**List of experiments/Assignments:**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	3	Verification of Bernoulli's theorem.	02
2	4	Determination of coefficient of a Venturimeter.	02
3	4	Determination of Cc, Cv, Cd of a sharp edged circular orifice.	04
4	4	Determination of Cd for triangular or rectangular notch.	04
5	4	Determination of coefficient of friction of a given pipes	04
6	5	Determination of minor losses in a pipe line. a) due to sudden contraction b) due to sudden expansion	04
7	5	a) study and use of Moody's chart. b) Use of design chart(nomogram) for determining diameter of GI concrete and PVC pipe	04
8	-	Study of parts of a centrifugal pump, care to be taken in its installation (pumps in series and parallel) Simple numericals for calculating Discharge and efficiency of centrifugal pumps.	04
9	-	Selection of pump for calculated designed discharge and given total manometric head from nomograms or charts or characteristic curves or catalogues available from pump manufacturers.	04
<b>Total</b>			<b>32</b>

**References/ Books:**

Sr. No.	Name of Book	Author	Publisher
1	A text book of Fluid mechanics and Hydraulic Machines	R.K.Bansal	Laxmi publication pvt.ltd,2005
2	Fluid Mechanics & Hydraulic Machines	Modi & Seth	Standard Book House,2009 edition.
3	Fluid Mechanics & Hydraulic Machinery	Jagdish Lal	Metropolitan Book, New Delhi
4	Fluid Mechanics(including hydraulic machines)	A.K.Jain	Khanna publications




**Course Curriculum Development Committee:****a. Internal Faculty**


- i. Smt.M.K.Anserwadekar
- ii. Dr.S.S.Motling

**b. External Faculty**

- i. Mrs. S. S. Kasulla (Lecturer, G.P. Thane)
- ii. Mrs. Vijaya Bangale (SL Lecturer, VJTI, Matunga)

  
**Academic Coordinator**  
 (Dr. R. A. Patil)

  
**Head of Department**  
 (Civil Engineering)

  
**Principal**  
 Govt. polytechnic Mumbai

**Course Name: -Hydraulics****Course Code:-16204**

CO1	Know the fluids and its behaviors.
CO2	Operate various pressure, discharge, velocity measuring devices.
CO3	Select suitable pipes for given conditions of pressure, discharge and velocity
CO4	Design channel section for given conditions of discharge, and slope.

**CO Vs PO matrix**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	-	-	-	-	1	1
CO2	3	3	3	3	2	1	1	2	2	1
CO3	2	3	3	2	1	-	1	1	1	1
CO4	3	3	3	-	2	2	-	-	-	1

**CO Vs PSO matrix**

CO/PSOs		PSO1	PSO2	PSO3
CO1	Know the fluids and its behaviors.	-	2	-
CO2	Operate various pressure, discharge, velocity measuring devices.	1	1	-
CO3	Select suitable pipes for given conditions of pressure, discharge and velocity	1	1	2
CO4	Design channel section for given conditions of discharge, and slope.	1	2	2

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	CO1, CO4
2	2	Hydrostatics	CO1, CO2
3	3	Hydro kinematics	CO1, CO2,
4	4	Measurement of flow	CO1, CO2,
5	5	Flow through pipes	CO3
6	6	Flow through open channels	CO1, CO4

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Programme : <b>Diploma in Civil Engineering</b>									
Course Code: <b>CE16205</b>				Course Title: <b>Highway Engineering</b>					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70 (3 Hrs.)	30	-	25		125

\*External Examiner

**Rationale:**

It is the accepted fact that of all the modes of transportation, road transport is the nearest to the people & the most important one. The passenger & the goods have to be first transported by road before reaching a railway station or a port, or an air-port. The road network alone can serve the remotest villages of the vast country like us. In the light of the above, highway engineering, therefore, becomes almost indispensable subject in Civil Engineering branch.

**Course Outcomes:**

Student should be able to

CO1	Know the various phases of Highway Engineering. Like - development, planning, alignment, highway geometric design & location, highway traffic operation & its control, economic considerations, finance & administration.
CO2	Design the various geometric parameters of a road.
CO3	Understand the intricacies of traffic engineering.
CO4	Understand the financial aspects of a highway project

**Course Content Details:**

Unit No	Topics / Sub-topics
1	<b>Introduction :</b> 1.1 Classification of roads. 1.2 Preparation of master plan & its planning. 1.3 Role of IRC. 1.4 Factors affecting ideal alignment of Highway.
2	<b>Highway Geometric Design :</b> 2.1 Introduction. 2.2 Highway cross-section elements: Friction, Pavement unevenness, Camber, Carriage way, Shoulders, Kerbs, Road margins, Right of way, Typical cross section of roads. 2.3 Sight Distance: Stopping sight distance, Overtaking sight distance, PIEV theory. 2.4 Horizontal alignment: Design speed, Super elevation, Attainment of super elevation, Widening of pavements, Horizontal transition curves, Setback distance on horizontal curves. 2.5 Design of vertical alignment: Gradient, ruling, limiting, exceptional, minimum,

	floating, Compensation in gradient on horizontal curves, length of summit curve, length of valley curve.
<b>3</b>	<b>Road side Development :</b> 3.1 Environmental factors in planning & development of highways. 3.2 Arboriculture. 3.3 Planning Plantation. 3.4 Species & their selection.
<b>4</b>	<b>Traffic Engineering :</b> 4.1 Introduction. 4.2 Traffic Characteristics: Road user & vehicle characteristics, Traffic studies- Traffic volume, speed, O&D, traffic flow, traffic capacity, parking, accident studies. 4.3 Traffic operations: Traffic regulations, Traffic control devices, Intersections-types, Grade and grade separation. 4.4 Design of parking facility: On - street, off - street parking. 4.5 Highway Lighting.
<b>5</b>	<b>Hill Roads :</b> 5.1 General considerations. 5.2 Alignment of hill roads. 5.3 Geometrics of hill roads. 5.4 Construction of hill roads: Rock cutting, precipice work, retaining wall, revetment wall, foundations of retaining wall. 5.5 Drainage of hill roads: Road side drainage, Cross Drainage, Sub-surface drainage. 5.6 Maintenance problem in hill roads.
<b>6</b>	<b>Highway Economics &amp; Finance :</b> 6.1 Introduction. 6.2 Highway user benefits. 6.3 Highway costs. 6.4 Economic analysis. 6.5 Highway finance. 6.6 BOT system of Highway development.

**Suggested Specifications Table with Hours and Marks (Theory):**

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	05	04	02	-	06
2	Highway Geometric Design	16	08	08	08	24
3	Road side Development	03	02	04	-	06
4	Traffic Engineering	12	04	08	04	16
5	Hill Roads	07	04	06	-	10
6	Highway Economics & Finance	05	04	04	-	08
<b>Total</b>		<b>48</b>	<b>26</b>	<b>32</b>	<b>12</b>	<b>70</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).



**List of experiments/Assignments:**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	2	Road project for a road of minimum 0.5 km. length having at least one small cross drainage work: Site selection, Reconnaissance survey, Fixing the alignment, Detailed profile survey along the alignment and cross section of road and CD Work, Prepare computer generated drawing of longitudinal section and typical cross sections of the road in cutting and filling	08
2	2	Visit to a road under construction/constructed to study the construction of (a) WBM road (b) flexible pavement (c) Rigid pavement roads for observing the type of construction and construction equipments.	08
3	2	Preparing drawings of detailed cross sections of a) Major District Road b) State Highway (c) National Highway (d) Express Highway in cutting and banking showing details and dimensions with proper scale. (Any two)	06
4	4	Traffic volume study and its representation of an important road intersection in your city.	02
5	2	Visit to a W.B.M. and Bituminous road for observing the different types of defects in roads. Prepare a visit report. Which should consist of (a) List of various defects observed b) Suggestions regarding the possible remedial measure.	04
6	3,6	Prepare assignment on 1) Pavement failures. 2) Repairs and Maintenance of Roads. 3) Noise Barriers.	04
<b>Total</b>			<b>32</b>

**References/ Books:**

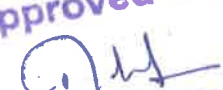
Sr. No.	Name of Book	Author	Publisher
1	Highway Engineering	Khanna -Justo	Nem Chand & Bros. Roorkee
2	Roads, Railway and Bridges	Birdi and Ahuja.	Standard Book House
3	Transportation Engineering	N.L. Arora.	Dhanpat Rai Publishing
4	Principles and Design of Highway Engineering	Sharma S.K.	S. Chand & company, Delhi
5	IRC Book	Culdisag	

**Course Curriculum Development Committee:****a. Internal Faculty**

- i. Mrs. S. M. Male.
- ii. Ms. M. S. Sorde

**b. External Faculty**

- i. Mr. K. V. Kelgandre (Sr. Lecturer, K.J.S.Polytechnic, Vidya Vihar)
- ii. Mrs. S.S. Kasulla (Lecturer, Government Polytechnic, Thane)

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 Academic Co-ordinator  
 G. P. Mumbai

  
 Academic Coordinator

(Dr. R. A. Patil)

21-6-17

  
 Head of Department  
 (Civil Engineering)

Dr. S. S. Motling

  
 Principal

Govt. polytechnic Mumbai

Course Name: - Highway Engineering

Course Code: - CE 16205

## CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	1	-	-	1	-	2	1
CO2	2	1	2	2	-	1	1	1	2	1
CO3	2	2	2	2	-	-	-	2	1	-
CO4	1	2	1	3	-	-	-	-	2	1

## CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Know the various phases of Highway Engineering. like- development, planning, alignment, highway geometric design & location, highway traffic operation & its control, economic considerations, finance & administration.	2	2	3
CO2	Design the various geometric parameters of a road.	1	2	3
CO3	Understand the intricacies of traffic engineering.	1	2	3
CO4	Understand the financial aspects of a highway project	1	2	3

## Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	1,2
2	2	Highway Geometric Design	1,2,3
3	3	Road side Development	1,2
4	4	Traffic Engineering	1,3
5	5	Hill Roads	1,2
6	6	Highway Economics & Finance	1,4

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Programme : <b>Diploma in Civil/Mechanical/Electrical Engineering</b>									
Course Code: <b>AM16203</b>				Course Title: <b>Concrete Technology</b>					
Compulsory / Optional:				<b>Compulsory</b>					
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
<b>3</b>	<b>-</b>	<b>2</b>	<b>5</b>	<b>70 (3 Hrs.)</b>	<b>30</b>		<b>50*</b>	<b>25</b>	<b>175</b>

\* TW shall be based on the practicals done during the semester

### Rationale:

Concrete is most widely used construction material in all types of Civil Engineering Structures. The Civil Engineering technician has to plan, supervise and ensure the quality of final product of concrete, i.e. its durability, strength, tolerance, appearance & finish. To discharge his duties effectively, he must be able to supervise the concrete construction at all stages of concrete chain; which broadly consists of making of concrete and interaction of its various ingredients both in plastic and hardened stage. For this purpose, a technician must know the basic properties of concrete as well as of its ingredients like cement, aggregates, water and admixtures, etc. He should learn and practice the basic principles governing the strength, durability and workability of concrete. He should understand the basic principles of mix-design and develop supervisory skills required for various operations in concrete construction.

### Course Outcomes:

Student should be able to

CO1	State various terms related to concrete, concreting operations.
CO2	Evaluate physical properties of cement, sand and aggregates and concrete.
CO3	Measure and understand the properties of concrete in plastic state and hardened state.
CO4	Describe the functions of mineral and chemical admixtures.
CO5	Design Concrete Mix as per IS method with and without admixture (mineral and/or chemical admixture).
CO6	Describe special concrete and Explain various repair materials and techniques for repair of cracks.

### Course Content Details:

Unit No	Topics / Sub-topics
<b>1</b>	<b>Introduction :</b> 1.1 Scope and definition of concrete, role of concrete in construction. 1.2 Need for supervisory skills in concreting operations, Concept of concrete chain Grade of concrete. 1.3 Basic raw materials in concrete, Grades of concrete, Advantages and Disadvantages of concrete.
<b>2</b>	<b>Cement :</b> 2.1 Methods of manufacturing of Portland cement by dry process. 2.2 Basic Chemical constituents of cement & their effects on the properties of cement, hydration of cement, Rate of hydration, Mechanism and effect of admixtures on rate of hydration.

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	<p>2.3 Final Chemical compounds of cement and their properties(<math>C_2S, C_3S, C_3A, C_4AF</math>)</p> <p>2.4 Characteristics and uses of following types of cements. Ordinary Portland Cement b) Rapid hardening cement c) Low heat cement d) Sulphate resisting cement e) Portland slag cement f) Colored cement g) Portland Pozzolana cement (PPC) h) Multi blend cement and grades of cement.</p> <p>2.5 Standard tests and IS specifications on cement (IS 269, IS 12269)- a) Consistency b) Fineness c) Initial &amp; final setting d) Compressive strength of cement e) soundness of cement.</p> <p>2.6 Field-testing of cement and Storage of cement.</p>
3	<p><b>Aggregates (course &amp; fine) :</b></p> <p>3.1 Classification of aggregates according to a) nature of formation b) size c) shape, texture.</p> <p>3.2 Testing as per IS 383, IS2383 and importance of Gradation, Sieve analysis, Fineness modulus, water absorption, moisture content unit weight and specific gravity of coarse and fine aggregate.</p> <p>3.3 Concepts of Bulking of sand, Silt content, Zoning, Crushed sand, deleterious materials and their testing of fine aggregates, properties of Crushed sand.</p> <p>3.4 Concepts and Determination of Crushing value, impact value, abrasion value, Flakiness Index, Elongation index, Soundness and their specifications as per Indian standards</p>
4	<p><b>Mineral Admixtures, Chemical Admixture and Water :</b></p> <p>4.1 Quality of water for concrete and curing, limits of impurities of water, Duff Abram's w/c ratio</p> <p>4.2 Definition of admixtures, Types of Admixtures- Accelerators and retarders, plasticizers and super plasticizers, air entraining admixtures. Purpose, benefits of each type of admixtures on the fresh and hardened concrete, Marsh cone test.</p> <p>4.2 Pozzolanic Materials: - Micro silica/GGBS/fly ash/ Rice Husk Ash and its advantages &amp; disadvantages, their influence on fresh and hardened concrete.</p>
5	<p><b>Properties of Concrete :</b></p> <p>5.1 Fresh Concrete and its properties: - workability, hardness, segregation &amp; bleeding. Measurement of workability by slump cone test and compaction factor test.</p> <p>5.2 Hardened Concrete and its properties:- Compressive strength, acceptability criteria for compressive strength, Tensile Strength, Bond Strength, Flexural Strength ,</p> <p>5.3 Factors affecting durability of Concrete (ASTMC 1203):- Plastic shrinkage cracks, Corrosion of reinforcement, Carbonation, Chloride ingress, relation between impermeability and w/c ratio.</p> <p>5.4 Importance, limitations and different methods of Non destructive Testing.</p> <p>5.5 Rebound hammer test, Ultrasonic pulse velocity test, carbonation test, half cell potentiometer test, core test, load test, corrosion test, cover meter.</p>
6	<p><b>Concreting Operations :</b></p> <p>6.1 Batching, mixing, transporting, placing and compaction of concrete.</p> <p>6.2 All conventional methods of curing, chemical and steam curing. Advantages and disadvantages of these methods.</p> <p>6.3 Construction Joints – method of joining old and new concrete. Expansion joints, Contraction joints.</p> <p>6.4 Finishing: - Purpose of finishing, types/methods of finishing, vacuum dewatering</p>

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C. 100

	system etc. 6.5 Concreting in extreme weather condition ,under water concreting.
7	<b>Mix Design of Concrete :</b> 7.1 Factors causing variations in concrete quality, field control, advantages of Q.C. Precaution to be taken to maintain Q.C 7.2 Objectives of mix design, nominal mix, design mix. 7.3 Factors affecting Mix design. 7.4 Introduction to different methods of mix design and its suitability 7.5 I.S. method to design a concrete mix as per IS 10260-2009 with and without mineral and/or Chemical admixtures.
8	<b>Special concrete and Cracks in Concrete :</b> 8.1 Concepts, Properties and applications of Ready mix concrete, Fibre reinforced concrete, High Performance concrete, High volume fly ash concrete, Self compacting concrete, Light Weight Concrete, Pre-stressed concrete, Roller Compacted Concrete, Fibre reinforced concrete, No fines concrete, High density concrete, High grade concrete, Polymer modified concrete. 8.2 Types, Causes and Remedies of cracks before hardening. 8.3 Types, Causes and Remedies of cracks after hardening. 8.3 Prevention of cracks. 8.4 Materials for repair of crack. 8.5 Methods used for repair of crack

**Suggested Specifications Table with Hours and Marks (Theory):**

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level I	U Level	A Level	Total Marks
1	Introduction	02	04	00	00	04
2	Cement	06	02	04	04	10
3	Aggregates (course & fine)	06	02	04	04	10
4	Mineral Admixtures, Chemical Admixture and water	06	04	04	00	08
5	Properties of Concrete	08	02	04	04	10
6	Concreting Operations	06	00	04	04	08
7	Mix design of concrete	08	02	04	04	10
8	Special Concrete and Cracks in concrete	06	02	04	04	10
<b>Total</b>		<b>48</b>	<b>16</b>	<b>28</b>	<b>24</b>	<b>70</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

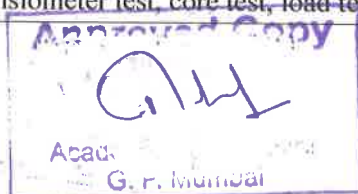
**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.





**List of experiments/Practicals:**

Sr. No.	Unit	Experiment	Approx. Hours
		<b>Group A Cement:</b>	6
1	2	Determination of fineness of cement by sieving / Blaine's air permeability apparatus	2
2	2	Determination of water for cement paste of normal consistency.	2
3	2	Determination of initial and final setting time of cement.	2
4	2	Determination of compressive strength of cement.	2
5	2	Determination of soundness of cement.	2
		<b>Group B Coarse aggregate:</b>	6
6	3	Determination of fineness modulus and particle size distribution	2
7	3	Determination of flakiness and elongation index	
8	3	Determination of abrasion value	2
9	3	Determination of impact value	2
10	3	Determination of crushing value	2
		<b>Group C fine aggregate:</b>	6
11	3	Determination of fineness modulus particle size distribution	2
12	3	Determination of bulking of sand	2
13	3	Determination of silt contents	2
14	3	Determination of specific gravity and water absorption	2
15	3	Determination of bulk density	2
15A	3	Test on modified or crushed sand	
		<b>Group D concrete:</b>	6
16	5	Slump test on concrete and Compaction factor test	4
17	5	Compressive strength of concrete	2
18	5	Non destructive test on concrete by Rebound Hammer or UPV (Study or Performance) Ultrasonic pulse velocity test, carbonation test, half cell potentiometer test, core test, load test, corrosion test, cover meter. (The	2





		demo of the test will be given by industrial expert.)	
		<b>Group E Mini Project:</b>	
19	7	Concrete mix design as Per IS 10262 : 2009. Each batch should be given different data for Grade with mineral admixture and /or Chemical admixture.	6
<b>Total</b>			<b>32</b>

**Notes:** If possible an industrial visit should be arranged or videos should be shown of different applications of this course.

#### References/ Books:

Sr. No.	Author	Title	Publisher
1	M. S. Shetty	Concrete Technology (Theory & Practical)	S. Chand Publication
2	M. L. Gambhir	Concrete Technology	Tata Mc-Graw. Hill Publishing Co. Ltd. New Delhi
3	A. M. Neville and J. J. Brooks	Properties of Concete	Trans Atalantic
4	A.R. Santhakumar	Concrete Technology	Oxford University Press.
5	A. M. Neville	Properties of Concrete	Pearson Education

#### CDs, PPTs Etc.:

CD or PPT of above experiments developed by NITTTR and NPTEL (if available) shall be shown to the students on T. V. / L.C.D.

#### IS, BIS and International Codes:

1.

I.S.4031- (Part 1 to Part 6) Indian standard method of physical tests for hydraulic Cement, BIS, New Delhi.

I.S. 4031 (Part 1) - 1996 Part 1 - Determination of fineness by dry sieving.

I.S. 4031 (Part 2) - 1999 Part 2 - Determination of fineness by air permeability Method.

I.S. 4031 (part 3) - 1988 (reaffirmed 2000) Part 3- Determination of soundness

I.S. 4031 (part 4) - 1988 (reaffirmed 1995)

Part 4 - Determination of consistency of standard cement paste. I.S.4031 (part 5) - 1988, (reaffirmed 2000)

Part5 - Determination of initial and final setting times I.S: 4031 (part 6) - 1988, (reaffirmed 2000)

Part 6 - Determination of Compressive strength of hydraulic cement other than masonry cement

2.

I.S: 2386 (part i to part vi) – 1963 Indian standard methods of test for aggregate for Concrete. BIS, New Delhi.

Part i - Particle size and shape. (Reaffirmed 1997)

Part ii - Estimation of deleterious materials and organic impurities. (Reaffirmed 2002)

Part iii - Specific gravity, density, voids , absorption and bulking. (Reaffirmed 1997)

Part iv - Mechanical properties (reaffirmed 1997)

Part v - Soundness. (Reaffirmed 1997)

Part vi - Measuring mortar making properties of fine aggregate. (Reaffirmed 2002)

3.

I.S: 383 - 1970 Indian standard specification for coarse and fine aggregates from



Natural sources for concrete. B.I.S., New Delhi.

4. I.S: 1911 - 1959 (reaffirmed) Indian Standard methods of sampling and analysis of concrete), B.I.S., New Delhi.

5. I.S: 456 - 2000 Indian standard, plain and reinforced concrete – code of practice. (fourth revision ), B.I.S., New Delhi.

6. I.S: 516 - 1959 Indian standard methods of tests for strength of concrete (xii reprint December 1987), B.I.S., New Delhi.

7. I.S.: 8112- 1989 Indian standard - 43 grade ordinary portland cement Specification

8. I.S: 12269 - 1987 (reaffirmed 1999) Indian standard specification for 53 grade O.P.C..

9. I.S: 9103 - 1999 Indian standard – concrete admixtures specification

10. I.S.: 455- 1989 (reaffirmed 1995) - Indian standard – Portland slag cement specification

11. I.S.: 1489 (part 1) 1991 - Portland - Pozzolana Cement – specification part 1 fly ash based

12. I.S.: 7861 (part 1) 1975 (reaffirmed 1997) - Indian standard of practice for extreme weather concreting part 1 recommended practice for hot weather concreting

13. I.S.: 7861 (part 2) - 1981 (reaffirmed 1997) - Indian standard of practice

For extreme weather concreting

part 2 - recommended practice

for cold weather concreting

13. I.S : 8041 - 1990 - Indian standard - rapid hardening Portland Cement specification BIS- New Delhi

14. I.S: 12330 - 1988 (reaffirmed 1995) - Indian standard specification for sulphate resisting Portland cement

15. I.S. : 12600 - 1989 ( reaffirmed 1995) - Portland cement, low heat Specification

16. I.S. : 10262 - 1982 Indian standard recommended guidelines for concrete mix Design

17. Sp 23 handbook on concrete mixes (based on Indian standards)

18. I.S. 13311 (part-1 and 2) - 1992 methods of non-destructive testing of concrete. part-1 ultrasonic pulse velocity, part-2 rebound hammer.

#### Course Curriculum Development Committee:

##### a. Internal Faculty

i. Mrs. S.S.Chavan.

##### b. External Faculty

i. Mr. Rohit Ramteke (Lecturer, G.P.Pune)

Academic Coordinator

Dr. R.A. Patil

21-6-17

Head of Department

(Civil Engineering)

Dr. S.S. Molling

Principal

Govt. polytechnic Mumbai

Course Name:- Concrete Technology

Course Code:-AM16203

#### CO Vs PO matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	2	-	-	-	-	-	-	-	-	-
CO 2	2	2	3	-	-	1	2	-	-	-
CO 3	2	3	2	-	-	2	2	2	3	2
CO4	-	-	3	2	2	-	-	-	-	1
CO5	-	-	3	3	-	-	2	-	-	2
CO6	-	-	3	3	-	2	2	2	3	2

**CO Vs PSO matrix**

CO/POs		PSO1	PSO2	PSO3
CO 1	State various terms related to concrete, concreting operations.	3	2	1
CO 2	Evaluate physical properties of cement, sand and aggregates and concrete.	-	2	-
CO 3	Measure and understand the properties of concrete in plastic state and hardened state.	-	2	3
CO4	Describe the functions of mineral and chemical admixtures.	-	3	3
CO5	Design Concrete Mix as per IS method with and without admixture (mineral and/or chemical admixture).	-	3	2
CO6	Describe special concrete and Explain various repair materials and techniques for repair of cracks.	1	2	3

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	1
2	2	Cement	1,2
3	3	Aggregates (course & fine)	1,2
4	4	Mineral Admixtures, Chemical Admixture and water	1,5
5	5	Properties of Concrete	1,2,3
6	6	Concreting Operations	1
7	7	Mix design of concrete	1,3,5
8	8	Special Concrete and Cracks in concrete	1,3,6

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Programme : <b>Diploma in Civil Engineering</b>									
Course Code: <b>CE16306</b>				Course Title: <b>WATER SUPPLY ENGINEERING</b>					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
<b>3</b>	<b>-</b>	<b>2</b>	<b>5</b>	<b>70</b>	<b>30</b>		<b>25*</b>	<b>25</b>	<b>150</b>

\*External Examiner

**Rationale:**

Water is the basic need for all living beings. Therefore, maintaining supply of this basic necessity in adequate quantity & in desired form is of great importance. With a view to provide adequate water supply of required quality and quantity to every village, town and city. Water supply schemes are being commissioned on large scale. Therefore, it is a must for a Civil Engineer to study Water Supply system.

**Course Outcomes:**

Student should be able to:

CO1	Know the necessity of water supply scheme.
CO2	Estimate water demands required for a particular locality.
CO3	Analyze the quality of water.
CO4	Suggest treatment required by knowing the quality of water.
CO5	Understand the distribution system.

**Course Content Details:**

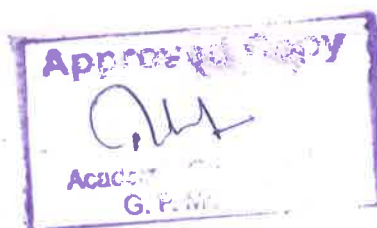
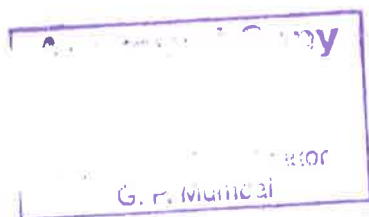
Unit No	Topics / Sub-topics
<b>1</b>	<b>Introduction</b> 1.1 Necessity of Water Supply Schemes 1.2 Need for protected water supply-Water borne diseases
<b>2</b>	<b>Estimation of demand and water</b> 2.1 Various Demand- Domestic, Public, Commercial, Industrial, Fire, Loss and Wastages 2.2 Variations in Demand- Hourly Variation, Daily Variations, Monthly Variations, Seasonal variations. Graph showing Variations. 2.3 Forecasting of Population by Various Methods- Arithmetical Increase method, (Numerical ) Geometrical Increase method, (Numerical ) Simple graphical method, Master plan method, Graphical Comparison method
<b>3</b>	<b>Quality of water</b> 3.1 Characteristics of Water, Palatability 3.2 Physical- Color, Taste and Odour, Temperature, Turbidity

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	<p>3.3 Chemical-Total Solids, Hardness, PH and Alkalinity, Chlorides, Dissolved gases, N<sub>2</sub> And its compounds.</p> <p>3.3 Biological- Standard Plate Count (SPC) or Total Count test, E-coli test, Most Probable Number (MPN), Radioactive substances if any</p> <p>3.4 Standards for Potable Water as per BIS, WHO standards of water .</p>
<b>4</b>	<p><b>Sources &amp; conveyance of water, pipes</b></p> <p>4.1 Surface – Lake, rivers, reservoirs</p> <p>4.2 Subsurface – Wells, springs, artesian well</p> <p>4.3 Intake Arrangement – Intake well, Jack well, Pump house.</p> <p>4.4 Different types of pipes for conveyance of water</p> <p>4.5 Laying of pipes- Pressure test &amp; Leakage test, Selection of appropriate diameters &amp; class of pipes.</p>
<b>5</b>	<p><b>Treatment of Water</b></p> <p>5.1 Flow diagram of water treatment plant</p> <p>5.2 Aeration- Objectives, Methods of aeration</p> <p>5.3 Sedimentation- Theory of sedimentation, Objects and Principles of Sedimentation -Plain sedimentation, tube settlers, Sedimentation with Coagulation. –Sedimentation tanks-Types, Constructional, details and working -Study of Clarri flocculator.</p> <p>5.4 Filtration -Objects, theory of filtration Classification of filters-Slow &amp; Rapid sand filters, pressure filters. Construction and Working procedure, Washing of filters</p> <p>5.5 Disinfection -Necessity, Methods of disinfection, Chlorination- Different forms of chlorination, Break-Point of chlorination, Residual chlorine.</p> <p>5.6 Water Softening. Causes of Hardness, Temporary &amp; Permanent Hardness, and Methods to remove Hardness: Ion exchange, Use of iodine, ozone, uv rays</p>
<b>6.</b>	<p><b>Distribution of water</b></p> <p>6.1 Types of water supply scheme- Pumping, Gravity, Combined (with examples)</p> <p>6.2 Valves-Pipe Appurtenances Sluice valve, Air relief valve, Gate valves, Pressure relief valve -Their functions &amp; Locations.</p> <p>6.3 Study of water supply layout arrangement for building with reference to cocks, valves, junctions &amp; tap connections.</p> <p>6.3 Layouts for distribution system- Dead end, Grid iron, Circular and Radial system, Maintenance of Distribution system.</p>





**Suggested Specifications Table with Hours and Marks :**

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	02	02	00	00	02
2	Estimation of demand and water	05	02	04	00	06
3	Quality of water	12	02	04	12	18
4	Sources & conveyance of water, pipes	05	04	04	00	08
5	Treatment of Water	16	06	06	12	24
6	Distribution of water	08	02	04	06	12
<b>Total</b>		<b>48</b>	<b>18</b>	<b>22</b>	<b>30</b>	<b>70</b>

**Legends:** R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

**Notes:** This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

**List of experiments/Assignments:**

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	3	To determine pH of given water sample.	02
2	3	To determine the turbidity of the given sample of water	02
3	3	To determine the optimum dose of coagulant in the given sample by Jar test .	02
3	5	To determine the hardness of a given water sample by standard E.D.T.A.method .	02
5	3	To determine suspended solids, dissolved solids and total solids of water sample	04
6	6	Study of water supply layout arrangement for a building and writing a report with layout drawing to suggest various appurtenances required for the same building.	06
7	-	Study and write an Assignment on Rural water supply schemes	04
8		Assignment on Awareness of water	02
9	5	Visit to a water treatment plant & submitting a report on the same.	08
<b>Total</b>			<b>32</b>

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Academic Co-ordinator  
G. P. Mumbai

**References/ Books:**

Sr. No.	Name of Book	Author	Publisher
1	S. K. Garg	Water Supply Engineering	Khanna Publishers, New Delhi
2	S. C. Rangwala	Water Supply and Sanitary Engineering	Charotar Publishing House, Delhi
3	Kamala ,A&Kanthrao.	Environmental Engineering	Tata McGraw Hill-Newyork
4	G.S. Birdie	Water Supply and Sanitary Engineering	Dhanpat Rai & Sons, New Delhi
5	Expert Committee, Govt. of India	CPHEEO Manual on Water Supply and Treatment	Ministry of Urban Development, Govt. of India
6	Steel & Terrence	Water Supply and Sewerage	McGraw Hill Book Company, New York

**Course Curriculum Development Committee:****a. Internal Faculty**

- i. Smt.M.K.Anserwadekar
- ii. Smt.S.S.Chavan

**b. External Faculty**

- i. Mrs. S. S. Kasulla (Lecturer, G.P. Thane)

Academic Coordinator

(Dr. R. A. Pahi)  
21-6-17Head of Department  
(Civil Engineering)

Dr. S. S. Motling

Principal

Govt. polytechnic Mumbai

Course Name: - Water supply Engineering

Course Code: - CE 16306

**CO Vs PO matrix**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	-	-	3	-	-	-	-	-	1
CO2	-	-	-	2	-	-	1	-	2	2
CO3	1	1	2	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	1
CO5	-	-	3	-	-	-	-	-	-	-

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**CO Vs PSO matrix**

CO/POs		PSO1	PSO2	PSO3
CO1	Know the necessity of water supply scheme.	-	2	
CO2	Estimate water demands required for a particular locality.	-	3	3
CO3	Analyze the quality of water.	-	2	3
CO4	Suggest treatment required by knowing the quality of water.	-	2	3
CO5	Understand the distribution system.	1	2	3

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	CO1
2	2	Estimation of demand and water	CO2
3	3	Quality of water	CO3
4	4	Sources & conveyance of water, pipes	CO5
5	5	Treatment of Water	CO4
6	6	Distribution of water	CO5

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Programme : <b>Diploma in Civil Engineering</b>									
Course Code: <b>CE16303</b>				Course Title: <b>Computer Aided Drafting</b>					
Compulsory / Optional: <b>Compulsory</b>									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
1	-	4	5	-	-	50	-	25	75

**Rationale:**

As diploma engineer student must know more about computer operation & its applications. In order to work in software engineering fields in Civil Engineering the student must know drafting methodologies and their applications to various Civil Engineering fields. Using CAD software it is easy to create and modify drawings. In civil engineering industry operating skills are required for computer aided drafting, handling of printers & plotters.

**Course Outcomes:** Student should be able to-

CO1	Understand the importance of CAD.
CO2	Use different CAD commands for drawing.
CO3	Draw, edit and modify 2D drawings.
CO4	Understand various latest software packages being used in Civil Engineering.

**Course Content Details:**

Unit No	Topics / Sub-topics
1	<b>Recapitulation :</b> 1.1 Windows- operations such as moving, Resize, close, minimize, maximize. Windows operation using my computer, control panel, accessories.
2	<b>Computer aided drafting (CAD) :</b> 2.1 Introduction to CAD Applications Advantages of CAD,CAM,CAE, pre-requisite (hardware and software). 2.2 CAD Packages available in market, Auto CAD, Omega Designer, P-CAD, Robo CAD, Felix CAD, IntelliCAD, LisCAD. 2.3 Auto CAD and manual drafting, advantage. System requirements, CAD peripherals, 2.4 Opening screen, functional and control keys, WCS, UCS
3	<b>Draw and Enquiry commands</b> Line, circle, arc, Redraw, Erase, Undo, Redo, Osnap, Ellipse, Polygon, copy move, setting up of drawing, Paper sizes, limits, layers, Grid, snap zoom, pan, Region, Color, Array, Rotate, Scale, Trim, Break, Extend, Fillet, Chamfer, Text, mirror, Stretch, Line mode, Arc mode, area list Blist
4	<b>Dimensioning Commands:</b> Drawing, Dim, Dim scale, Linear, Angular, Adjustable, Geometric dimension, Editing dimension text and variables.
5	<b>Organization Drawing</b> with layers, layer state creating new layer Changing object properties. Drawing set up – Controlling unit display, sizing the drawing sheet, creating new drawing with Wizards and Templates.





6	<b>Study of latest software packages used in Civil Engineering:</b> 6.1 For drafting and modeling :- Auto CAD, Microstation, Smart sketch, Revit, Inroads, Speedicon, Triforma, ZCADD 6.2 For analysis:- STADPRO, GTSTRUDD, Tekla, SDS2
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Table showing distribution of teaching hours :

Unit No	Topic Title	Teaching Hours
1	Recapitulation	2
2	Computer aided drafting (CAD)	2
3	Draw and Enquiry commands	4
4	Dimensioning Commands:	3
5	Organization Drawing	3
6	Study of latest software packages used in Civil Engineering	2
<b>Total</b>		<b>16</b>

List of experiments/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1,3,4	<b>Practice exercises for following topics</b> 1. Set the initial view. 2. Use of Draw command. 3. Use of Edit command. 4. Use of Modify command. 5. Apply dimensions.	08
2	3,4,5	Any two drawings from following – Plan of building, Elevation, Section, Isometric view of any object, etc.	20
3	3,4,5	To prepare, drawing for any civil engineering RCC/ Steel structure using any available CAD package.	20
4	2,3,4,5,6	To prepare drawing to show detailed structural drawing using any CAD package. (ladder, Stairs, Foundation Structure, Platform connection details)	16
<b>Total</b>			<b>64</b>

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Auto CAD Practice 2008	BPB Publication	BPB Publication, New Delhi
2	Inside Auto CAD The ABC's of Auto CAD-2008	Raker & Rice Alan Miller	McGraw Hill , New Delhi
3	Bently Software and Intigraph	----	----



**Course Curriculum Development Committee:****a. Internal Faculty**i. Ms. M. S. Sorde *for Samund***b. External Faculty**

i. Mr. K. V. Kelgandre (Sr. Lecturer, K.J.S.Polytechnic, Vidya Vihar)

*29-6-18*  
Academic Coordinator*Samund*  
Head of Department  
(Civil Engineering)*h*  
Principal  
Govt. polytechnic Mumbai

Course Name: - Computer Aided Drafting

Course Code: - CE16303

**CO Vs PO matrix**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	1	-	-	-	-	-	-	-	-
CO2	1	2	1	1	-	-	1	1	1	1
CO3	1	2	2	2	-	-	1	1	1	1
CO4	-	2	-	-	-	1	1	-	-	1

**CO Vs PSO matrix**

CO/POs		PSO1	PSO2	PSO3
CO1	Understand the importance of CAD.	1	-	-
CO2	Use different CAD commands for drawing.	2	1	1
CO3	Draw, edit and modify 2D drawings.	2	1	1
CO4	Understand various latest software packages being used in Civil Engineering.	1	-	-

**Unit Number and COs**

Sr. No.	Unit No.	Topic Title	COs
1	1	Recapitulation	CO4
2	2	Computer aided drafting (CAD)	CO1, CO2, CO3
3	3	Draw and Enquiry commands	CO1, CO2, CO3
4	4	Dimensioning Commands:	CO1, CO2, CO3
5	5	Organization Drawing	CO1, CO2, CO3,
6	6	Study of latest software packages used in Civil Engineering	CO4

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 Academic Co-ordinator  
 G. P. Mumbai

