

Government Polytechnic, Mumbai

(Academically Autonomous Institute of Maharashtra Government)

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gpmumbai@gpmumbai.ac.in

Programme : Civil Engineering

Fourth 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				
AM16301	Theory of Structures	4	--	1	5	5	70	30				100
AM16304	Soil Mechanics	3	2	--	5	5	70#	30			50	150
CE16302	Advanced Surveying	3	4	--	7	7	70	30	25 *		25	150
CE16501	Construction Management	3	2	--	5	5	70	30		50*		150
CE16206	Railway and Bridge Engineering	3		--	3	3	70	30				100
CE16307	Sanitary Engineering	3	2	--	5	5	70	30		50*		150
4th Level	Optional subject I (any one)	3	2	--	5	5	--	--		50	50	100
CE 16401	Repairs and rehabilitation of buildings											
CE 16402	Plumbing and Sanitary services											
CE 16403	Material Management											
CE 16404	Safety and quality control											
	TOTAL	22	12	1	35	35	420	180	25	150	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; # online examination

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Academic Co-ordinator
G. P. Mumbai

Head of Department
(Civil Engineering)

Principal
Government Polytechnic Mumbai

Academic co-ordinator
Government Polytechnic Mumbai

Programme : Diploma in Civil Engineering									
Course Code: AM16301				Course Title: Theory of Structures					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
4	01	--	5	70 (3 Hrs.)	30	-	-	-	100

Rationale:

This subject deals with analysis of forces and stresses in structures. This forms base for developing the concepts required in the design of various structures.

The application of theoretical principles and laws are applied to field situation to solve field problems, which enables the students in understanding concept.

Course Outcomes:


Student should be able to

CO1	Calculate stresses on given plane for the element with given state of stress.
CO2	Analyse Statically Determinate structures.
CO3	Draw shear force and bending moment diagram for different beams.

Course Content Details:

Unit No	Topics / Sub-topics
1	Principal planes & principal stresses : 1.1 Concepts of simple shear, Complementary shear, Element subjected to general state of stress (Plane stress condition i.e. Normal stresses in x, y direction and shear stress all in same plane). 1.2 Equations for Normal stress Shear stress on any given plane, Principal planes and Principal stresses, maximum shearing stresses and their planes. (No Derivations of these equations) Resultant stress, angle of obliquity, Numerical problems on above. 1.3 Graphical method: -Use of Mohr's circle method for analysis of an element subjected to complex State of stresses. Introductory. (No problems on Mohr's circle in theory examination.)
2	Direct and Bending Stresses : 2.1 Concept of direct and eccentric loads. 2.2 Tension and compression members subjected to load with eccentricity about one principal axis only, stress distribution, nature of stresses. 2.3 Condition for no tension, limits of eccentricity, maximum and minimum stresses, core of section for rectangular & Circular sections, middle third rule, middle quarter rule. 2.4 Columns, walls, pillars and chimney of uniform section subjected to lateral wind pressure. Coefficient of wind resistance. Stress distribution at base (No problems on non uniform sections) 2.5 Structures retaining water and earth level up to top , conditions of stability, stress distribution at the base.(Simple Numerical on trapezoidal gravity section)
3	Slope and deflection: 3.1 Concept of slope and deflection. 3.2 Slope and deflection of determinate beam subjected to bending. 3.3 Relation between slope, deflection and Radius of curvature, differential equation (no

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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	Principal planes & principal stresses	10	02	02	06	10
2	Direct and Bending Stresses	12	02	02	06	10
3	Slope and deflection	08	02	02	04	08
4	Fixed Beams	08	02	02	08	12
5	Continuous Beams	08	00	04	08	12
6	Moment Distribution Method	08	02	02	08	12
7	Columns	10	02	00	04	06
Total		64	12	14	44	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	Assignment -1: Solving of four problems on Principal planes & principal stresses	2
2	2	Assignment -2: Solving of four problems on Direct and Bending stresses	2
3	3	Assignment -3: Solving of four problems on Slope and deflection	2
4	4	Assignment -4: Solving of three problems on Fixed Beams	2
5	5	Assignment -5: Solving of four problems on Continuous Beams	3
6	6	Assignment -6: Solving of four problems on Moment Distribution Method	3
7	7	Assignment -7: Solving of four problems on Columns	2
Total			16

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

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Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Principal planes & principal stresses	1,2
2	2	Direct and Bending Stresses	1,2
3	3	Slope and deflection	1,2
4	4	Fixed Beams	1,2,3
5	5	Continuous Beams	1,2,3
6	6	Moment Distribution Method	1,2,3
7	7	Columns	1,2

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Programme : Diploma in Civil Engineering									
Course Code: AM16304				Course Title: Soil Mechanics					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03		02	05	70 #	30	--	--	50	150

on line Term end Examination.

Rationale:

Soil Mechanics engineering is important for every structure, since all structures rest on soil. The stability of these structures depends upon behavior of soil and bearing capacity of soil to carry loads under different loading conditions.

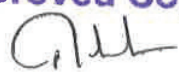
The design of foundation of buildings, dams, towers, embankments, roads, railways, retaining walls, bridges is mainly governed by the knowledge of soil characteristics, stress distribution under loading on soil, bearing capacity of soil etc. The content of this subject are useful to every engineer in the design, execution and stability analysis of structures.

Objectives: After studying this course, the student will be able to-

CO1	Know the Origin & Field applications of Soil.
CO2	Know the physical properties and behavior of soils.
CO3	Classify the soil as per IS classification and to know grading & consistency of Soil.
CO4	State the necessity of compaction and consolidation of soil with its techniques.
CO5	Know & understand factors affecting permeability of soil, and Shear Strength of Soil.
CO6	Know importance of bearing capacity and Know the techniques of stabilization of soil.

Course Content Details:

Unit No	Topics / Sub-topics	
1	Introduction to Soil Mechanics	
	1.1	IS definition of soil, Origin of soil, Formation of soil. Major soil deposit in India.
	1.2	Importance of soil in Civil Engineering as construction material in Civil Engineering Structures, as foundation bed for structures.
	1.3	Field application of Soil Mechanics for foundation design, pavement design, design of earth retaining structures, applications in design of earthen dams in Maharashtra and India.
2	Physical Properties of Soil	
	2.1	Soil as Three Phase System. water content, determination of Water Content by oven drying method as per IS code.
	2.2	Physical properties: Void ratio, porosity & degree of saturation, density index, unit wt. of Soil mass - Sp. Gravity, bulk density, dry density, Water content
	2.3	Relation between: Void ratio and porosity, void ratio, sp. gravity & degree of saturation. (No derivations)
	2.4	Determination of specific gravity by Pycnometer.
	2.5	Determination of bulk unit weight and dry unit weight by Core Cutter method (Simple Numerical problems on physical properties only)
3	Grading & Consistency of soil	
	3.1	Particle size distribution, mechanical sieve analysis as per IS code, particle size distribution curve, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils, I.S. classification of soil.

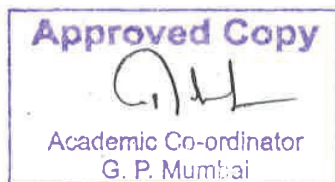
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	3.2	Consistency of soil: stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, Plasticity index, Consistency index.
	3.3	Determination of Liquid limit, Plastic limit and Shrinkage limit as per IS code.
4	Compaction & Consolidation	
	4.1	Concept of compaction & consolidation, difference between consolidation and compaction.
	4.2	Compaction: Light and Heavy compaction, zero air void line, O.M.C, Std. Proctor test. Modified Proctor test. Factors affecting compaction.
	4.3	Field methods of compaction – rolling, ramming and vibration and Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator
5	Permeability & Shear strength of soil	
	5.1	Definition & concept of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head Permeability tests.
	5.2	Types of Filters. Use of Geofabric as Filters
	5.3	Concept and definition of shear strength of soil, constituents of shear resistance of soil, definition of Cohesion, internal friction, angle of shearing resistance.
	5.4	Coulomb's equation & failure envelope, significance of "C" and "Ø" soils.
	5.5	Introduction to determination of shearing strength of soil in laboratory by direct Shear test (drained & untrained).
6	Bearing Capacity and Stabilization of Soil	
	6.1	Concept & definition of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing Capacity, effect of water table on bearing capacity.(No Numerical)
	6.2	Factors effecting bearing capacity and methods to improve Bearing capacity of soil.
	6.3	Plate load test - procedure, and limitations of test only
	6.4	Soil stabilization: Scope & purpose.
	6.5	Methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization. California bearing ratio, C.B.R. test, meaning of C.B.R. value.

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 to Soil Mechanics	4	02	02	--	04
2	Physical Properties of Soil	8	04	04	06	14
3	Grading & Consistency of soil	10	02	04	08	14
4	Compaction & Consolidation	10	02	04	08	14
5	Permeability & Shear strength of soil	10	02	08	04	14
6	Bearing Capacity and Stabilization of Soil	06	04	--	06	10
Total		48	16	22	32	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 Practicals : (Any Ten)

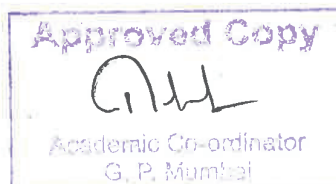
Sr. No	Unit	Experiment/Assignment	Approx. Hours
1		Determine specific gravity of soil by pycnometer method as per I.S. 2720 part- III.	02
2		Determine water content of given soil sample by oven drying method as per I.S. 2720 part- II	04
3		Determine dry unit weight of soil in field by core cutter method as per I.S. 2720 part-XXIX.	02
4		Determine grain size distribution of given soil sample by mechanical sieve analysis as per I.S. 2720 part- IV.	04
5		Determine Liquid Limit of given soil sample as per I.S. 2720 part- V.	02
6		Determine Plastic Limit of given soil sample as per I.S. 2720 part- V.	02
7		Study of Shrinkage Limit	02
8		Determine MDD and OMC by Standard proctor test (OR Study of Modified proctor test).	04
9		To determine Coefficient of permeability by Constant head method (OR Falling head test as per I.S.)	04
10		Determine shear strength of soil by direct shear test (OR Vane Shear Test)	04
11		Study of plate load test.	02
Total			32

References/ Books:

Sr.No.	Name of Book	Author	Publisher
1	Soil Mechanics & Foundation Engg.	K.R.Arora	Standard Publisher Distributors
2	Introduction to Soil Mechanics	B.J.Kasmalkar	Pune Vidyarthi Griha Prakashan
3	Basic & Applied Soil Mechanics	Gopal Rajan & A.S.R.Rao.	New Age International Publisher
4	Soil Mechanics and Foundation Engineering	B.C. Punmia	Standard Book House, New Delhi
5	Soil Mechanics	V.N.S Murthy	Sai Kripa Technical Consultants
6	Geotechnical Engineering (Soil Mechanics)	T.N.Ramamurthy & T.G.Sitharam	S Chand and Company Ltd

2. IS, BIS and International Codes:

1. Is 2809-1972-Glossary of Terms and Symbols Relating To Soil Engineering.
2. Is 1892-1979-Code of Practice For Sub Surface Investigation of Foundation
3. Is 2720-Test For Soil Part 1-1983 To Part 29



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

Mr. S. V. Khadake

**b. External Faculty**

Mr. A B Jagtap

Lecturer in Applied Mechanics

G P Solapur



Academic Coordinator

Head of Department
(Civil Engineering)Principal
Govt. polytechnic MumbaiCourse Name: **Soil Mechanics**Course Code: **AM16304****CO Vs PO matrix**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	-	-	2	-	1	-	-	1
CO2	2	2	3	2	1	-	-	2	1	1
CO3	2	3	3	2	1	-	-	2	1	1
CO4	1	2	1	1	1	1	-	1	-	2
CO5	2	2	2	1	1	-	-	1	1	1
CO6	1	1	1	1	1	1	-	1	-	2

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Know the Origin & Field applications of Soil.	1	-	1
CO2	Know the physical properties and behavior of soils.	1	2	1
CO3	Classify the soil as per IS classification and to know grading & consistency of Soil.	1	2	2
CO4	State the necessity of compaction and consolidation of soil with its techniques.	-	2	1
CO5	Know & understand factors affecting permeability of soil, and Shear Strength of Soil.	-	2	1
CO6	Know importance of bearing capacity and Know the techniques of stabilization of soil.	-	1	1

Unit Number and COs

Sr.No.	Unit No.	Topic Title	COs
1	1	Introduction to Soil Mechanics	1
2	2	Physical Properties of Soil	2
3	3	Grading & Consistency of soil	3
4	4	Compaction & Consolidation	4
5	5	Permeability & Shear strength of soil	5
6	6	Bearing Capacity and Stabilization of Soil	6

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Programme : Diploma in Civil Engineering									
Course Code: CE16302				Course Title: Advanced Surveying					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	--	4	7	70	30	25*	---	25	150

*External Examiner

Rationale:

This is core technology subject, which is intended to teach the students core facts, concepts, principles, procedures in surveying and levelling. With this knowledge and skill, he will be able to choose appropriate surveying and levelling methods depending upon requirement to carry out survey work in Building Construction system, Transportation Engineering system, Environmental Engineering system and Irrigation Engineering system etc. It will also equip him while serving as investigator for design department, supervisor on the site of work, draftsman in the drawing office and estimator in the estimation office. A systematic study of this core subject along with the knowledge of different instruments will be very much useful to Diploma holder who is an important man on the field.

Course Outcomes: Student will -

CO1	know various methods for surveying.
CO2	operate advanced survey instruments like micro optic theodolite, digital Theodolite, Total Station,
CO3	carry out traverse survey using theodolite, Total Station
CO4	conduct contour survey.
CO5	find out horizontal and vertical distances with a tachometer,
CO6	set curves.

Course Content Details:

Unit No	Topics / Sub-topics
1	THEODOLITE SURVEY 1.1 Technical terms used in theodolite surveying. Components of Transit Theodolite and their functions. 1.2 Temporary adjustment of theodolite. 1.3 Swinging the telescope, transiting the telescope, changing the face. 1.4 Permanent adjustment of transit theodolite. (Only relationship of different axes of theodolite) 1.5 Measurement of Horizontal angle, method of Repetition, errors eliminated by method of repetition. 1.6 Measurement of Deflection angle. 1.7 Measurement of Vertical angle 1.8 Measurement of magnetic bearing of a line by Theodolite. 1.9 Prolonging a Straight line. 1.10 Sources of errors in Theodolite Surveying. 1.11 Traversing with Theodolite – Method of included angles, locating details, checks

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	<p>in closed traverse, Calculation of bearings from angles.</p> <p>1.12 Traverse Computation - Latitude, Departure Consecutive Co-ordinates, error of Closure, Distribution of angular error, balancing the traverse by Bowditch rule and Transit Rule, Gale's traverse table, simple problems on above topic.</p> <p>1.13 Study and use of one second Micro Optic Theodolite, Digital Theodolite. Features of Electronic Theodolite.</p>
2	<p>CONTOURING</p> <p>2.1 Introduction</p> <p>2.2 Contour Interval</p> <p>2.2.1 Factors Affecting Contour Interval</p> <p>2.3 Horizontal Equivalent</p> <p>2.3.1 Difference between Contour Interval and Horizontal Equivalent</p> <p>2.4 Fundamental Characteristics of Contour Lines</p> <p>2.5 Contour Maps</p> <p>2.6 Uses of Contour Maps.</p> <p>2.7 Methods of Locating Contour</p> <p>2.7.1 Direct Method</p> <p>2.7.2 Indirect Method</p> <p>2.8 Interpolation of Contours</p> <p>2.9 Contour Drawing</p> <p>2.10 Toposheets: Introduction. General layout of toposheets. Information available on toposheets.</p>
3	<p>TACHEOMETRY</p> <p>3.1 Definition and use of tacheometry.</p> <p>3.2 Principles of tacheometry and use of anallatic lens.</p> <p>3.3 Use of theodolite as Tacheometer with vertical staff and fixed hair system (no derivations).</p> <p>3.4 Determination of tachometric constants. Simple numerical problems on above topics.</p>
4	<p>SIMPLE CURVES</p> <p>4.1 Definition & Necessity of curves. Types of horizontal curves.</p> <p>4.2 Elements of the simple circular curves and relation between radius & degree of a curve. Notations for circular curve and corresponding calculations. Peg interval. Concept of unit chord & sub-chord.</p> <p>4.3 Methods of setting out curves by offset from long chord method and Rankine's method of tangential angle. Simple numerical problems on above topics.</p> <p>4.4 Commonly used radii and degree of curves for curves for roads and railways.</p>
5	<p>TOTAL STATION SURVEYING</p> <p>5.1 Introduction of total station. Component parts of total station. Classification of total stations.</p> <p>5.2 Fundamental parameters of total station. Minimum equipment inventory required for a total station survey, Setting up of total station, Setting a back sight, Azimuth mark.</p> <p>5.3 Measurement with total station.</p> <p>5.4 Measuring distances & angles with a total station. Traverse Survey with a total station. Field book recording, Radial shooting, Survey station description by codes, Instrument station entry, Data retrieval, Field generated graphics, Lay out using total station.</p>

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	5.5 Precautions to be taken while using total station. Total survey system error sources and how to avoid them. 5.6 Advantages and disadvantages of a total station.
6	AERIAL SURVEY AND REMOTE SENSING 6.1 Aerial Survey-Introductions, definition, Aerial photograph, leader survey. 6.2 Remote Sensing – Introduction, Electro-Magnetic Energy ,Remote sensing system- Passive system , Active system. 6.3 Applications – mineral, land use / Land cover, Natural Hazards and Environmental engineering system, mitigation of disaster management. 6.4 Introduction to various systems of GIS leica system.

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	Theodolite survey	12	04	10	06	20
2	Contouring	08	02	06	04	12
3	Tacheometry	06	02	04	04	10
4	Simple curves	08	02	06	04	12
5	Total station surveying	08	02	04	04	10
6	Aerial survey and remote sensing	06	04	02	-	06
		48	20	28	22	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/Assignments:

***Note:** For practicals, the batch of 20 students with 2 staff members should be formed.

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	Understanding the components of theodolite and their function, reading the vernier, temporary adjustments of theodolite.	4
2	1	Measurement of horizontal angle by repetition method.	4
3	1	Measurement of vertical angle.	4
4	1	Observation of magnetic bearing of line using theodolite.	2
5	1	Measurement of deflection angle by taking an open traverse of 4-5 sides.	4
6	1	Use of theodolite for extending the straight line.	2

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7	3	To find reduced level and horizontal differences using theodolite as tacheometer.	4
8	3	To find the constants of a given tacheometer.	4
9	4	Setting out simple curve by offset from long chord method.	4
10	4	Setting out simple curve by Rankine's method.	4
11	1	Study and use of 1" Micro optic theodolite for measurement of vertical and horizontal angles.	6
12	5	Determine the geographical parameters using Total Station.	6
13	5	Use total station for measuring horizontal angle, vertical angle.	4
14	5	Use total station for measuring horizontal distance, sloping distance, vertical distance.	6
15	5	Building Layout with total station.	6
Total			64

List of Projects:

Sr. No.	Unit	Project	Approx. Hours
1	2	Carry out Block contouring project for a plot 100mx120m with a block size 10mx10m plot the contours on imperial drawing sheet.	8hrs
2	1	Theodolite survey for a closed traverse (5-6) sides and locating the details of buildings. Plotting the Gale's table and traverse on A1 size imperial drawing sheet.	8 hrs
3	5	Carry out block contouring using total station for a plot of 100x120 meter with block size of 5 m x5m on sloping ground and locate the building layout up to 100 square meter on site. Prepare the contour map and centre line plan on A-1 size imperial sheet.	8 hrs
Total			24

References/ Books:

Sr. No.	Name of Book	Author	Publisher
01	Surveying & Levelling, Vol. I & II,	Kanetkar & Kulkarni	PVG, Pune.
02	Surveying, Vol .I.&II	Dr. B. C. Punmia,	Laxmi Publications, Delhi
03	Text book of Surveying	Hussain & Nagraj,	Chand & Co., Delhi
04	Surveying, Vol. I & II	Dr. K. R. Arora	Standard Book house, Delhi.
05	Fundamentals of Surveying	S. K. Roy	Prentice Hall of India, Delhi.
06	Surveying,	Narinder Singh	Tata McGraw Hill Co., Delhi
07	Surveying, Vol. I & II	S. K. Duggal	Tata McGraw Hill Co., Delhi
08	Surveying & Levelling	N. N. Basak	Tata McGraw Hill Co., Delhi
09	Higher Surveying	Dr. A. M. Chandra	New Age International, Delhi.

Websites for reference:

1. www.iscmapping.com
2. www.webinfolist.com



3. www.surveyofindia.gov.in

4. www.mcnetboy.net

5. www.wikipedia.com

Course Curriculum Development Committee:

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ii. Mrs. VijayaBangale (Lecturer, VJTI, Matunga)


Academic Coordinator


Head of Department
(Civil Engineering)


Principal
Govt. polytechnic Mumbai



Course Name: - Advanced Surveying

Course Code:- CE16302

CO VsPO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	--	3	--	1	--	--	--	--	--	1
CO2	--	3	2	1	--	--	--	1	--	1
CO3	1	3	3	3	1	--	--	1	--	1
CO4	1	3	3	3	1	--	--	1	--	1
CO5	1	3	3	3	1	--	--	1	--	1
CO6	1	3	3	3	1	--	--	1	--	1

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	know various methods for surveying.	--	1	3
CO2	operate advanced survey instruments like micro optic theodolite, digital Theodolite, Total Station.	--	2	3
CO3	carry out traverse survey using theodolite, Total Station	1	2	3
CO4	conduct contour survey.	1	2	3
CO5	find out horizontal and vertical distances with a tacheometer.	--	2	3
CO6	set curves.	1	2	3

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Theodolite survey	CO1, CO2, CO3
2	2	Contouring	CO1, CO4
3	3	Tacheometry	CO1, CO5
4	4	Simple curves	CO1, CO6
5	5	Total station surveying	CO1, CO2, CO3
6	6	Aerial survey and remote sensing	CO1

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Programme : Diploma in Civil Engineering									
Course Code: CE16501				Course Title: Construction Management					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	70	30	--	50*	--	150

External Examination*Rationale:**

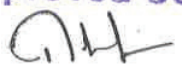
The Civil Engineer has to plan, Manage and execute Civil Engineering works. He has to manage different resources. He should have knowledge of basic management and basic management processes related to Civil engineering field.

Course Outcomes:

CO1	Use management techniques.
CO2	Plan, Monitor and execute various types of construction work
CO3	Manage different resources (Men, Material, Money, Machines)
CO4	Read, draw & update bar charts, CPM and PERT.
CO5	Inspect & control quality of construction.

Course Content Details:

Unit No	Topics / Sub-topics
1	Construction Industry 1.1 Definition and objectives of construction management. 1.2 Importance of construction industry in National Development. 1.3 Special characteristics of Civil engineering works. 1.4 Classification and types of construction works. 1.5 Stakeholders /Agencies associated with construction works. 1.6 Resources of construction industry, Material, Manpower, Money, Machinery. 1.7 Stages in construction – Planning stage, execution stage. 1.8 RERA
2	Scientific Management 2.1 Definition of Scientific Management. 2.2 Necessity Of Scientific management. 2.3 Principles of Management. 2.4 Functions of Management. 2.5 Application of Principles and functions of management to Civil Engineering works.
3	Leadership and human relationship 3.1 Leadership – styles of leadership 3.2 Desirable qualities of leadership for effective Execution of Construction work. 3.3 Functions of leadership 3.4 Human relation, Human needs 3.5 Motivation and its importance and need, functions of Motivation.

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4	Planning and scheduling of construction works 4.1 Levels and stages of planning (pre & post tender) 4.2 Necessity and Importance of planning. 4.3 Planning for owner/client and planning for contractor. 4.4 Site selection and orientation of building. 4.5 Study of drawing, Design, Raw materials Equipment & Human resources required. 4.6 Methods of scheduling, Advantages of scheduling. 4.7 Bar chart. Preparing construction schedule. Advantages & limitations of bar charts. 4.8 Planning and scheduling by Network Construction. Logic. Determine various timings EST, EFT, LST, and LFT. Total Float, Preparation of activity table, Examples on developing Critical path, Introduction to PERT. Terms used. 4.9 Comparison between CPM and PERT. 4.10 Preparing Construction schedule comprising of items of Work and duration. 4.11 Site layout 4.11 Resource Aggregation for labour.
5	Communication and Safety at Site 5.1 Importance of communication at construction site. 1.2 Types of communication. 1.3 Barriers to effective communication. 5.4 Techniques to overcome barriers of effective communication. 5.5 Importance of safety in construction works. 5.6 Common Causes of accidents, types of accidents, Remedial Measures. 5.7 Terms used- Injury frequency rate(IFR), Injury Severity rate (ISR), Injury Index (II), Accident cost. Effective safety Programme.
6	Inspection and quality 8.1 Concept of quality. 8.2 Supervision techniques to establish dimensional control such as line, Level Gradient, Slope, Plumb, Camber. 8.3 Functions of Inspection Department. 8.4 Quality assurance and quality control. 8.5 Sampling Techniques.

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	Construction Industry	04	2	2	04	08
2	Scientific Management	04	2	04	--	06
3	Leadership and human relationship	04	2	02	04	08
4	Planning and scheduling of construction works	18	4	8	16	28
5	Communication and Safety at Site	06	2	2	4	08
6	Inspection and quality	09	--	6	6	12
Total		48	12	24	34	70

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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	An assignment on Importance of construction industry in National Development.	2
2	2	An assignment on Principles and functions of management to Civil Engineering works. Flowchart of stakeholders and their functions.	4
3	3	An assignment on importance of Leadership and human relationship in construction industry.	4
4	4	Planning and scheduling by Network Construction for Engg. Project. Latest software for CM like – primavera, MSP	4
5	5	An assignment on Common Causes of accidents at construction site and effective safety Programme.	6
6	6	Visit to construction site to study 3M of construction management.	6
7	7	Visit to construction site to know functions of inspection department and quality control.	6
Total			32

References Books:

Sr.No.	Name of Book	Author	Publisher
1	M.L.Dhir, Gehlot	Construction Planning & Management	Wiley New Delhi
2	Harpal Singh	Construction Management & Accounts	Tata McGraw Hill
3	B.Sengupta&Guha	Construction management & planning	Tata McGraw Hill
4	R.L.Peurifoy	Construction Planning equipment and methods	McGraw-Hill Co. Ltd.
5	Banga & Sharma	Organization of Management	McGraw-Hill Co. Ltd.

Course Curriculum Development Committee:

a. **Internal Faculty**


D.K.Fad

b. **External Faculty**

N G Waykole

Lecture in Civil Engg

G P Pune


Academic Coordinator
(Dr. R. A. P. Adhi)


Head of Department
(Civil Engineering)


Principal
Govt. polytechnic Mumbai

Course Name: -Construction Management

Course Code: -CE16501

CO Vs PO matrix

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

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Use management techniques.	2	2	1
CO2	Plan, Monitor and execute various types of construction work	2	3	1
CO3	Manage different resources (Men, Material, Money, Machines)	2	2	1
CO4	Read, draw & update bar charts, CPM and PERT.	2	2	1
CO5	Inspect & control quality of construction.	2	3	1

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Construction Industry	1,2,3,4,5
2	2	Scientific Management	1,3
3	3	Leadership and human relationship	2,3
4	4	Planning and scheduling of construction works	2,3,4
5	5	Communication and Safety at Site	3,5
6	6	Inspection and quality	2,5

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Programme : Diploma in Civil Engineering									
Course Code: CE16206				Course Title: Railway and Bridge Engineering					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	-	3	70	30	-	-	-	100

*External Examiner

Rationale:

Railway is important mode of surface transportation. Railways are economic for the long distance transportation of passengers and freight on the land. India has the second largest Railway network in the world. At present in the India, the share of goods transportation in railway is reduced than the roadways. There is a very good scope of developing high speed trains and special corridors for freight transportation in India. Bridges and Tunnels are essential to provide safe and economic passage over/through obstructions to railway or road corridor. The study of this subject provides necessary knowledge of railway track, its component parts, geometric design, points and crossings, stations and yards, signaling and control system, maintenance, modern development and safety in railways. It also provides knowledge of types of bridges, bridge super structure and sub structure, loads acting on bridges, bridge hydrology, bridge maintenance.

Course Outcomes: Student should be able to-

CO1	Know about railway track components, their materials, size, function and importance.
CO2	Carry out geometric design of railway track.
CO3	Know about requirements of railway track for high speed trains, safety aspects and maintenance.
CO4	Know components of bridges, requirement and function of the components, hydrological details.
CO5	Understand about different types of bridges.
CO6	Develop the skill regarding inspection and maintenance of bridges.

Course Content Details:

Unit No	Topics / Sub-topics
1	Component Parts of Railway 1.1 Factors governing rail alignment and gradient. 1.2 Railway gauges- broad, meter and narrow. Zones of Indian Railways 1.3 Rails- function and rail types. 1.4 Sleepers- functions and types (wooden sleepers, steel sleepers, prestressed concrete sleepers and their advantages). 1.5 Ballast- Functions and different types with their properties, relative merit and demerits. 1.6 Rail joints- requirement of rail joints, types and advantages. 1.7 Fixtures and fastening- bearing plates, spikes, bolts, keys and spring.
2	Geometric Design of Railway 2.1 Coning of wheels and canting of rails, super elevation on curves, grade compensation. 2.2 Creep of rails, definition, and indication of creep, effects of creep and prevention of



2	Geometric Design of Railway 2.1 Coning of wheels and canting of rails, super elevation on curves, grade compensation. 2.2 Creep of rails, definition, and indication of creep, effects of creep and prevention of creep. 2.3 Cross section, standard cross section of broad gauge –single and double line in cutting and embankment. 2.4 General idea of laying of railway track and different methods of laying, maintenance of railway track
3	Station and Yards 3.1 Factors affecting selection of site for station 3.2 Types of stations - wayside, crossing, junction, terminal 3.3 Station yards-Types such as Passenger Yard, Goods Yard, Locomotive Yard, Marshalling Yard and their requirements 3.4 Function of Passenger Yard, Goods Yard, Locomotive Yard and Marshall Yard
4	Component Parts of Bridges 4.1 Factors affecting selection of bridge site. 4.2 Component parts of bridges, types and functions of foundation, piers, abutment, bearing, wing walls, approaches, bridge floor, Expansion Joints 4.3 Bridge Hydraulic: Data to be collected in general, afflux, cut water, ease water, weep holes, free board, scour depth (only definitions)
5	Types of Bridges 5.1 Classification of bridge according to site, functions, structural form, span and material. 5.2 Types- Cantilever, RCC Girder Bridge, prestressed girder bridge, suspension bridge, causeways and culverts, cable stayed bridge (sketches and description)
6	Inspection and Maintenance of Bridges 6.1 Importance of inspection. 6.2 Routine and special maintenance. 6.3 Checklist for maintenance.

NOTE: - A visit to railway station and bridge site should be arranged.

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	Component parts of railway	12	4	8	4	16
2	Geometric design of railway	9	4	8	4	16
3	Station and yards	8	4	6	2	12
4	Component parts of bridges	8	2	4	2	8
5	Types of bridges	7	2	4	2	8
6	Inspection and maintenance of bridges	4	2	3	5	10
Total		48	8	33	19	70

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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.

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Roads, Railway and Bridges	Birdi and Ahuja	
2	Bridge Engineering	Bindra S.I.	Dhanpat Rai and Sons New Delhi

Course Curriculum Development Committee:

a. **Internal Faculty**

i. Ms. M. S. Sorde

b. **External Faculty**

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

Academic Coordinator

Head of Department
(Civil Engineering)

Principal
Govt. Polytechnic Mumbai



Course Name: - Railway and Bridge Engineering

Course Code: - CE16205

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	1	-	-	-	-	-	-	-	-
CO2	1	2	1	1	-	1	-	1	1	1
CO3	-	1	1	1	1	-	1	1	1	1
CO4	-	1	-	-	-	-	-	-	-	-
CO5	-	1	-	1	1	1	1	-	-	1
CO6	1	2	1	1	1	2	1	1	1	1

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Know about railway track components, their materials, size, function and importance.	1	-	-
CO2	Carry out geometric design of railway track.	2	1	-
CO3	Know about requirements of railway track for high speed trains, safety aspects and maintenance.	1	-	1
CO4	Know components of bridges, requirement and function of the components, hydrological details.	1	-	-
CO5	Understand about different types of bridges.	1	1	-
CO6	Develop the skill regarding inspection and maintenance of bridges.	2	1	1

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Component parts of railway	CO1
2	2	Geometric design of railway	CO2
3	3	Station and yards	CO3
4	4	Component Parts of Bridges	CO4
5	5	Types of bridges	CO5
6	6	Inspection and maintenance of bridges	CO6

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Programme : Diploma in Civil Engineering									
Course Code: CE16307				Course Title: Sanitary Engineering					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	--	2	5	70	30	--	50*	--	150

*External Examiner

Rationale:-

Some part of used water and solid wastes become sewage whose safe disposal is essential from environmental point of view. If solid and liquid wastes are not disposed off in scientific and hygienic manner, the environmental balance gets disturbed which ultimately leads to health hazards. Sanitary Engineering, being an essential part of Civil Engineering has been included in Civil Engineering Course.

Course Outcomes: Student should be able to:

CO1	Know the necessity of Sanitation and Sewage treatment plant.
CO2	Analyse the characteristics of sewage.
CO3	Understand the Construction and operation of Waste water treatment plant.
CO4	Suggest the suitable treatment to be given to waste water based on its characteristics.
CO5	Know the various methods of disposal of sewage effluents and dewatered sludge.

Course Content Details:

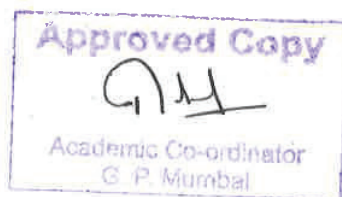
Unit No	Topics / Sub-topics
1	Introduction 1.1 Necessity of Building Sanitation. 1.2 Need of treating the waste prior to disposal. 1.3 Terms: sewage, sludge, refuse, garbage, rubbish, storm water sanitary sewage, domestic sewage.
2	Building Sanitation 2.1 Terms: water pipe, rainwater pipe, Antisiphonage pipe, waste pipe, drains. 2.2 Building sanitary fitting, water closet, flushing cistern, wash basin, sinks, urinals, Traps-Nhani trap, Gully trap P, Q, S Traps, their function, use and location. 2.3 Systems of plumbing: Single stack system, one pipe system, two pipe system, choice of system. 2.4 Principles governing design of building drainage, layout plan for building sanitary fittings (Drainage Plan) Minimum size of drains and their slopes, inspection and junction chambers, their necessity, location, size and shape. 2.5 Rainwater and sewage collection systems.
3	Types of Sewerage System 3.1 Systems of sewerage- separate system, combined system, partially separate system, comparison and their suitability.

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	<p>3.2 Types of sewers- Shapes and materials used, their suitability and selection.</p> <p>3.3 Design of sewers, quantity of sewage, self cleaning velocity, gradient of sewers, Size of sewers, use of tables in design of sewers.</p> <p>3.4 Laying of sewers.</p> <p>3.5 Testing of sewers.</p> <p>3.6 Maintenance of sewers. Sewer Appurtenances</p> <p>3.7 Man hole, component parts, location, spacing and construction Drop man holes.</p> <p>3.8 Sewer inlets- street inlets.</p>
4	<p>Characteristics of waste</p> <p>4.1 Characteristics of solid wastes: Common constituents of dry refuse.</p> <p>4.2 Characteristics of sewage: (a) Physical : Turbidity, Colour, Odour, Temperature (b) Chemical : Total solids, Suspended solids, Settleable solids, PH value, Chloride content, N₂ content, Presence of fats, Grease & oils, Sulphides, Sulphates Dissolved oxygen, B.O.D, C.O.D.</p> <p>4.3 BIS Standards of solid wastes and sewage.</p>
5	<p>Treatment of waste</p> <p>5.1 Flow diagram of sewage treatment plant.</p> <p>5.2 Preliminary treatment: screens, grit chambers.</p> <p>5.3 Primary treatment: - sedimentation - principle, types of Sedimentation tanks: rectangular, circular. Constructional details of sedimentation tanks.</p> <p>5.4 Secondary treatment: - (a) trickling filters - construction and operation, types of trickling filters: standard and high rate filters, recirculation of treated sewage and its use in high rate trickling filters.</p> <p>(b) Secondary treatment through activated sludge process: various operations involved and units of an activated sludge plant, bulking and foaming in an activated sludge plant, sludge recycle.</p> <p>5.5 Chlorination of sewage.</p>
6.	<p>Disposal of waste</p> <p>6.1 Disposal of dewatered sludge: disposal by dumping into the sea, disposal by burial into the trenches, disposal by incineration.</p> <p>6.2 Other treatment units and disposals, aerated lagoons.</p> <p>6.3 Oxidation pond - principle and working.</p> <p>6.4 Disposal of sewage effluents-</p> <p>6.5.1 a) Disposal by dilution - river, sea: standards of dilution for discharge of waste waters into rivers and sea.</p> <p>6.5.2 b) Disposal on land - disposal of sewage effluents on land for irrigation, quality</p> <p>6.6 Standards for waste water effluents to be discharged on land for irrigation.</p> <p>6.7 Introduction to Industrial Waste Treatment.</p> <p>6.8 Introduction to Environmental Impact Assessment.</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	03	04	02	00	06
2	Building Sanitation	09	06	04	02	12
3	Types of Sewerage System	07	00	04	06	10
4	Characteristics of waste	08	02	04	06	12
5	Treatment of waste	12	02	04	12	18
6	Disposal of waste	09	02	04	06	12
Total		48	16	22	32	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/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	04	To determine pH of given Sewage sample.	02
2	04	To determine the turbidity of the given sample of sewage water.	02
3	04	To determine suspended solids, dissolved solids and total solids of sewage sample.	04
4	02	Estimation of sanitary fittings for a building.(if possible same building referred in water supply Engg term work).	06
5	02	Writing a report on Maintenance of sanitary units.	02
6	--	Study and write an Assignment on Rural sewage treatment schemes.	08
7	--	Visit to a sewage treatment plant & submitting a report on the same.	08
Total			32

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Sewage Disposal and Air Pollution Engineering	S. K. Garg	Khanna Publishers
2	Waste Water Engineering	Metcalf & Eddy	McGraw Hill Book Company, New York
3	Water supply and Sanitary Engineering	S.C.Rangwala	Charotkar Publishing Hou
4	CPHEEO Manual on Water Supply and Treatment	Expert Committee, Govt. of India	Ministry of Urban Development, Govt. of India
5	Water Supply and Sewerage	Steel & Terrence	McGraw Hill Book Company, New York

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Academic Co-ordinator
G. P. Murnbai

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Course Curriculum Development Committee:

a. **Internal Faculty**

i. Smt.M.K.Anserwadekar



b. **External Faculty**

1. Mr. K. V. Kelgendre (Sr. Lecturer, K.J.S.Polytechnic, Vidya Vihar)



Academic Coordinator



Head of Department
(Civil Engineering)



Principal

Govt. polytechnic Mumbai



Course Name: - Sanitary 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	-	-	-	-	-	-	-

CO Vs PSO matrix

	CO	PSO1	PSO2	PSO3	PSO4
CO1	Know the necessity of Sanitation and Sewage treatment plant.	-	-	3	-
CO2	Analyse the characteristics of sewage	-	2	-	1
CO3	Understand the Construction and operation of Waste water treatment plant	2	2	2	3
CO4	Suggest the suitable treatment to be given to waste water based on its characteristics	-	2	3	3
CO5	Know the various methods of disposal of sewage effluents and dewatered sludge	-	2	3	3

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	CO1
2	2	Building Sanitation	CO1
3	3	Types of Sewerage System	CO3
4	4	Characteristics of waste	CO2
5	5	Treatment of waste	CO4
6	6	Disposal of waste	CO5

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Programme : Diploma in Civil Engineering									
Course Code: CE16401				Course Title: Repairs and rehabilitation of buildings					
Compulsory / Optional: Optional									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	--	--	--	50	50	100

*External Examiner

Rationale:

In these days with the advent of advanced analysis and design techniques, the safety margin has decreased considering slender sections of structural elements than before. This economic choice has increased the importance of vigilant supervision in maintenance, accurate workmanship in maintenance and good management for safety and serviceability of the structures more than before.

In a well-managed building, maintenance work in fact should continue throughout the year under an adequate preventive maintenance policy. "The prevention is better than cure" is an axiom well applicable to maintenance of building also.

Course Outcomes: Student should be able to-

CO1	Understand the need of repairs.
CO2	Know the reasons of building collapse.
CO3	Understand various types of defects in buildings.
CO4	Develop the skill of correct use of materials for effective maintenance and related repair works.
CO5	Understand various types of defects in reinforcement.
CO6	Develop the skill of maintenance of water supply and sanitary systems.

Course Content Details:

Unit No	Topics / Sub-topics
1	INTRODUCTION 1.1 Meaning of – i) Repairs ii) Rehabilitation. 1.2 Necessity of - i) Repairs ii) Rehabilitation. 1.3 Useful life of building and factors on which life of building depends. 1.4 How to check necessity for repairs, steps to initiate repairs - for a housing society. 1.5 service life and serviceability
2	REASONS FOR BUILDING COLLAPSES 2.1 Factors to be considered in repairs, necessity of structural appraisal by experienced consultant for optimization of cost. 2.2 Scope of structural consultant, structural consultant appraisal reports - its contents (Data collection). Types of Structural audit, purposes and its compliance. Government regulations-DCR. 2.3 Identification of distresses and their causes. 2.4 Field methods to test structural stability of RCC building - procedure, inference of

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	results.
3	TYPES OF DEFECTS /DAMAGES IN STRUCTURES 3.1 Macro defects, Micro defects. 3.2 Poor structural design and specifications. 3.3 Proper maintenance, environmental problems and aging effects. 3.4 Indiscriminate additions and alteration. 3.5 Causes that lead to repairs. 3.6 Appraisal process and report check list for inspection. 3.7 Annual, routine, remedial maintenance. 3.8 Basics of cracking problems- 3.8.1 Structural cracks, non structural cracks, crack width, critical crack width. 3.8.2 Control of cracking, types of cracks. 3.8.3 Methods of crack identification.
4	CONSTRUCTION CHEMICALS 4.1 List of construction chemicals available/ suitable for various works. 4.2 Specifications, rates and methods of use under various conditions 4.3 Polymer Modified Concrete for structural repairs, micro concrete, fibre wrapping techniques, jacketing, protective coatings, bonding agents with mode of application, Retrofitting, etc. 4.4 Identification of waterproofing problems in w/c, bath, terrace, joints etc. and suggesting remedial measures for each. 4.5 Suggesting approximate construction chemicals for type of waterproofing, surface preparation and testing of waterproofing.
5	REINFORCEMENT IN STRUCTURAL MEMBERS 5.1 Reasons for rusting of structural steel. 5.2 Re-strengthening the rust steel - methods. 5.3 Circumstances under which RCC structure has to be dismantled completed and reconstructed, Problems in reconstruction TDR etc. 5.4 Procedural requirements for reconstruction of old buildings.
6	WATER SUPPLY AND SANITARY SYSTEMS 6.1 Maintenance survey for water supply and sanitary system. 6.2 Common repairs and adjustments in sanitary fitments, maintenance of water tanks, server lines in septic tanks, avoiding accidents in bathrooms.

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Suggested Specifications Table with Hours and Marks (Oral):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	4	2	2	0	4
2	Reasons for building collapses	6	2	4	2	8
3	Types of defects /damages in structures	16	4	8	4	16
4	Construction chemicals	8	0	4	4	8
5	Reinforcement in structural members	8	0	4	4	8
6	Water supply and sanitary systems	6	0	4	2	6
Total		48	8	26	16	50

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	6	Market survey of various materials used in repairs of civil Engineering structures & method of application.	08
2	All	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
3	2,3,4, 7,8	Visit and inspect the site where defects / damages are occurs and classify the types of defects / damages and suggest the method of repairing.(reference structural audit)	08
4	All	Report writing on the site visit.	08
Total			32

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Maintenance of Buildings	A. C. Panchdhari	
2	Maintenance of RCC Structures	J. J. Shah	
3	Maintenance of Structures	-	CPWD Manual
4	Maintenance of Structures	Manual of ACC on the topic	
5	Maintenance of Structures	Ambuja technical series	
6	Maintenance of Structures	Sunanda specialty coatings	

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Academic Co-ordinator
G. P. Mumbai

Course Curriculum Development Committee:

a. Internal Faculty

Mrs. S. Sorde

i. Mrs. M. S. Sorde

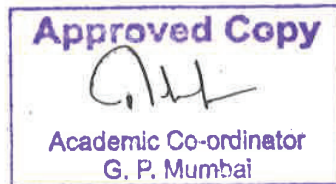
b. External Faculty

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


Academic Coordinator


Head of Department
(Civil Engineering)


Principal
Govt. Polytechnic Mumbai



Course Name: - Repairs and rehabilitation of buildings Course Code: - CE16401

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	1	-	-	1	1	1	-	-	-
CO2	1	1	-	-	1	1	1	-	-	-
CO3	-	2	-	-	1	1	-	1	1	1
CO4	-	2	1	1	-	1	-	2	1	1
CO5	-	2	-	-	1	1	-	1	1	1
CO6	-	2	-	1	1	1	1	-	-	1

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Understand the need of repairs.	-	1	2
CO2	Know the reasons of building collapse.	-	1	2
CO3	Understand various types of defects in buildings.	1	2	2
CO4	Develop the skill of correct use of materials for effective maintenance and related repair works.	-	1	1
CO5	Understand various types of defects in reinforcement.	1	2	2
CO6	Develop the skill of maintenance of water supply and sanitary systems.	1	-	1

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	CO1
2	2	Reasons for building collapses	CO2
3	3	Types of defects /damages in structures	CO3
4	4	Construction chemicals	CO4
5	5	Reinforcement in structural members	CO5
6	6	Water supply and sanitary systems	CO6

Programme : Diploma in Civil Engineering									
Course Code: CE16402				Course Title: Plumbing and Sanitary Services					
Compulsory / Optional: Optional									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	-	2	05	-	-	-	50	50	100

*External Examiner

Rationale:

Plumbing though crucial but remained as neglected subject. As a result, there is a great demand to well trained Plumbing Professionals in the building industry. Plumbing service is necessary for proper water supply & efficient drainage facility in a building. As buildings are becoming more complex and more modern plumbing materials and systems are available in India, it is necessary to include the same in the Civil Engineering curriculum. Plumbing services are important component of Civil Engineering. Internal plumbing contributes to around 15% of the construction cost. Indian Plumbing Association (IPA) has adopted, reviewed and revised the Uniform Plumbing Code of International association of Plumbing and Mechanical officials to suit Indian practices, customs and Laws. The code is published as Uniform Plumbing Code – 2008 India (UPC1). Need of proper use of Plumbing code must be code based education and training in Plumbing will have better job opportunities and improved income. The formal education in Plumbing will improve the plumbing system design and installation standards, thereby ensuring health and safety of people, structure and environment.

Course Outcomes: Student should be able to-

CO1	Understand proper coordination of plumbing work.
CO2	Interpret plumbing drawings.
CO3	Select proper plumbing materials & systems.
CO4	Supervise plumbing installation as per UPC - 2008.

Course Content Details:

Unit No	Topics / Sub-topics
1	Introduction to Codes, Architectural and Structural Coordination 1.1 Importance of plumbing, history of ancient plumbing, model code- roles, scope, purpose and use of codes and standards in building industry, approvals, AHJ(Authority Having Jurisdiction) general regulations, minimum standards, labelling, alternative materials, sewers required, damage to drainage system, improper location, workmanship, prohibited fitting and practices, engineered systems, water conservations, protection of pipes and structures, water proofing, rat proofing. 1.2 Architectural and structural coordination (not included in UPC1 and ITM) Architectural and Structural provisions for Plumbing systems, coordination required during the planning stage, various agencies involved and their roles, policy decisions, schematic alternatives, planning spaces for plumbing systems, water tanks, pump room, centralized hot water system, toilet locations, toilet planning, plumbing shafts, basement and terraces planning. Structural parameters, sunken toilets, location of columns and beams, post tensioned slabs, importance of ledge walls, waterproofing. Local Municipal laws, domestic and fire static water requirements, water sources, prohibited fittings and systems.

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2	Plumbing Terminology 2.1 Plumber, Plumbing fixture: accessible / readily accessible, aerated fitting, bathroom group, carrier, flood level rim, floor sink, flush tanks, lavatories, macerating toilet system, plumbing appliances, flush meter valve. 2.2 Traps, indirect waste, vent blow off, development length, parts of vent system - stack vent, branch vent, continuous vent, individual vent, dirty arm, FOG (Fat, Oil and Grease) disposal system receptors, and slip joint. 2.3 Drainage - adapter fitting, adjusted roof area, AAV (Air Admittance Valve), air break, air gap, area drain, bell and spigot joint, building drain, branch, DFU, grease interceptor, roof drain, smoke test, stack, joints. 2.4 Water Supply: Angle valve, anti- scald valve, check valve, gate valve, PRE (Pressure Relief Valve), back flow, bypass, cross connection, ferrule, gray water, joints..
3	Plumbing Fixtures and Fixture Fittings 3.1 Different types of plumbing fixtures, shapes/ sizes, capacities, situation and where used. 3.2 Ablution Fixtures - Wash basin, sinks (kitchen sinks cleaner sinks) bath tub, flushing cistern, drinking fountain. Soil Fixtures - water closets, urinal, mop sink, bidets, and slop sinks plumbing fittings for Ablution fixtures and Soil fixtures. 3.3 Water Conserving Fixtures- Water cooler, cloth washer, hot and cold water system, display fountain. Installation standard for plumbing fixtures, dimension in plan and elevation.
4	Traps, Interceptors, Indirect Waste and Vents 4.1 Definition, function, Requirement of good trap, trap arms, Development length, trap seals, venting to traps, trap primers, Classification of traps, Prohibited traps. 4.2 System of plumbing for building drainage-Two pipe system, one pipe system, waste receptors, dish washers, drinking fountain. 4.3 Vent- purpose of venting, trap seal protection, materials, vent connection, flood rim level, vent stacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, vent sizing.
5	Sanitary drainage and storm drain 5.1 Preamble on single and two pipe systems, different pipe materials and jointing methods, special joints, hangers, and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below inverted level, suds relief, building sewers, trenching, testing sumps and pumps, sizing of horizontal and vertical pipe. 5.2 Storms drain required, prohibited connections, subsoil drains, sub drain, gutters/ channels/scuppers, roof drains, strainers, leaders, conductors and connections, collect/ capture storm water, discharging storm water.
6	Water Supply, Gray and Reclaimed Water 6.1 Preamble on municipal water, sources of water, potable and non potable water, reclaimed water, water storage , hot and cold water distribution system, backflow protection, air gap, cross connection control, pipe materials and jointing method, alternative materials, hangers, and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure control, unions, thermal expansion, types of valves, installation and testing, disinfection, protection of underground pipes, colour codes and arrow marking, introduction to wsfu. 6.2 Definition of gray water, approvals, specification, and drawing, safety, total gray water discharge, holding tanks, valves and piping, reclaimed water system, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses, Rain water harvesting in plumbing systems.

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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 to Codes, Architectural and Structural Coordination.	08	04	04	04	12
2	Plumbing Terminology	10	04	04	06	14
3	Plumbing Fixtures and Fixture Fittings	06	04	04		08
4	Traps, Interceptors, Indirect Waste and Vents.	06	02	04	04	10
5	Sanitary drainage and storm drain.	08	04	04	04	12
6	Water Supply, Gray and Reclaimed Water	10	02	06	06	14
TOTAL		48	20	26	24	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/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	3	Draw sketches of installation details of plumbing fixtures and fittings in plan, elevation and section; with standard dimensions (Minimum 4)	04
2	1	Interpretation of sample plumbing drawings for multistoried building	02
3	3	Draw toilet layouts, plans, elevations and sections of selected case. Give dimensions	04
4	5	Prepare layout of drain pipes & chambers for carrying sewage to septic tank & NMC sewer line for building visited in practical no 3	04
5	--	Visit any plumbing site and submit a report on observation on plumbing system, architectural and structural provisions, pipe materials work method, safety and recommendations based on the provisions of UPC-I and ITM (Visit to COEP plumbing laboratory)	08
6	---	Seminar: Students can select any topic from contents by referring codes, text book, professional magazines, technical papers published and websites of manufacturers and make a seminar presentation in 10 minutes using power point. Weightage is assigned for contents and presentation skills. (Students can work in a group of two.)	08
7		Study of Surface drainage of complex (residential & industrial) rainwater harvesting	02
Total			32

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References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Plumbing Engineering	S. M. Patil	Seema Publication, Mumbai.
2	Plumbing Design and Practice	S. G. Deolalikar	Tata McGraw-Hill
3	Plumbing Technology Design and Practice	Lee Smith	Delmar Publication
5	Practical Plumbing Design Guide	James C. Church	Mcgraw-Hill (T)
6	Plumbing and Illustrated Guide to the Plumbing codes.	Michal Casey, Douglas Hannes, Redwood Kardon	
7.	2008 Uniform plumbing code – India (UPC-I)		


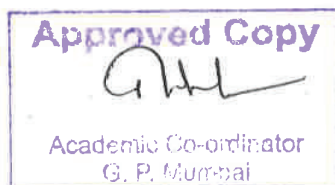
Course Curriculum Development Committee:**a. Internal Faculty**

Smt. M .K. Anserwadekar


b. External Faculty

Mrs. Vijaya Bangale (SL Lecturer, VJTI, Matunga)


Academic Co-ordinator

**Head of Department
(Civil Engineering)**

**Principal
Govt. polytechnic Mumbai**


Course Name: - Plumbing and Sanitary services

Course Code: - CE16402

CO Vs PO matrix

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

CO Vs PSO matrix

CO/PSOs		PSO1	PSO2	PSO3
CO1	Understand proper coordination of plumbing work	2	3	1
CO2	Interpret plumbing drawings.	3	3	-
CO3	Select proper plumbing materials & systems	1	2	-
CO4	Supervise plumbing installation as per UPC - 2008.	2	3	1

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction to Codes, Architectural and Structural Coordination.	CO1, CO4
2	2	Plumbing Terminology	CO1, CO2, CO4
3	3	Plumbing Fixtures and Fixture Fittings	CO1, CO2, CO3
4	4	Traps, Interceptors, Indirect Waste and Vents.	CO1, CO2, CO3
5	5	Sanitary drainage and storm drain.	CO2, CO3
6	6	Water Supply, Gray and Reclaimed Water.	CO2, CO3

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Programme : Diploma in Civil Engineering									
Course Code: CE16403				Course Title: Material Management					
Compulsory / Optional: Optional									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	02	05	--	--	--	50	50	100

*External Examiner

Rationale:

This course deals with management of materials. Smooth running of any industry depends upon the interdepartmental relations and planning for execution of work jointly. Efficiency of production department also depends upon the availability of raw material of required quality and quantity. Therefore there should be proper co-ordination between production department, production planning, stores department and purchase department. Incorrect materials planning can also lead to higher inventories & high cost.

Course Objectives:

CO1	Perform functions of Materials Management.
CO2	Manage inventory of materials by various inventory management techniques.
CO3	Buy materials by following particular procedure and price forecasting.
CO4	Prepare requisition of materials along with specifications.
CO5	Materials management using latest techniques.
CO6	Negotiation using different techniques and Management of obsolete, surplus and scrap materials.

Course Content Details:

Unit No	Topics / Sub-topics	
1	Importance of Materials Management	
	1.1	Growing importance of Materials Management
	1.2	Scope of Materials Management
	1.3	Objectives and functions of Materials Management
	1.4	Organizing for Materials Management
	1.5	Introduction to Materials planning
	1.6	Importance of specifications in Materials Management
2	Inventory Management	
	2.1	Selective control – ABC Analysis – Purpose and objectives of ABC Analysis Mechanics
	2.2	Advantages of ABC Analysis.
	2.3	Limitations of ABC Analysis.
	2.4	Order point – Lead Time, safety stock, Re-order point, standard order, and Economic order.
	2.5	Quantity (EOQ), Graphical & Analytical Method.
3	Buying procedure	
	3.1	Sourcing, Buy or lease.
	3.2	Purchase systems.

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	3.3	Problems in relations with supplier.
	3.4	Value Analysis → Definition & scope.
	3.5	Selection of products for value analysis.
	3.6	Value analysis framework.
	3.7	Implementation & methodology.
	3.8	Ethics in purchasing.
4	Inventory control & Cost reduction techniques	
	4.1	Inventory turns ratios.
	4.2	Standardization- need & importance.
	4.3	Codification- concept, benefits.
	4.4	Value engineering & Value analysis- concept & process.
5	Latest Techniques in Materials Management	
	5.1	Just in Time (JIT), zero inventory concept.
	5.2	Integrated computerized management systems in Materials Management.
	5.3	Introduction to SAP.
6	Management of obsolete Surplus and Scrap material	
	6.1	Definitions, Reasons for generation and accumulation of obsolete Surplus and scrap, Survey committee, presale preparations, sale, auction, sale by tender.
	6.2	Interlinking between material management and construction planning

Suggested Specifications Table with Hours and Marks (Theory):

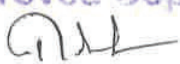
Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Importance of Materials Management	10	04	04	06	14
2	Inventory Management	10	02	04	08	14
3	Buying procedure	10	04	04	06	14
4	Inventory control & Cost reduction techniques	06	02	04	04	10
5	Latest Techniques in Materials Management	05	02	02	04	08
6	Management of obsolete Surplus and Scrap material	07	02	04	04	10
Total		48	16	22	32	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/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	Functions of Materials Management, Importance of specifications in material management.	06
2	2	ABC Analysis – Purpose and objectives of ABC Analysis, Simple numericals on Economic Order Quantity (EOQ).	08

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3	3	Purchase systems, Ethics in purchasing.	04
4	4	Standardization- need & importance, Codification.	04
5	5	Just in Time (JIT) zero inventory concept.	02
6	6	Reasons for generation and accumulation of obsolete Surplus and scrap.	04
7	7	Introduction to material management software	04
Total			32

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Materials Management	Ammer Deans S.	R.D. Irwin Hllions
2	Materials Management An Integrated approach	P. Gopalkrishan and M. Sundaresan	Prentice – Hall of India Pvt. Ltd. New Delhi.
3	An integrated concept of Materials Management	M.M. Shah	Tata McGraw Hill Publisher Co. Ltd. New Delhi

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

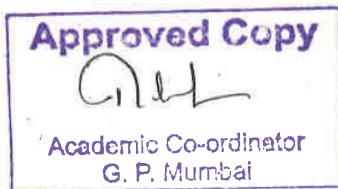
Mr. D. K. Fad


b. External Faculty

Mr. S B Jadhav
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Academic Coordinator

Head of Department
 (Civil Engineering)


Principal
 Govt. polytechnic Mumbai


Course Name: Material Management

Course Code: CE16403

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	-	1	2	1	2	1
CO2	2	2	2	1	-	-	1	-	2	1
CO3	2	1	2	2	-	1	1	1	2	1
CO4	2	2	2	2	-	-	-	2	1	-
CO5	1	2	1	3	-	-	-	-	2	1
CO6	1	2	1	2	1	-	1	1	2	1

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Perform functions of Materials Management.	2	1	2
CO2	Manage inventory of materials by various inventory management techniques.	1	2	2
CO3	Buy materials by following particular procedure and price forecasting.	1	2	2
CO4	Materials management using latest techniques.	1	2	2
CO5	Prepare requisition of materials along with specifications.	1	2	2
CO6	Negotiation using different techniques and Management of obsolete, surplus and scrap materials.	1	2	2

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Importance of Materials Management	1,3
2	2	Inventory Management	1,3,4
3	3	Buying procedure	2,4,5
4	4	Inventory control & Cost reduction techniques	1,2,3,5
5	5	Latest Techniques in Materials Management	1,2,3,4,5
6	6	Management of obsolete Surplus and Scrap material	1,5

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Programme : Diploma in Civil Engineering									
Course Code: CE16404				Course Title: Safety and quality control					
Compulsory / Optional: Optional									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	2	5	-	-	-	50	50	100

Rationale:

Success of any industry depends on quality of their products. With the changing scenario of industries are adapting system standardization & concept of quality is changed to quality is not to be inspected but to be built in, quality is not the responsibility of any one department and evaluation of the quality control programmed of that industry. The subject imparts knowledge so that student understands & performs his nature of job related to quality control effectively.

This subject deals with the scope of safety in construction operations as well as in the demolition operation. It also deals with importance of safety with regards to storage, stocking and handling of materials of construction.

Course Outcomes: Student should be able to-

CO1	Understand safety measures in construction operation and demolition operation.
CO2	Study statutory obligations about safety and accident prevention.
CO3	Recognize quality characteristic of product.
CO4	Analyze the aspects of quality such as quality in design, quality in conformance and quality in performance.

Course Content Details:

Unit No	Topics / Sub-topics
1	Meaning and scope of safety in construction: 1.1 Basic philosophy peculiarities and parameters governing the safety in construction such as site planning and layout, safe access, good house-keeping. 1.2 Accidents and hazards- their causes and effects.
2	Safety in construction operation: 2.1 Safety in the use of construction machineries. 2.2 Movement of construction machinery- heavy/ long items, earth moving equipments. Railway wagons, motor trucks, materials, vehicles, etc. 2.3 Safety in prevention & protection at work site including the collapsing of the structure. 2.4 Safety in use of explosives- open cast machinery, quarrying. 2.5 Project management and safety in construction- Introduction, manpower utilization, utilization of material, equipment and tools. Temporary installation and structures. 2.6 Special precautions for works of engineering, construction like distilling/fractioning columns, chimney, silos-oil and gas installation, transmission/communication lines, cable car installation, air fields.

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	2.7 Tolerance
3	Safety in Demolition operation: 3.1 Planning and permit. 3.2 Planning the sequence of demolition. 3.3 Safety precaution to be taken for and during demolition carrying out repairs, additions and alterations.
4	4.1 Safety with regard to storage, stocking and handling of materials of construction: -Health hazards while handling construction materials and chemicals; safety measures with respect to handling of materials such as cement, limes, aggregates, flyash, timber, steel, glass, paint, varnishes, petroleum products, chemicals used in construction, plastic & PVC materials, etc. 4.2 Accident prevention: - Occupational health hazards, occupational diseases relating to construction work. Safety in the use and maintenance of personal protective equipments specific to construction industry, health and welfare measures, emergency medical treatment of injuries and rehabilitation at construction site.
5	Introduction to statutory obligations:- 5.1 Regulations of employment and condition of work in construction. 5.2 Construction safety law, IS and NB codes, local building and development. 5.3 Accident investigation and reporting, structure stability and precautions to be taken.
6	Quality control: 8.1 Meaning of Quality control, difference between quality of design, quality of conformance (QC) and Quality of performance (QA), concept of reliability and maintainability. 8.2 Quality policy, Quality objectives, economics of Quality, cost and value of Quality specification. 8.3 Quality control, assurance, checklist, standard procedures and Quality audit, maintenance. 8.4 Vendor rating, organization setup for Quality management. 8.5 Difference between Quality control and inspection. 8.6 Inspection objectives and types. 8.7 Quality compliance. 8.8 New trends in Quality management: 1. Quality circles- basic concept, purpose & functioning. 2. Concept of TQM, concept of KAIZEN, concept of PLKA YOKE 3. ISO 9000, various aspects of certification, application & advantages.

NOTE: - Visit and case study of different structures- enabling, erection, construction, occupancy, during repairs, demolition.

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Suggested Specifications Table with Hours and Marks (Oral):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Meaning and scope of safety in construction	4	2	2	0	4
2	Safety in construction operation	12	0	4	6	10
3	Safety in Demolition operation	4	0	2	4	6
4	Safety with regard to storage, stocking and handling of materials of construction	11	0	4	8	12
6	Introduction to statutory obligations	4	0	2	2	4
7	Quality control	13	4	6	4	16
Total		48	06	20	24	50

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.

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Construction Safety	Jimmie W. Hinze	Prentice Hall Central Labour Institute Sion
2	Structural Renovation Building	Mcgraw Hill Publications	Alexander Newoman
3	Design and renovation	W. W. Norton & Company	Donald Friedman
4	Metrology and Quality Control	R. K. Jain	
5	Quality Control	M. S. Mahajan	

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

M.S. Sorde
i. Ms. M. S. Sorde

b. External Faculty

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



Government Polytechnic, Mumbai

Civil Engineering Department

Academic Coordinator

Head of Department
(Civil Engineering)

Principal

Govt. Polytechnic Mumbai

Course Name: - Safety and quality control

Course Code: - CE16404

CO Vs PO matrix

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

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Understand safety measures in construction operation and demolition operation.	-	3	1
CO2	Study statutory obligations about safety and accident prevention.	-	2	-
CO3	Recognize quality characteristic of product.	-	1	1
CO4	Analyze the aspects of quality such as quality in design, quality in conformance and quality in performance.	-	1	-

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Meaning and scope of safety in construction	CO1
2	2	Safety in construction operation	CO1
3	3	Safety in Demolition operation	CO1
4	4	Safety with regard to storage, stocking and handling of materials of construction	CO2, CO3
5	5	Introduction to statutory obligations	CO2
6	6	Quality control	CO4

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