



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-23 Curriculum
(Sandwich Pattern)**

**Semester-III
(Course Contents)**

Government Polytechnic, Mumbai																									
(Academically Autonomus Institute, Government of Maharashtra)																									
Name of the Programme: Diploma In Civil Engineering (Sandwitch Pattern)																									
Teaching and examination Scheme (P23)										Duration Of Programme										Semester					
: 6 Semester										With Effect From										: 2023-24					
: THIRD										Duration										: 16 WEEKS					
										Scheme										: (P23)					
Sr No	Course Title	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Paper Duration (hrs.)	Assessment Scheme												Total Marks	
					Actual/Contact Hrs. / Week			Self-Learning (Term Work + Assignment) Hrs./Week				Notional Learning Hrs./Week		Theory			Based on LL & TL				Based on Self Learning		SLA		
																	Practical								
																	FA-TH		SA-TH						Total
T1	T2	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min										
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min										
1	MECHANICS OF STRUCTURES	DSC	AM 23102	4	3	-	2	3	8	4	2 Hrs. 30 min.	20	20	60	10	100	40	25	10	-	-	-	25	10	150
2	SOIL MECHANICS	DSC	AM 23103	4	3	-	2	3	8	4	2 Hrs. 30 min.	20	20	60	10	100	40	25	10	-	-	-	25	10	150
3	BUILDING DRAWING	AEC	CE 23501	2	1	-	4	3	8	3	-	-	-	-	-	-	25	10	50#	-	20	25	10	100	
4	TRANSPORTATION ENGINEERING	DSC	CE 23103	3	3	-	-	3	6	3	2 Hrs. 30 min.	20	20	60	10	100	40	-	-	-	-	-	25	10	125
5	SURVEYING II	DSC	CE23104	3	3	-	4	1	8	4	2 Hrs. 30 min.	20	20	60	10	100	40	25	10	50#	-	20	25	10	200
	UNIVERSAL HUMAN VALUES II	VEC	UV 23302	4	1	-	-	1	2	2	-	-	-	-	-	-	-	-	-	-	-	50	20	50	
	Total			20	14	0	12	14	40	20	12	80	80	240	40	400	160	150	60	100	0	40	200	80	775

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL- Laboratory Learning, FA-Formative Assessment, SA-Summative Assessment, IKS-Indian Knowledge System, SLA - Self Learning Assessment
 Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note: 1. FA-TH represents addition of two-20 marks class tests conducted during the semester.

2. If candidate is not securing minimum passing marks in FA-PR of any course, then the candidate shall be declared as "Detained" in that semester.

3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.

4. Notional Learning hours for the semester are (CL+TL+LL+SL) hours X 16 Weeks

5. 1 credit is equivalent to 30 Notional hrs.

6. *Self-learning hours shall not be reflected in the Time Table.

7. Students must secure a minimum of 40 marks out of 100 for passing the course, It shall be mandatory to obtain a minimum of 10 marks out of 60 in the End Term Theory Examination separately.

Course Category: Discipline Specific Core Course (DSC): 4, Discipline Specific Elective (DSE):0, Value Education Course (VEC):0,

Intern. /Apprentice. /Project /Community (INP):1, Ability Enhancement Course (AEC): 1, Skill Enhancement Course (SEC): 0, Interdisciplinary Elective (IDE): 3

APPROVED COPY

CDC Co-ordinator
G. R. Mumbai

Department Coordinator,
Curriculum Development, Dept. of Civil Engineering

Head of Department,
Dept. of Civil Engineering

In-Charge
Curriculum Development Cell

Principal,
Government Polytechnic Mumbai

Programme : Diploma in Civil Engineering(Sandwich Pattern)													
Course Code: AM 23102						Course Title: Mechanics of Structures							
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						Assessment Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2:30 Hrs.)	FA- PR	SA		SLA	Total
						T1	T2			PR	OR		
3	-	2	3	8	4	20	20	60	25	-	-	25	150

Total IKS Hrs. for course: 4

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

1. FA-TH represents marks of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Understanding the concept and approach of Mechanics of Structures is to induce the knowledge of loading applied and corresponding stresses developed by the students. In addition to analysis and design of structure, it is needs to understand the material properties and their behaviour. The students are enabled to analyse the structures/bodies under the action of direct and transverse loading and stress condition. The approach of teaching this course is to think critically and apply their skills while solving the problems. The experiments are expected to perform in the laboratory by acquiring knowledge with required skill of material features.

II. Industry / Employer Expected Outcome

Select a building/infrastructure project where student has to pick up certain structural members say beams etc. and analyze those by the actual loading on the site and verify.

III. Course Outcomes:

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Compute the Moment of Inertia of symmetrical and asymmetrical structural sections.
CO2	Know the material properties, deformation and stress induced under different loadings
CO3	Determine the elastic constants, temperature and volumetric stress/strain subjected to different loadings.

CO4	Compute shear force and bending moment along with their distribution diagrams.
CO5	Estimate the shear and bending stresses along with their distribution diagrams.

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	TLO1.1 Explain moment of inertia for plane bodies, radius of gyration, section modulus, expression for moment of inertia about centroidal axes for regular plane figures such as rectangular, triangular, circular, semicircular and quarter circular sections TLO1.2 Explain Theorems of Moment of Inertia, Parallel axis theorem, perpendicular axis theorem, polar moment of inertia	Moment of Inertia 1.1 Concept of moment of inertia for plane bodies, radius of gyration, section modulus, expression for moment of inertia about centroidal axes for regular plane figures such as rectangular, triangular, circular, semicircular and quarter circular sections 1.2 Theorems of Moment of Inertia, Parallel axis theorem, perpendicular axis theorem, polar moment of inertia, Numerical problems on Moment of inertia of composite sections for sections as mentioned in sub-topics 1.1 only Course Outcome: CO1 , Teaching Hours : 07 hrs Marks: 10 (R- 2, U-4, A-4)
2	TLO2.1 Explain the elastic, plastic and rigid bodies, concept of deformation, stresses and strains, different properties of Engineering materials TLO2.2 Explain axial tensile and compressive load, Hooke's Law, Young's modulus, axial stress, axial strain, lateral strain, modulus of elasticity, Poisson's ratio TLO2.3 Understand and explain behavior of mild steel under tensile loading, stress-strain curve along with important points such as limit of proportionality, yield stress, ultimate stress, breaking stress, Factor of safety, safe stress, working stress TLO2.4 Explain concept of composite section, conditions for composite sections, advantages and limitations of composite section TLO2.5 Explain concept of temperature stresses and strains, nature of stresses.	Simple Stresses and Strains 2.1 Definition of elastic, plastic and rigid bodies, concept of deformation, stresses and strains, different properties of Engineering materials 2.2 Axial tensile and compressive load, Hooke's Law, Young's modulus, axial stress, axial strain, lateral strain, modulus of elasticity, Poisson's ratio, problems on bars of uniform and stepped cross section 2.3 Behavior of mild steel under tensile loading, stress-strain curve along with important points such as limit of proportionality, yield stress, ultimate stress, breaking stress, Factor of safety, safe stress, working stress 2.4 Concept of composite section, conditions for composite sections, advantages and limitations of composite section (Simple numerical problems to be asked in the examination) 2.5 Concept of temperature stresses and strains, nature of stresses, simple problems on temperature stresses on homogenous sections only. Course Outcome: CO2 Teaching Hours : 10 Marks:12 (R-4 , U-4, A- 4)

3	TLO3.1 Explain Elastic Constants and Strain Energy TLO3.2 Explain Volumetric strain, bulk modulus, Concept of "uni-axial stress, equation of total strain in uni-axial direction, elastic constants, relation between elastic moduli TLO3.3 Explain the concept of strain energy, resilience, proof resilience, modulus of resilience, strain energy stored due to gradual, sudden and impact loadings.	Elastic Constants and Strain Energy 3.1 Elastic Constants and Strain Energy 3.2 Volumetric strain, bulk modulus, Concept of "uni-axial stress, equation of total strain in uni-axial direction, elastic constants, relation between elastic moduli (No derivations of these relations). Simple numerical problems. 3.3 Concept of strain energy, resilience, proof resilience, modulus of resilience, strain energy stored due to gradual, sudden and impact loadings. simple numerical problems. Course Outcome:CO3 Teaching Hours : 08 Marks:10 (R- 2 , U- 4 , A- 4)
4	TLO4.1 Explain/Describe Concept and definition of shear force and bending moment, sign convention, relation between bending moment, shear force and rate of loading TLO4.2 Explain the shear force and bending moment diagram for simply supported, cantilever and overhanging beams subjected to concentrated load, uniformly distributed load and couple, point of zero shear, point of contra flexure	Shear Force and Bending Moment 4.1 Concept and definition of shear force and bending moment, sign convention, relation between bending moment, shear force and rate of loading. 4.2 Shear force and bending moment diagram for simply supported, cantilever and overhanging beams subjected to concentrated load, uniformly distributed load and couple, point of zero shear, point of contra flexure, simple numerical problems. Course Outcome:CO4 Teaching Hours :10 Marks:14 (R- 4 , U- 4 , A- 06)
5	TLO5.1 Explain/Describe concept of pure bending, assumptions in pure bending theory, stress distribution diagram, bending or flexure equation, section modulus, moment of resistance TLO5.2 Solve numericals on moment of resistance for symmetrical beam sections. Simple numerical problems on standard sections TLO5.3 Explain shear stress equation with meaning of each terms TLO5.4 Explain shear stress distribution for solid and hollow rectangular section, solid and hollow circular section, I section, T section	Shear and Bending Stresses 5.1 Concept of pure bending, assumptions in pure bending theory, stress distribution diagram, bending or flexure equation (derivation not required), section modulus, moment of resistance. 5.2 Numericals on moment of resistance for symmetrical beam sections. Simple numerical problems on standard sections(No problems built up section) 5.3 Shear stress equation with meaning of each terms (Derivation not required) 5.4 Shear stress distribution for solid and hollow rectangular section, solid and hollow circular section, I section, T section, Numerical problems on circular and rectangular section only. Course Outcome:CO5 Teaching Hours :10 Marks:14 (R- 4 , U- 4 , A- 6)

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcomes (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1. Listing of various parts and their functions of Universal Testing Machine along with brief introduction of other test to be conducted on UTM	List the various parts and their functions of Universal Testing Machine along with brief introduction of other test to be conducted on UTM	2	CO2
2	LLO2. Stress strain curve by showing important points on it	Tension test on mild steel or TMT specimen as per IS 432 (part I) or HYSD or Fe500 steel specimen as per IS 1608 & 1139. Also, draw the stress strain curve by showing important points on it.	2	CO2
3	LLO 3. Determination Hardness for mild steel, aluminium, copper, brass, cast iron (any two metals).	Hardness test on mild steel, Aluminium, copper, brass, cast iron (any two metals).	2	CO2
4	LLO 4. Measurement of compressive strength on timber along the grain and across the grain as per IS 2408.	Compression test on timber along the grain and across the grain as per IS 2408.	2	CO2
5	LLO 5. Measurement of flexure strength on timber beam of rectangular section as per IS 1708 and IS 2408	Flexure test on timber beam of rectangular section as per IS 1708 and IS 2408.	2	CO1 & 5
6	LLO 6. Measurement of Izod impact load test values & Charpy impact test values for aluminium, copper, mild steel, brass, cast iron as per IS 1598 (any two metals).	Izod impact load test & Charpy impact test on aluminium, copper, mild steel, brass, cast iron as per IS 1598 (any two metals).	2	CO3
7	LLO 7. Measurement of water absorption and flexural strength on flooring or roofing tiles as per IS 1237, IS 13630, IS 654, IS 2690.	Water absorption and flexural test on flooring or roofing tiles as per IS 1237, IS 13630, IS 654, IS 2690.	2	CO3
8	LLO 8. Measurement of Water absorption and compression strength on wet bricks as per IS 3495 (part II), IS 1077.	Water absorption and compression test on wet bricks as per IS 3495 (part II), IS 1077.	2	CO2 & 5

9	LLO 9. Measurement of Abrasion on flooring tiles as per IS 13630 (part 7).	Abrasion test on flooring tiles as per IS 13630 (part 7).	2	CO2
10	LLO 10.1 Measurement of shear on mild steel, aluminium, copper, brass, cast iron as per IS 5242 (any two metals).	Shear test on mild steel, aluminium, copper, brass, cast iron as per IS 5242 (any two metals).	2	CO2
11	LLO 11. Plot SF and BMD diagram for various kinds of loading.	Plot shear force and bending moment diagram for cantilever, simply supported and overhanging beams loaded by concentrated and uniformly distributed loads (two problem on each beam types on A4 graph paper).	2	CO4
12	LLO 12. Plot shear stress distribution for solid and hollow rectangular section, solid and hollow circular section, I section, T section.	Plot shear stress distribution for solid and hollow rectangular section, solid and hollow circular section, I section, T section	2	CO5

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Assignment NO. 1: Ten Numericals on topic 1 given by subject teacher
2. Assignment NO. 2: Ten Numericals on topic 2 given by subject teacher
3. Assignment NO. 3: Ten Numericals on topic 3 given by subject teacher
4. Assignment NO. 4: Ten Numericals on topic 4 given by subject teacher
5. Assignment NO. 5: Ten Numericals on topic 5 given by subject teacher
6. Assignment NO. 6: SLA assignment on 2D analysis of P frame structures on basic software

Formative assessment (Assessment for Learning) for PR and SLA

- Rubrics for continuous assessment based on process and product related performance indicators(__ marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (__marks)

7. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CO1	3	2	2	2	1	--	3	2	2	3
CO2	3	2	2	2	2	1	2	3	2	3
CO3	2	3	3	3	2	1	2	2	2	2
CO4	3	2	3	2	--	--	3	3	2	2
CO5	3	3	3	3	--	--	2	2	2	3

Legends: - High:03, Medium:02, Low:01, No Mapping: --

8. Suggested Learning Materials / Books

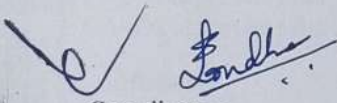
Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mechanics of Material	Beer and Jonson Tata McGraw hill	ISBN 9781259097171
2	Strength of material	Singer and Pytel Harper & Raw	ISBN-10 0060453133
3	Mechanics of structures, Volume-I	Junnarkar, S. B., Charotar Publishing House, Anand.	ISBN :9789385039270988 ISBN 978-93-85039-02-7
4	Strength of Material	S.Ramamurtham Dhanpat Rai and sons	ISBN-10: 818743354X
5	Strength of Material	R. K. Bansal S Chand	ISBN 9789385401961
6	Strength of Material	B. K. Sarkar Tata McGraw hill	ISBN 0070494843
7	Mechanics of structure	Y. N Walavalker Everest pub-House, Pune 30	ISBN NO: EPH-0-89-890925-17
8	Strength of Material	S.S Bhavikatti Vikas Publishing House Pvt.Ltd	ISBN 8125912193

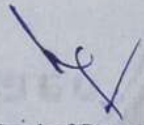
9. Learning Websites & Portals

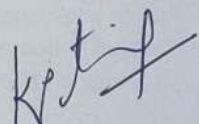
Sr.No	Link / Portal	Description
1	https://easyengineering.net/a-handbook-on-civil-engineering-for-railway-other-engineering-competitive-exams/#google_vignette	
2	https://testbook.com/objective-questions/mcq-on-strength-of-materials--5eea6a0b39140f30f369de8b	
3	https://www.constructionplacements.com/interview-questions-and-answers-on-strength-of-materials/	
4	https://www.youtube.com/watch?v=gY_hYswySH4	

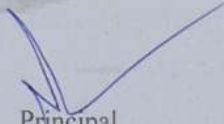
10. Academic Consultation Committee/Industry Consultation Committee:

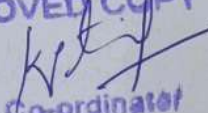
Sr. No	Name	Designation	Institute/Organization
1	Shri. S D Borkar	Deputy Engineer	PWD
2	Shri. Sudhir Nimbalkar	Assistant Engineer	BMC
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Dr D K Gupta	HOD in Civil Engg.	Govt. Polytechnic Mumbai


Coordinator,
Curriculum Development,
Department of Civil Engineering


Head of Department
Department of Civil Engineering


I/C, Curriculum Development Cell


Principal

APPROVED COPY

CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Civil Engineering (Sandwich Pattern)													
Course Code: AM 23103						Course Title: Soil Mechanics							
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						Assessment Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2:30 Hrs.)	FA- PR	SA		SLA	Total
						T1	T2			PR	OR		
3	-	2	3	8	4	20	20	60	25	-	-	25	150

Total IKS Hrs. for course: 4

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

1. FA-TH represents marks of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

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

II. Industry / Employer Expected Outcome

Select a building/infrastructure project where right from starting to end soil investigation is done as per the theory taught and practiced.

III. Course Outcomes:

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Know the introductory- information of Soil Mechanics
CO2	Know the physical properties and behavior of Soils.
CO3	Classify the soil as per IS classification and to know about the consistency of soil.
CO4	State the necessity of compaction and consolidation of soil with 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.	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	TLO1.1 Describe IS Definition of soil, Origin of soil, Formation of soil, TLO1.2 State overview of different types of soils in India TLO1.3 Explain the importance of soil in Civil Engineering as construction material TLO1.4 Describe field application of Soil Mechanics	Introduction to Soil Mechanics: 1.1 IS Definition of soil, Origin of soil, Formation of soil, Soil-formation in Geological cycle 1.2 General characteristics of different types of soils, Overview of different types of soils in India. 1.3 Importance of soil in Civil Engineering as construction material in Civil Engineering Structures, such as foundation bed for structures. 1.4 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. Course Outcome: CO1 Teaching Hours : 03 Marks: 4 (R- 2, U-2, A-0)
2	TLO2.1 Explain the Soil as Three Phase System and water content, determination of Water Content by oven drying method TLO2.2 Describe physical properties of soil TLO2.3 Establish relation between various properties of soil. Explain various index properties of soil TLO2.4 Determine specific gravity by Pycnometer TLO2.5 Determine bulk unit weight and dry unit weight by Core Cutter method	Physical Properties of Soil: 2.1 Soil as Three Phase System. Water content, determination of Water Content by oven drying method as per IS 2720 (part II). 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) .Concept of various index properties of soil for the Purpose of their classification & Use. 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). Course Outcome: CO2 Teaching Hours : 08 Marks:12 (R-4 , U-4, A-4)
3	TLO3.1 Explain particle size distribution, mechanical sieve analysis as per IS code, particle distribution curve, uniformity coefficient and coefficient of curvature, graded and uniformly graded soils TLO3.2 Explain consistency of soil: stages of consistency, Atterberg's limits of consistency TLO3.3 Determine Liquid limit, Plastic limit and Shrinkage limit	Classification & Consistency of soil: 3.1 Particle size distribution, mechanical sieve analysis as per IS code, particle distribution curve, uniformity coefficient and coefficient of curvature, graded and uniformly graded soils, IS. Classification of soil. IS : 460 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. Course Outcome:CO3 Teaching Hours :08 Marks:10 (R- 2 , U- 4 , A- 4)

4	TLO4.1 Explain/Describe concept of compaction & consolidation TLO4.2 Explain the compaction: Light and Heavy compaction, zero air void line, O.M.C, Standard, Proctor test, Modified Proctor test. Factors affecting compaction TLO4.3 Explain field methods of compaction – rolling, ramming and vibration and suitability of various compaction equipment's-smooth wheel roller, sheep foot roller, pneumatic typed roller, Rammer and Vibrator.	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, Standard, Proctor test, Modified Proctor test. Factors affecting compaction. 4.3 Field methods of Compaction – rolling, ramming and vibration and suitability of various compaction equipment's-smooth wheel roller, sheep foot roller, pneumatic typed roller, Rammer and Vibrator. Course Outcome:CO4 Teaching Hours :08 Marks:10 (R- 2 , U- 4 , A-4)
5	TLO5.1 Explain/Describe the definition & concept of permeability. Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability TLO5.2 Explain the concept and definition of shear strength of soil TLO5.3 Explain the Coulomb's equation & failure envelope, significance of "C" and "φ" soils. TLO5.4 Explain direct Shear test (drained & un-drained).	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 Concept and definition of shear strength of soil. Constituents of shear resistance of soil, definition of Cohesion, internal friction. Angle of shearing resistance. 5.3 Coulomb's equation & failure envelope, significance of "C" and "φ" soils. Types of soil C-soil, φ-soil, C-φ soil. 5.4 Introduction to determination of shearing strength of soil in laboratory by direct Shear test (drained & un drained). Course Outcome:CO5 Teaching Hours :08 Marks:10 (R- 2 , U- 4 , A-4)
6	TLO6.1 Explain/Describe concept & definition of bearing capacity TLO6.2 Explain the factors effecting bearing capacity and methods to improve Bearing capacity of soil TLO6.3 Explain standard penetration test- procedure, and limitations of test TLO6.4 Explain plate load test- procedure, and limitations of test. TLO6.5 Soil stabilization: Scope & purpose. TLO6.6 Describe methods of soil stabilization – Mechanical soil stabilization – GGBS, fly ash, glass slag, lime stabilization, cement stabilization, bitumen stabilization, fly-ash	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 Standard penetration test- procedure, and limitations of test 6.4 Plate load test - procedure, and limitations of test. 6.5 Soil stabilization: Scope & purpose. 6.6 Methods of soil stabilization – Mechanical soil stabilization – GGBS, fly ash, glass slag, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization. California bearing ratio. Course Outcome: CO6 Teaching Hours :10 Marks: 14 (R- 4 , U- 4, A-6)

	stabilization, California bearing ratio.	
--	--	--

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcomes (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1. Introduction to Soil Mechanics and study various field application	Introduction to Soil Mechanics and study various field application.	02	CO1
2	LLO2. Determination of water content of given soil sample by oven drying method as per I.S. 2720 part- II	Determine water content of given soil sample by oven drying method as per I.S. 2720 part- II	04	CO2
3	LLO 3. Determination of specific gravity of soil by pycnometer method as per I.S. 2720 part- III	Determine specific gravity of soil by pycnometer method as per I.S. 2720 part- III	02	CO2
4	LLO 4. Measurement of grain size distribution of given soil sample by Mechanical sieve analysis as per I.S. 2720 part- IV.	Determine grain size distribution of given soil sample by Mechanical sieve analysis as per I.S. 2720 part- IV	02	CO3
5	LLO 5. Measurement of MDD and OMC by Standard proctor test (OR Study of Modified proctor test).	Determine MDD and OMC by Standard proctor test (OR Study of Modified proctor test).	04	CO4
6	LLO 6. Determination of coefficient of permeability by Constant head method (OR Falling head test as per I.S.)	To determine Coefficient of permeability by Constant head method (OR Falling head test as per I.S.)	04	CO5
7	LLO 7. Determination of shear strength of soil by direct shear test	Determine shear strength of soil by direct shear test	04	CO5
8	LLO 8. Determination of bulk dry unit weight of soil by core cutter method as per I.S. 2720 part-XXIX.	Determine bulk dry unit weight of soil by core cutter method as per I.S. 2720 part-XXIX.	02	CO2
9	LLO 9. Determination of Liquid Limit of given soil	Determine Liquid Limit of given soil sample	02	CO3

	stabilization, California bearing ratio.	
--	--	--

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcomes (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1. Introduction to Soil Mechanics and study various field application	Introduction to Soil Mechanics and study various field application.	02	CO1
2	LLO2. Determination of water content of given soil sample by oven drying method as per I.S. 2720 part- II	Determine water content of given soil sample by oven drying method as per I.S. 2720 part- II	04	CO2
3	LLO 3. Determination of specific gravity of soil by pycnometer method as per I.S. 2720 part- III	Determine specific gravity of soil by pycnometer method as per I.S. 2720 part- III	02	CO2
4	LLO 4. Measurement of grain size distribution of given soil sample by Mechanical sieve analysis as per I.S.. 2720 part- IV.	Determine grain size distribution of given soil sample by Mechanical sieve analysis as per I.S.. 2720 part- IV	02	CO3
5	LLO 5. Measurement of MDD and OMC by Standard proctor test (OR Study of Modified proctor test).	Determine MDD and OMC by Standard proctor test (OR Study of Modified proctor test).	04	CO4
6	LLO 6. Determination of coefficient of permeability by Constant head method (OR Falling head test as per I.S.)	To determine Coefficient of permeability by Constant head method (OR Falling head test as per I.S.	04	CO5
7	LLO 7. Determination of shear strength of soil by direct shear test	Determine shear strength of soil by direct shear test	04	CO5
8	LLO 8. Determination of bulk dry unit weight of soil by core cutter method as per I.S. 2720 part-XXIX.	Determine bulk dry unit weight of soil by core cutter method as per I.S. 2720 part-XXIX.	02	CO2
9	LLO 9. Determination of Liquid Limit of given soil	Determine Liquid Limit of given soil sample	02	CO3

	sample			
10	LLO 10 Determination of Plastic Limit of given soil sample	Determine Plastic Limit of given soil sample	02	CO3
11	LLO 11. Study of Shrinkage Limit.	Study of Shrinkage Limit.	02	CO3

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

Select a building/infrastructure project where right from starting to end soil investigation is done and learn and compare with what has been as taught and practiced

Formative assessment (Assessment for Learning) for PR and SLA

- Rubrics for continuous assessment based on process and product related performance indicators(____ marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (____ marks)

1. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CO1	2	3	1	1	1	1	1	--	2	1
CO2	2	3	3	3	2	2	2	--	2	1
CO3	2	3	3	3	2	2	2	--	2	1
CO4	1	3	2	2	2	1	1	--	2	1
CO5	2	3	3	2	2	1	1	--	2	1
CO6	2	2	2	2	2	1	1	--	2	1

Legends: - High:03, Medium:02, Low:01, No Mapping: --

2. Suggested Learning Materials / Books

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Soil Mechanics & Foundations Engg.	K.R Arora , Standard Publisher Distributors	ISBN-10: 8180141128; ISBN-13: 978-8180141126
2	Introduction to Soil Mechanics	B.J.Kasmalkar Pune Vidyarthi GrihaPrakashan	ISBN 9781407029252
3	Soil Mechanics & Foundations Engg	Gopal Rajan & A.S.R.Rao. New Age international Publisher	ISBN. 978-81-224-1223-9
4	Soil Mechanics	B.C. Punmia Standard Book House, New Delhi	ISBN-10: 8180141128; ISBN-13: 978-8180141126
5	Soil Mechanics	V.N.S Murthy Sai Kripa Technical Consultants	ISBN-10: 8180141128; ISBN-13: 978-8180141126
6	Geotechnical Engineering (Soil Mechanics)	T.N.Ramanurthy & T.G.Sitharam S Chand and Company Ltd.	ISBN 10: 812192457X
7	Is 2809-1972-Glossary of Terms and Symbols Relating To Soil Engineering.	BIS, New Delhi	ISBN-10: 8180141128; ISBN-13: 978-8180141126
8	Is 1892-1979-Code of Practice For Sub Surface Investigation of Foundation	BIS, New Delhi	ISBN 9781407029252
9	Is 2720-Test For Soil Part 1-1983	BIS, New Delhi	ISBN. 978-81-224-1223-9

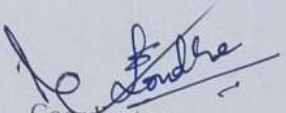
3. Learning Websites & Portals

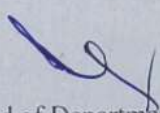
Sr.No	Link / Portal	Description
1	https://en.wikipedia.org/wiki/Soil_mechanics	
2	https://www.nap.edu/read/11558/chapter/9	
3	https://ascelibrary.org/doi/pdf/10.1061/9780784412886.bm02	
4	https://www.springer.com/journal/11204	
5	http://www.nationallibrary.gov.in	

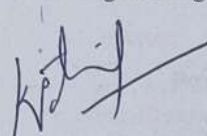
4. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Shri. S D Borkar	Deputy Engineer	PWD

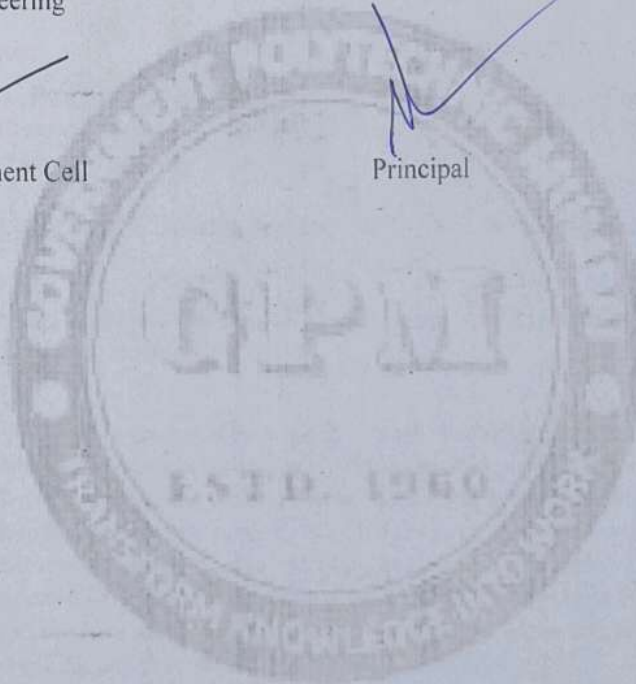
2	Shri. Sudhir Nimbalkar	Assistant Engineer	BMC
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Dr D K Gupta	HOD in Civil Engg.	Govt. Polytechnic Mumbai


Coordinator,
Curriculum Development,
Department of Civil Engineering


Head of Department
Department of Civil Engineering


I/C, Curriculum Development Cell


Principal



APPROVED COPY

CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Civil Engineering (Sandwich Pattern)													
Course Code: CE23501						Course Title :BUILDING DRAWING							
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						Assessment Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2Hrs. 30min.)	FA-PR	SA		SLA	Total
						TS1	TS2			PR	OR		
1	-	4	3	8	4	-	-	-	25	50#	-	25	100

Total IKS Hrs. for course:

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

1. FA-TH represents an average of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Drawing is a universal language of Engineers. It is the language through which Engineers can communicate with skilled, semiskilled and unskilled labours. The students have to use this subject to develop ability to read, understand and prepare drawings, to use it for different subjects during diploma course. Student will be taught to draw building structures and its various parts using conventions and symbols as per IS 962. Civil Engineer has to convert design parameters, process details into pictorial views. Therefore, it is required to understand and prepare the drawings and interpret the drawings, so that, the work can be executed. Civil engineer should be competent to convert his ideas into the drawing. Drawings are essential for drafting specifications and tender documents. The knowledge of this course is useful for construction technology, estimating and costing, design of structure, surveying, and projects.

II. Industry / Employer Expected Outcome

Prepare Drawings of the given building structure with required specifications

III. Course Outcomes: Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Interpret and Draw the conventions, signs and symbols.
CO2	Know and apply basic rules & bylaws governing the planning of building and calculate different areas such as plinth area, floor area, built-up area, carpet area.
CO3	Draw line plan, developed plan, elevation, section, site plan, location plan and foundation plan and measured drawing of residential building.
CO4	Draw line plans of public building.
CO5	Draw perspective drawing for the given type of objects.

Course Content Details:

Unit No.	Learning Outcomes	Topics / Sub-topics
1	TLO 1.1 Describe the standard signs and symbols as per IS 962:1989. TLO 1.2 Describe the given door/window section using their standard signs and symbols, different water supply and Sanitary units of the building in the drawing TLO 1.3 Use the various types of lines	Introduction: 1.1 Purpose of drawing, primary requirements of good drawing. Conventions as per IS 962:1989. 1.2 Symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork etc. used in civil engineering construction, graphical symbols for door and window, Abbreviations, symbols for sanitary and electrical installations. 1.3 Types of lines- visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots, Appropriate lettering and numbering. Course Outcome : CO1 Teaching Hours : 2hrs
2	TLO 2.1 Explain the given basic principles of Planning of building (residential and public). TLO 2.2 Propose the relevant dimensions for the given component of building structures. TLO 2.3 Plan the dwelling unit as per the given requirement and specifications TLO 2.4 Plan the dwelling units/building in accordance with the provisions of governing authority in a given area TLO 2.5 Compute the required area of construction using the norms of the local authority.	Principles of Planning: 1.1 Principles of planning of Residential and Public building: Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Roominess, Circulation, Furniture requirements, Sanitation, Economy. (IKS- Orientation of Indian Heritage Structures such as Mahalaxmi Temple, Kolhapur) 1.2 Space requirement and norms for minimum dimension of different components of building structure. 1.3 Planning of residential buildings as per the given requirement using IS 962-1989. 1.4 Rules and bye-laws of sanctioning authorities (local authority and town planning department) for construction work. 1.5 Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio) / FSI. Course Outcome: CO2 Teaching Hours : 4 hrs
3	TLO 3.1 Draw line plans for the given residential buildings. TLO 3.2 To prepare Submission Drawing of load bearing and Framed structure in accordance with the provisions of governing authority in a given area. TLO 3.3 Prepare working drawing of the given Load bearing and Framed structure TLO 3.4 Prepare foundation plan of the given Load bearing and Framed structure. TLO 3.5 Prepare structural drawings of given RCC Components of the building structure.	Residential building: 3.1 Line plans for residential building of minimum three rooms including w/c, bath and staircase as per principles of planning. 3.2 Data drawing (for Load bearing and framed structure): Developed plan, elevation, sections, site plan, location plan, Block Plan, foundation plan, preparing schedule of openings, construction notes, Area statement. Planning of staircase- Rise and Tread for residential building. 3.3 Working drawing: Developed plan, elevation, section passing through staircase or Sanitary Block. 3.4 Foundation plan of Load bearing and Framed structure. 3.5 Details of RCC Components: Footing, column,

		Beam, Chajjas, Lintel, Staircase and slab. Course Outcome:CO3 Teaching Hours : 6hrs
4	TLO 4.1 Propose the relevant data for the given public building structures. TLO 4.2 Draw line plans for the given public buildings.	Public Building: 4.1 Data required for planning public building such as Library, community centre, post office, high school, primary health centre, market, hospital, bank, hostel, Bus Depot. 4.2 Line plans for public building-primary health center, restaurant, bank, post office, hostel and Library. Course Outcome:CO4 Teaching Hours : 3 hrs
5	TLO 4.1 Explain the principles of perspective drawings in the given situation TLO 4.2 Prepare perspective drawing of the given object using Two-point perspective method	Perspective Drawing 4.1 Definition, Types of perspective, terms and principles used in perspective drawing 4.2 Two Point Perspective of objects- steps, monuments, pedestals. Course Outcome:CO5 Teaching Hours : 2 hrs

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr. No.	Practical / Tutorial / Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	LLO 1.1 Represent the given door /window section using their standard signs and symbols.	Draw various types of graphical symbols for materials doors and windows as per IS 962:1989 (Sketch book)	2	CO1
2	LLO 2.1 Use the symbols to different water supply and Sanitary units of the building in the drawing	Draw various types of graphical symbols for sanitary, water supply as per IS 962:1989 (Sketch book)	2	CO1
3	LLO 3.1 Use the symbols to different Electrical units of the building in the drawing.	Draw various types of graphical symbols for electrical installations and write abbreviations as per IS 962:1989 (Sketch book)	2	CO1
4	LLO 4.1 Illustrate different specifications of the given drawings.	Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Sketch book)	2	CO1
5	LLO 5.1 Identify the different units of the building and prepare the plan as per the actual measurements.	Measure the units of existing building (Load Bearing / Frame structure) & Draw line plan of measured existing building (Sketch book)	4	CO1
6	LLO 6.1 Prepare Line Plans of the Residential building as per the requirement.	Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom) for Residential Bungalows. (Minimum three) (Sketch book)	4	CO3

7	LLO 7.1 Prepare Line Plans of the Public building as per the requirement.	Draw line plans to suitable scale for Public Buildings - Primary Health Centre (Sketch book)	2	CO4
8	LLO 8.1 Prepare Line Plans of the Public building as per the requirement.	Draw line plans to suitable scale for Public Buildings – Hostel, Library (Sketch book)	4	CO4
9	LLO 9.1 Prepare Line Plans of the Public building as per the requirement.	Draw line plans to suitable scale for Public Buildings – Bank, Post office (Sketch book)	4	CO4
10	LLO 10.1 Prepare Developed Plan, Elevation, Section, Site Plan and area statement of the residential building as per the requirement.	Draw the Developed plan, Elevation Section through WC, Bath or Staircase, Site plan including area statement, schedule of opening and construction notes for a Framed Structure (One/Two BHK) (Sketch book)	6	CO3
11	LLO 11.1 Prepare Developed Plan, Sectional elevation, Foundation Plan of the load bearing structure as per the requirement.	Draw submission drawing to Suitable scale of a single Storey load bearing residential building (2BHK) with flat Roof and staircase showing - Developed plan, Elevation Section passing through Stair or W.C. and Bath, Foundation plan and schedule of openings, Site plan with suitable scale, area statement, construction notes .(on A1 paper)	8	CO3
12	LLO 12.1 Prepare Developed Plan, Sectional elevation, Foundation Plan site plan and area statement of the Framed structure as per the requirement.	Draw Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHK with attached toilet to 1 bedroom showing the position of European type WC pan) showing developed plan, elevation, section passing through staircase, site plan (1:200), foundation plan (1:50), area statement, schedule of openings, Construction Notes, Reference Note, Revision History and Cloud marks.(on A1 paper)	8	CO3
13	LLO 13.1 Prepare Sectional elevation and plan of footing, RCC Beam, Lintel Beam Chajja and Stair case for framed structure as per the requirement.	Draw Detailed enlarge section of RCC column, footing RCC Beam, Lintel, Chajja And RCC staircase with suitable scale. (on A1 paper)	8	CO3
14	LLO 14.1 Prepare Perspective view of the given object	Draw two-point Perspective Drawing of small objects - steps, monuments, pedestals (any one) scale 1:50..(on A1 paper)	4	CO5

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Collect and study building Bye laws, rules and regulation for planning any two competent authority such as Gram Panchayat /Municipal Corporation/Metro Cities/Town Planning Department.
2. Prepare report on Provisions given in National Building Code 2016
3. Prepare list of the documents required for obtaining permission for construction of residential building/apartment from competent authority and write report.
4. Prepare a report on IS-962:1989 - Code of practice for architectural and building drawings
5. Prepare Developed Plan and Elevation for any one Public Building.
6. Prepare a model of a simple building using cardboard showing different components with suitable color.

7. Prepare a model of a simple building using BIM.

NOTE :

Above is just a suggestive list of microprojects faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.

VI. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction	0	0	0	0
2	Principles of Planning	0	0	0	0
3	Residential building	0	0	0	0
4	Public Building:	0	0	0	0
5	Perspective Drawing	0	0	0	0
Total		0	0	0	0

VII. Assessment Methodologies/Tools**Formative assessment (Assessment for Learning)**

Rubrics for continuous assessment based on process and product related performance indicators (25 PR marks)

For laboratory learning 25 marks.

Rubric - Each Practical Carries.

1) 02 Marks for present, (0 Marks for Absent & 01 Marks for extra practical.)

2) 04 Marks for Discipline & involvement in the Practical Expt. (1 Mark for Preparation of Experimental set up, 1 Mark for settings & operations, 1 Mark for safety measures, 1 Mark for observations and recording)

3) 04 Marks for Result and Conclusion (1 Mark for Accuracy for result, 1 Mark for Neat clean presentation, 1 Mark for Answer to sample question, 1 Mark for Submission of report in time)

Summative Assessment (Assessment of Learning)

End semester assessment of Practical Exam, Oral Exam (50 PR marks)

VIII. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CO1	3	1	--	--	3	3	3	3	3	3
CO2	3	3	3	--	3	3	3	1	3	1
CO3	3	1	1	--	3	3	3	3	3	1
CO4	3	1	1	--	2	3	3	3	2	1
CO5	3	1	--	--	2	1	3	3	3	1

Legends: - High:03, Medium:02, Low:01, No Mapping: --

IX. Suggested Learning Materials / Books

Sr.No	Author	Title	Publisher
1	Shah. M.G., Kale C.M., Patki S.Y.	Building Drawing	Mcgraw Hill Publishing company Ltd. New Delhi 2002 ISBN: 9780074638767
2	Dr. Swamy Kumara N; Rao Kameshwara A .	Building Planning and Drawing	Charotar Publication. ANAND ISBN : 978- 93-85039-12-6 (Ed.2015)
3	Mantri Sandip	A to Z Building Construction	Satya Prakashan; 2nd edition (2015), New Delhi, ISBN: 978-8176849692
4	Y.S.Sane	Planning and Design of building	Allies bookstall Poona – 4 & Engineering Book publishers, Company Pune - 16. ASIN B0007JVH92
5	IS code 962:1989		

X. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=rX6XfCMRYU0	Demonstration video 2-Point Perspective View Basics.
2	https://ndl.iitkgp.ac.in/	National Digital Library of India
3	http://civildigital.com	Digital Library of Civil engineering subject for students

XI. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Mr. Rohan Deokar	Deputy Engineer	MMRDA
2	Mr. Sanjay Kulkarni	Surveyor and Consultant	S R Kulkarni Pvt. Firm
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Mrs. S. R. Hegonde	Lecturer in Civil Engg.	Govt. Polytechnic Mumbai

[Signature]
Coordinator,
Curriculum Development,
Department of Civil Engineering

[Signature]
I/C, Curriculum Development Cell

[Signature]
Head of Department
Department of Civil Engineering

[Signature]
Principal

APPROVED COPY

[Signature]
CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Civil Engineering (Sandwich Pattern)													
Course Code: CE23104						Course Title :TRANSPORTATION ENGINEERING							
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						Assessment Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2Hrs. 30min.)	FA-PR	SA		SLA	Total
						TS1	TS2			PR	OR		
3	-	-	3	6	3	20	20	60	-	-	-	25	125

Total IKS Hrs. for course: 3

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

1. FA-TH represents marks of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

This is a core technology subject which is intended to teach students facts, concepts, principles, procedures, of transportation engineering. system. (Roads, Railways) so that students can use this knowledge to identify types of roads as per IRC recommendations, geometric design features of highways, different tests on road materials, components of railway tracks.

II. Industry / Employer Expected Outcome

Select a project where right from starting to end, steps and processes involved in Road /Railway needed to be taught and practiced.

III. Course Outcomes:

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	To know the importance of transportation in development of nation.
CO2	Understand geometrical design features of different highways
CO3	Know different tests on road materials

CO4	Understand the components of railway tracks
CO5	Know the defects in railway tracks
CO6	Understand importance of waterways & airways

Course Content Details:

Unit No	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	TLO1.1 Explain the role of transportation, Purpose and Uses of transportation TLO1.2 Describe different modes of transportation TLO1.3 Explain Metro railway	Introduction 1.1 Role of transportation in the development of nation, Scope and Importance of roads in India and its Characteristics. 1.2 Different modes of transportation – land way, waterway, airway. Merits and demerits 1.3 Metro: types, necessity, advantages & disadvantages, layout of metro station, high speed metro. Course Outcome: CO1 Teaching Hours :4 hrs. Marks: 06(R-4, U-2, A-0)
2	TLO2.1 Explain the classification of Highways TLO2.2 list out factors affecting alignment. TLO2.3 Explain Camber and its types TLO2.4 Explain Right of way. TLO2.5 Explain Design speed and various factors affecting Design speed. TLO2.6 Explain Gradient and its types TLO2.7 Explain Sight distance and its types TLO2.8 Explain Curves and its necessity TLO2.9 Explain the extra widening of roads TLO2.10 Explain Super elevation and methods of providing super elevation TLO2.11 Draw Standard cross-sections of national highway in embankment and cutting.	Road Geometrics 2.1 General classification of roads. 2.2 Selection and factors affecting road alignment 2.3 Camber: Definition, purpose, types as per IRC – recommendations. 2.4 Right of way, Kerbs, Road margin, road formation 2.5 Design speed and various factors affecting design speed as per IRC – recommendations. 2.6 Gradient: Definition, types as per IRC – Recommendations 2.7 Sight distance (SSD): Definition, types as per IRC – recommendations. 2.8 Curves: Necessity, types: Horizontal, vertical curves. 2.9 Necessity of Extra widening of roads. 2.10 Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation. 2.11 Standard cross-sections of national highway in embankment and cutting. Course Outcome: CO2 Teaching Hours :10 hrs. Marks:14 (R-4, U-6, A-4)

3	TLO3.1 Explain 1Types of road materials and their Tests TLO3.2 Explain the pavements and their Components TLO3.3 Explain the Construction of WBM road TLO3.4 Explain Construction of Flexible pavement, its properties, merits and demerits TLO3.5 Explain cement concrete road, construction methods its merits and demerits	Construction of Road Pavements 3.1Types of road materials and their Tests – Test on aggregates- Flakiness and Elongation tests, Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test. 3.2Pavement – Definition, Types, Structural Components of pavement and their functions. 3.3 Construction of WBM road. Merits and demerits of WBM & WMM road. 3.4 Construction of Flexible pavement / Bituminous Road. Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits and Demerits of BR. 3.5 Cement concrete road -methods of construction, Alternate and Continuous Bay Method, joints, filler and sealers, merits and demerits of concrete roads. Types of joints. Course Outcome:CO3 Teaching Hours :10 hrs Marks:10(R-2, U-4, A-4)
4	TLO4.1 Explain Classification of Indian Railways TLO4.2 Explain Permanent ways, its components, types of rail gauge TLO4.3 Types Rail, Rail Joints TLO4.4 Explain the Creep of rail, its causes and prevention TLO4.5 Sleepers - functions and Requirement, types TLO4.6 Explain Ballast, its functions and its types TLO4.7 Explain the Rail fixtures and fastenings	Basics of Railway Engineering 4.1 Classification of Indian Railways, zones of Indian Railways. 4.2 Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge. 4.3 Rail, Rail Joints - requirements, types. 4.4 Creep of rail: causes and prevention. 4.5 Sleepers - functions and Requirement, types - concrete sleepers and their density. 4.6 Ballast - function and types, suitability. 4.7 Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers. Course Outcome:CO4 Teaching Hours: 8 hrs Marks:12(R-5, U-5, A-2)

5	TLO5.1 Explain/Describe the Rail alignment and factors governing TLO5.2 Draw Track Cross sections, definition of important technical terms TLO5.3 Definition of the various technical terms in Railway Track Geometries, explanation of this terms. TLO5.4 Explain/Describe Branching of Tracks TLO5.5 Explain Station, its -Purpose and important technical terms. TLO5.6 Describe Station yard, its classification, its function TLO5.7 Describe Track Maintenance.	Track geometries, Construction and Maintenance 5.1 Alignment- Factors governing rail alignment. 5.2 Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms- permanent land, formation width, side drains. 5.3 Railway Track Geometries: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail. 5.4 Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle. 5.5 Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station. 5.6 Station yard: Classification- Passenger, goods, locomotive and marshaling yards. Function & drawbacks of marshaling yards. 5.7 Track Maintenance- Necessity, Classification, and Tools required for track maintenance with their functions. Course Outcome: CO5 Teaching. Hours: 10 hrs. Marks:12(R-5, U-5, A-2)
6	TLO6.1 Explain the scope of waterways & airways TLO6.2 Explain importance of waterways & airways TLO6.3 Uses of waterways & airways TLO6.4 Explain Route alignment, Signaling system	Waterway & Airways: 6.1 Scope of waterways & airways 6.2 Importance of waterways & airways 6.3 Uses of waterways & airways 6.4 Route alignment, Signaling system. Course Outcome:CO6 Teaching Hours: 3 hrs Marks: 06 (R-2, U-4, A-0)

Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills**Development (Self Learning):**

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Draw the cross-section of rail components and layout of a railway station and yard. Prepare the detailed report with site photographs.
- Inspect the nearby railway track, Bridge or tunnel (any one) to enumerate the defects (if any) and prepare the report suggesting the remedial measures for ensuring its stability.
- Prepare a model of a bridge/tunnel to demonstrate the relevant associated concept.
- Prepare a chart showing Classification of tunnels according to purpose, conveyance, material, position or alignment, shape and size or tunnels under different conditions
- Collect photographs of different types of bridge and tunnels from actual site and compare their relevance at that particular site.
- Prepare models of different gauges used in railways.
- Draw layout of Airport.

IV. Specification Table:

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction	4	2	0	06
2	Geometric Design of Highway	4	6	4	14
3	Construction of Road Pavements	2	4	4	10
4	Basics of Railway Engineering	5	5	2	12
5	Track geometrics, Construction and Maintenance	4	4	4	12
6	Waterways & Airways	2	4	0	06
Total		21	25	14	60

V. Assessment Methodologies/Tools**Formative assessment (Assessment for Learning)**

TH- Progressive /Periodic Test each of 20 Marks

SL - Continuous Assessment of Self Learning for 25 Marks

Summative Assessment (Assessment of Learning)

TH - Term End examination of 60 Marks

Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	3	3	1	1	3	2	2	2	1
CO2	3	3	3	3	2	2	2	2	2	3
CO3	3	3	2	3	2	3	2	2	2	3
CO4	3	3	3	3	2	3	2	2	2	3
CO5	3	3	3	3	2	3	2	2	2	3
CO6	3	2	3	3	2	3	2	2	2	2
Legends: - High:03, Medium:02, Low:01, No Mapping: --										

VI. Suggested Learning Materials / Books Sr. No.

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Transportation Engineering	L.R. Kadiyali Khanna Publishing House, New Delhi	ISBN: 978-9382609-858 Edition 2018
2	Highway Engineering	Khanna S.K., Justo, C E G and Veeraragavan Nem Chand and Brothers, Roorkee.	ISBN : 8185240779, 9788185240770
3	Transportation Engineering	Arora, N. L. Khanna Publishers, Delhi.	ISBN-13978-93-87394-29-2
4	A Textbook of Railway Engineering	Saxena S. C. and Arora S. P. Dhanpat Rai Publication.	ISBN-13: 978-8189928834
5	Road, Railways, Bridge and Tunnel Engg	Birdi, Ahuja Standard Book House, New Delhi.	ISBN-13: 978-8189401337
6	Airport Engineering	G.Venkatappa Rao, Tata McGraw-Hill Publishing Company, New Delhi, 1992.	ISBN, 0074603175 9780074603178

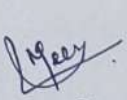
VII. Learning Websites & Portals

Sr.No	Link / Portal	Description
1	www.oupinheonline.com	
2	https://www.engineeringcivil.com	
3	www.youtube.com/watch?v=2g6s4euVoWo&list	
4	http://civildigital.com	
5	http://www.quora.com	
6	www.railway-technical.com	
7	http://www.nationallibrary.gov.in	

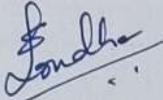
VIII. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Shri. S D Borkar	Deputy Engineer	PWD
2	Shri. Sudhir Nimbalkar	Assistant Engineer	BMC

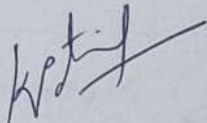
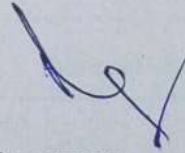
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Mrs. Meera Deshmukh	Lecturer in Civil Engg.	Govt. Polytechnic Mumbai



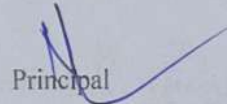
Coordinator,
Curriculum Development,
Department of Civil Engineering



Head of Department
Department of Civil Engineering

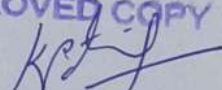


I/C, Curriculum Development Cell



Principal

APPROVED COPY


CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in Civil Engineering (Sandwich Pattern)													
Course Code: CE23105						Course Title SURVEYING II							
Compulsory / Optional: Compulsory													
Learning Scheme and Credits						Assessment Scheme							
CL	TL	LL	SLH	NLH	Credits	FA-TH		SA-TH (2:30 Hrs.)	FA- PR	SA		SLA	Total
						T1	T2			PR	OR		
3	-	4	1	8	4	20	20	60	25	50#	-	25	200

Total IKS Hrs. for course: 3

Abbreviations: CL- Class Room Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note:

1. FA-TH represents marks of two class tests of 20 marks each conducted during the term.
2. SA-TH represents the end term examination.

I. Rationale

Development and planning process for any civil engineering project needs survey of that area to be carried out and various types of survey maps are to be prepared. In the era of globalization today, the technology has brought the significant advancements in surveying instruments and techniques. This results in the availability of the precise digital surveying instruments like Electronic Distance Meter (EDM), Micro Optic Theodolite, Total Station Instrument, and Global positioning System (GPS) which are being used currently due to its accuracy, speed and easy operation of the same. Since, Remote sensing and Geographic Information System (GIS) is a vital discipline and being widely used for plotting and storing spatial information, it is expected the students should know the basics of the same to apply it in field. Therefore, the content of this course are designed to deal with the concepts and the principles related to the various advanced digital surveying instruments and the techniques to operate the same to get the desired out put in a short period with highest accuracy. Through this course students will develop the desired skills and competencies which are expected from them for survey related works. This course is therefore one of the core courses required for Civil Engineers.

II. Industry / Employer Expected Outcome

Select a building/infrastructure project where right from starting to end, various advanced digital surveying instruments and the techniques are used and practiced and the students excel and master these techniques and instruments.

III. Course Outcomes:

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1	Use Theodolite to perform survey.
CO2	Prepare plan of the areas using Theodolite
CO3	Find distance and elevations using Tacheometer
CO4	Set out simple circular curves
CO5	Prepare plan of the areas using Total Station instrument
CO6	Locate coordinates of stations using GPS

Course Content Details:

Unit No.	Theory Learning Outcomes (TLO)	Topics / Sub-topics
1	TLO1.1 Explain types and uses of Theodolite; Component parts of transit Theodolite and their functions TLO1.2 Describe technical terms TLO 1.3 Explain fundamental axes of transit Theodolite TLO1.4 Explain temporary adjustment of transit Theodolite TLO1.5 Describe measurement of horizontal angle TLO 1.6 Describe measurement of magnetic bearing of a line, deflection angle	Theodolite Surveying: 1.1 Types and uses of Theodolite; Component parts of transit Theodolite and their functions, Reading the Vernier of transit Theodolite 1.2 Technical terms- Swinging, Transiting, Face left, Face right 1.3 Fundamental axes of transit Theodolite and their relationship 1.4 Temporary adjustment of transit Theodolite 1.5 Measurement of horizontal angle- Direct and Repetition method, Measurement of vertical Angle. 1.6 Measurement of magnetic bearing of a line, deflection angle. Course Outcome: CO1, Teaching Hours :5hrs Marks: 10(R-4, U-6, A-)
2	TLO2.1 Explain Traverse Parameters TLO2.2 Describe Theodolite traversing TLO2.3 Explain traverse computation and calculations TLO2.4 Explain Gale's traverse table computation TLO2.5 Explain calculation of area from total Latitudes and Departures.	Theodolite Traversing and Computations 2.1 Traverse Parameters- Open Traverse, Closed Traverse. 2.2 Theodolite traversing by included angle method and deflection angle method. Check in open and closed traverse, Calculations of bearing from angles. 2.3 Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, Balancing the traverse by Bowditch's rule and Transit rule. 2.4 Gale's Traverse table computation. 2.5 Calculation of area from total Latitudes and Departures. Course Outcome: CO2 Teaching Hours :8hrs Marks:14 (R-2 , U-4, A-8)
3	TLO3.1 Explain Principle of tacheometry, tacheometer and its component parts, Characteristics of tacheometer TLO3.2 Explain the tacheometric formula for horizontal distance with telescope horizontal and staff vertical TLO3.3 Explain field method for determining constants of tacheometer TLO3.4 Determine horizontal and vertical distances with tacheometer by fixed hair method when line of sight is inclined and staff held vertical	Tacheometric surveying: 3.1 Definition, Principle of tacheometry, tacheometer and its component parts, Characteristics of tacheometer. 3.2 Tacheometric formula for horizontal distance with telescope horizontal and staff vertical. 3.3 Field method for determining constants of tacheometer. 3.4 Determining horizontal and vertical distances with tacheometer by fixed hair method when line of sight is inclined and staff held vertical.(Simple Numerical Problems) 3.5 Limitations of tacheometry. Course Outcome:CO3 Teaching Hours : 4 hrs Marks:10

	TLO3.5 Explain limitations of tacheometry	(R- 2, U- 2 , A-6)
4	TLO4.1 Explain/Describe types of curves used in roads and railway alignments and relation between degree and radius of curve TLO4.2 Explain the Elements of simple circular curve and designation of curve TLO4.3 Setting of simple circular curve TLO4.4 Solve simple numerical problems	Curve setting: 4.1 Introduction, Types of curves used in roads and railway alignments. Relation between degree and radius of curve. 4.2 Elements of simple circular curve. Designation of curve by radius and degree of curve. 4.3 Setting of simple circular curve by offsets from long chord and Rankine's method of deflection angle. 4.4 Simple numerical problems on above. Course Outcome:CO4 Teaching Hours : 4 hrs Marks:10 (R-2, U-2, A-6)
5	TLO5.1 Explain/Describe Principle of Electronic Distance Meter (E.D.M), use of E.D.M., Construction and use of One Second Micro Optic Theodolite, Electronic Digital Theodolite TLO5.2 Explain the Construction and Use of Total Station. Temporary adjustments of Total Station TLO5.3 Explain the Use of function keys. Measurements of Horizontal angles, vertical angles, distances and Coordinates using Total Station TLO5.4 Explain Traversing, Profile Survey and Contouring with Total Station TLO5.5 Explain LiDAR survey TLO5.6 Explain the use of Digital Planimeter	Advanced surveying equipment : 5.1 Principle of Electronic Distance Meter (E.D.M), use of E.D.M., Construction and use of One Second Micro Optic Theodolite, Electronic Digital Theodolite. 5.2 Construction and Use of Total Station. Temporary adjustments of Total Station. 5.3 Use of function keys. Measurements of Horizontal angles, vertical angles, distances and Coordinates using Total Station. 5.4 Traversing, Profile Survey and Contouring with Total Station. 5.5 LiDAR survey (introduction) 5.6 Study and use of Digital Planimeter. Course Outcome:CO5 Teaching Hours :6hrs Marks:10 (R- 2 , U- 4 , A-4)
6	TLO6.1 Explain/Describe Remote sensing, Remote sensing system- Active and Passive system, Applications of remote sensing TLO6.2 Explain the Measurement of area using digital planimeter TLO6.3 Explain Geographic Information System (GIS): Definition, Components and Applications in surveying	Remote sensing and GIS: 6.1 Introduction to Remote sensing, Remote sensing system- Active and Passive system, Applications of remote sensing. 6.2 Construction and Use of Global Positioning System (G.P.S.) 6.3 Geographic Information System (GIS): Definition, Components and Applications in surveying. Course Outcome:CO6 Teaching Hours :3hrs Marks:06 (R- 2 , U- 4 , A- --)

IV. Laboratory Learning Outcome and Aligned Practical / Tutorial Experiences.

Sr No	Laboratory Learning Outcomes (LLO)	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
-------	------------------------------------	--	----------------	--------------

1	LLO1 Demonstrate the functional utility of Transit Theodolite and Perform temporary adjustments of Transit Theodolite	Demonstrate the functional utility of Transit Theodolite and Perform temporary adjustments of Transit Theodolite	2	CO1
2	LLO2 Use transit theodolite to carry out Survey Project for closed traverse having minimum 5 sides.	Use transit theodolite to carry out Survey Project for closed traverse having minimum 5 sides.	8	CO2
3	LLO3 Use theodolite as a tachometer to compute reduced levels and horizontal distances correctly	Use theodolite as a tachometer to compute reduced levels and horizontal distances correctly	2	CO3
4	LLO4 Set out a circular curve by offsets from long chord method.	Set out a circular curve by offsets from long chord method.	2	CO4
5	LLO5 Demonstrate the functional utility of the components of Total Station and the function of keys and perform its temporary adjustments.	Demonstrate the functional utility of the components of Total Station and the function of keys and perform its temporary adjustments.	2	CO5
6	LLO6 Use GPS to locate the coordinates of a station correctly	Use GPS to locate the coordinates of a station correctly	2	CO6
7	LLO7 Use transit theodolite to measure Horizontal and Vertical angle correctly by direct method	Use transit theodolite to measure Horizontal and Vertical angle correctly by direct method	2	CO1
8	LLO8 Use transit theodolite to measure Horizontal angle correctly by method of Repetition	Use transit theodolite to measure Horizontal angle correctly by method of Repetition	6	CO1
9	LLO9 Prepare Gale's traverse table and Plot the traverse on A1 size imperial drawing sheet for the output of Survey Project mentioned at practical no.2	Prepare Gale's traverse table and Plot the traverse on A1 size imperial drawing sheet for the output of Survey Project mentioned at practical no.2	6	CO2
10	LLO10 Set out a circular curve by Rankine's method of Deflection angles	Set out a circular curve by Rankine's method of Deflection angles	2	CO4
11	LLO11 Use Total station instrument to measure horizontal distance, horizontal angle and vertical angle.	Use Total station instrument to measure horizontal distance, horizontal angle and vertical angle.	6	CO5
12	LLO12 Use Total station instrument to carry out Survey Project for closed traverse having minimum 5 sides.	Use Total station instrument to carry out Survey Project for closed traverse having minimum 5 sides.	8	CO5
13	LLO13 Plot the traverse on A1 size imperial drawing sheet for the output of Survey Project	Plot the traverse on A1 size imperial drawing sheet for the output of Survey Project mentioned at practical no.12	6	CO5

	mentioned at practical no.12			
14	LLO14 Use One Second Micro Optic Theodolite / Digital Theodolite to Measure Horizontal angle by direct method	Use One Second Micro Optic Theodolite / Digital Theodolite to Measure Horizontal angle by direct method	4	CO5
15	LLO15 Use Digital Planimeter to measure area of any irregular figure.	Use Digital Planimeter to measure area of any irregular figure.	2	CO5

V. Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills Development (Self Learning):

1. Experiment No. 2 & 9: Survey Project with theodolite for closed traverse

Survey Project for closed traverse having minimum 5 sides and prepare Gale's traverse table . 1 Full day Project

2. Experiment No. 11: Survey Project with total station for closed traverse

Undertake Survey Project of closed traverse having minimum 5 sides 1 Full Day Project

3. Assignment: Google earth application for measurement of area and length in a region

Formative assessment (Assessment for Learning) for PR and SLA

- ♦ Rubrics for continuous assessment based on process and product related performance indicators(____ marks)

Summative Assessment (Assessment of Learning)

End term examination, Viva-voce, Workshop performance (____marks)

4. Suggested COs - POs Matrix Form

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO - 2	PSO - 3

CO1	3	3	3	2	1	1	2	2	2	3
CO2	3	3	3	2	2	1	2	2	2	3
CO3	3	3	2	2	2	1	2	2	2	3
CO4	3	3	3	2	2	2	2	2	2	3
CO5	3	3	3	3	2	1	2	2	2	3
CO6	3	2	3	3	2	1	2	2	2	2

Legends: - High:03, Medium:02, Low:01, No Mapping: --

5. Suggested Learning Materials / Books

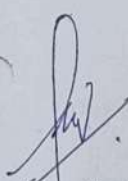
Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Surveying and Levelling	N. N. Basak Tata McGraw Hill Education Private Ltd. New Delhi, 33 rd reprint 2010	ISBN 93-3290-153-8
2	Surveying and Levelling volume I & II	Kanetkar, T. P.; Kulkarni, S. V. Pune Vidyarthi Gruh Prakashan	ISBN 978-81-858-2511-3 & ISBN 13: 9788185825007
3	Surveying and Levelling	Subramanian, R. Oxford University Press.	ISBN 13: 978-0-19-808542-3
4	Survey I and Surveying II	Duggal, S. K. McGraw Hill Education Private Ltd. New Delhi,	ISBN 978-00-701-5137-6 and ISBN-13: 978-1259029837
5	Surveying Vol. I and Vol. II	Punmia B.C., Jain Ashok Kumar; Jain Arun Kumar Laxmi Publications., New Delhi.	ISBN: 8-17-008853-4 ISBN 13: 9788170088837

6. Learning Websites & Portals

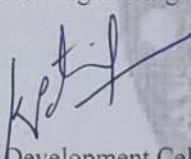
Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=n_EMrTbDZak	
2	https://www.youtube.com/watch?v=H2AQq2jshgg	
3	https://www.youtube.com/watch?v=C8UKJtZIAWE	
4	https://www.youtube.com/watch?v=J6j_sJyyudl	
5	http://www.asnu.com.au	
6	www.oupinheonline.com	
7	http://www.nationallibrary.gov.in	

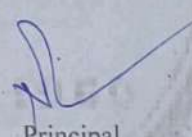
7. Academic Consultation Committee/Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organization
1	Shri. S D Borkar	Deputy Engineer	PWD
2	Shri. Sudhir Nimbalkar	Assistant Engineer	BMC
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Mr. Rohan Deokar	Deputy Engineer	MMRDA
5	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarniPvt.Firm
6	Mr D K Fad	Lecturer in Civil Engg.	Govt. Polytechnic Mumbai


Coordinator,
Curriculum Development,
Department of Civil Engineering


Head of Department
Department of Civil Engineering


I/C, Curriculum Development Cell


Principal

APPROVED COPY


CDC Co-ordinator
G. P. Mumbai

Programme : Diploma in ME/CE/EE/CO/IF/IS/EC/RT/LT/LG (Sandwich Pattern), AIML												
Course Code: UV23302						Course Title : Universal Human Values-II						
Compulsory / Optional: Compulsory												
Learning Scheme and Credits						Assessment Scheme						
CL	TL	LL	SLH	NLH	Credits	FA-TH	SA-TH	FA- PR	SA		SLA	Total
									PR	OR		
01	-	-	01	02	01	-	-	-	-	-	50	50

Total IKS Hrs. for course: 04

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL- Laboratory Learning, SLH- Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA- Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# Online Examination, @\$ Internal Online Examination

Note:

1. FA-TH represents an average of two class tests of 30 marks each conducted during the term.
2. SA-TH represents the end term examination.

Rationale:

Universal Human Values-I course helped students to discover themselves and comfortably connect with their peers. Students experienced living in harmony with nature by visiting a nature park and participating in activities like tree plantation, beach cleaning and institute cleaning.

The Universal Human Values-II course is more focused on helping students to create health consciousness and experience living in harmony with their bodies. It will help to create a holistic perspective based on self-exploration about themselves, family, society and nature. Patriotic values will be imbibed by learning about the constitution of India.

Through experiential learning, an ideal personality will be developed to excel in the field of work. It is the journey of thought process from 'my family' to 'world family'. In essence, it promotes human values, inculcates ethics and develops the best citizens.

Industry / Employer Expected Outcome:

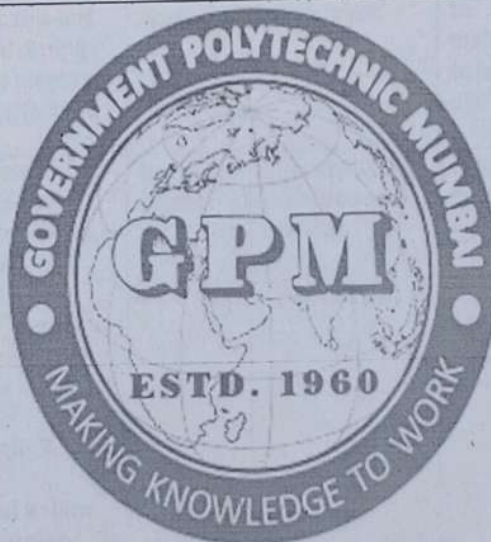
To demonstrate value based behavior at the workplace.

Course Outcomes:

On completion of this course, Students will be able to achieve & demonstrate the following COs on completion of course based learning

C01	Understand and appreciate duties and civic responsibilities.
C02	Develop health consciousness.
C03	Develop respect and recognition for others' work.
C04	Understand the importance of living in harmony with nature and society.
C05	Internalize lessons from great souls who exemplified nobility, courage and righteousness.
C06	Develop holistic well-being through balancing individual needs with common good.

Course Content Details:



Sr. No	CO	Activity	Related Value/s	Methodology of Implementation	Student's Role	Mentor's role	Resources Required
1	C01 C03	Read preamble of constitution and list down duties and responsibilities of a citizen	Patriotism Integrity Loyalty Harmony Righteousness	Read preamble of constitution of India from internet website	Brainstorm to understand the importance of preamble.	Motivate students to present different stories related to Indian constitution	https://www.constitutionofindia.net/constitution_of_india/preamble
2	C06	Prepare your own SWOT Analysis	Self-exploration, Honesty	Analysis and report writing	Thoughtfully analyze self	Explain process of SWOT analysis	Case studies
3	C02	Student will prepare a diet chart, analyze food consumption habit-List food consumed during last 3 days and identify its nutritional effects on body	Health consciousness	Balanced diet chart preparation	Find out the ways to maintain balanced diet chart	Provide information resources	Internet websites, Professional dietician
4	C03 C05	Identify 5 personalities from the areas like sports, defense, politics, businesses and social workers who have demonstrated great spirit of integrity in their life and write a report. e.g. Rajendra singh - Water man of india, Dr. A P J Abdul kalam - scientist and former president of india. Mohammed Yunus - Bangladeshi social entrepreneur, Kapil Dev -Cricketer of the century. David Packard - Chairman of Hewlett-Packard (HP)	Integrity, respect	Information collection and analysis	Identify personalities and study their extraordinary work	Guide students to identify various dimensions of the personality	Internet websites, Institute Library

5	C04 C06	Study the Sustainable Development Goals of the United Nations for peace and prosperity of people and the planet, now and into the future by visiting the following website: https://sdgs.un.org/goals	Social Gratitude Empathy, Compassion, Accountability	Visit the website, study history and List 17 SDGs	Study the sdg in detail (assigned to your group by mentor), prepare presentation	Assign 17 SDGs to different groups of students	Local NGOs working for UN
6	C02 C06	Understanding Eight limbs (Ashtanga) of Yoga for gaining the best mental health. IKS hours- Cultural and spiritual history of India-eight fold path of yoga.	Health consciousness Social gratitude	Arrange the session of a meditation expert to understand the philosophy of Yoga.	Students will need to understand and practice the principles of the eight limbs of yoga. Practice it daily for the best physical and mental health.	Mentors will need to provide guidance on understanding and practicing the principles of the eight limbs of yoga and provide feedback on students' progress.	Resources such as yoga mats or printed materials on the eight limbs of yoga may be required.
7	C05	1.Seven blunders told by Mahatma Gandhi and practice them as an ethic in your daily life to be a moral citizen. 2. Swami Vivekananda and his philosophy 3.Bharatratna Dr Babasaheb Ambedkar and his philosophy, teachings Any other social reformer IKS hours- Cultural history of India-Religious and Civic philosophies.	Character Humanity Sacrifice Honesty Accountability Patriotism	Select any one topic. Prepare Group presentations on selected topics.	Students will need to prepare and present a group presentation on a selected topic.	Mentors will need to provide guidance on preparing and presenting a group presentation and provide feedback on students' presentations.	

Government Polytechnic Mumbai

8	C03 C06	Visit websites of reputed industries and study their Corporate Social Responsibility (CSR) activities. Also arrange an interview of a successful entrepreneur.	Social Gratitude Accountability	Visit CSR section of the website of selected industry	Students will need to research and report on the CSR activities of a selected industry.	Mentors will need to provide guidance on researching and reporting on CSR activities and provide feedback on students' reports.	Access to the internet or relevant industry publications may be required.
9	C03	Analyze behavior pattern of self and group member while performing any group activity	Harmony in behavior	List different group activities, select anyone from the list and perform it.	Students will need to analyze their own behavior and that of their group members during a group activity and record their observations.	Mentors will need to provide guidance on observing and recording behavior patterns and provide feedback on students' observations.	Guidelines for observing and recording behavior patterns may be necessary.

10	C05	Read and create abstract of biography like, 1. Ek Hota Carver 2. Biography of a yogi 3. JRD Tata 4. Mahatma Gandhi 5. Pant pratinidhi 6. Shriman Yogi	Righteousness	Visit library, find out books, read and prepare the report	Students will need to select a biography to read and create an abstract that summarizes the key ideas and messages in the biography.	Mentors will need to provide guidance and support to help students select an appropriate biography and create a well-written abstract.	Access to a library or online resources to select a biography to read and create an abstract.
11	C01 C03 C04	NDRF one day training OR Police Mitra training OR Red cross training OR Fire safety training OR Self defense training for Girls OR CPR training	Accountability Empathy	Plan training with the help of related agencies	Students will need to attend a one-day training session.	Mentors will need to provide guidance on attending the selected training session and ensuring safety.	Access to training facilities and materials may be necessary.

Methodology:

1. The course teacher will be the mentor.
2. In consultation and under supervision of a mentor, the student/ Group of students has to complete the activity.
3. The mentor will work as a facilitator/ advisor.
4. The strategies to learn the course is "Self- Exploratory" and "Experiential Learning"
5. The onus of responsibility for completing the activities is with students.
6. Out of eleven activities the student has to complete at least five no. of activities throughout the term. Activity number two is compulsory.

Suggested Micro Project / Assignment/ Activities for Specific Learning / Skills**Development (Self Learning):**

During self learning hours students have to register online (<https://www.mahayouthnet.in/>) for the following "Youth Leadership for Climate Action" self-paced online courses. After completion of these courses students will appear for the online exam of these courses and earn a certificate of completion. Students will submit these 4 certificates to the mentor.

Sr. No.	Unit	Marks
1	Living with Climate Change	10
2	Water Management and Climate Action	
3	Energy Management and Climate Action	05
4	Waste Management and Climate Action	05
5	Bio-cultural diversity Conservation and Climate Action	05
6	The student has to complete at least five no. of activities out of the 11 activities mentioned in the course content details throughout the term and submit the reports. Each activity carries 05 marks.	25
Total		50

Note: 1. Unit 1 and Unit 2 are presented together and carry one certificate.
2. Unit 3, 4, and 5 are individual units.

Assessment methodologies/Tools:

Formative Assessment (Assessment for Learning)

The student has to complete at least five no. of activities throughout the term. Each activity carries 05 marks.

Criterion No.	Criterion	Max. Marks	Not Satisfactory	Good	Excellent
1	Attendance	01	0	1	1
2	Knowledge	02	0	1	2
3	Presentation / Performance	02	0	1	2
Total		05			

Suggested CO-PO Matrix form:

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/Development of Solutions	PO-4 Engineering Tools, Experimentation and Testing	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
C01	-	-	-	-	-	-	3	-	-	-
C02	-	1	1	-	-	-	1	-	-	-
C03	-	1	-	-	-	-	2	-	-	-
C04	-	1	1	-	1	-	2	-	-	-
C05	-	-	-	-	-	-	3	-	-	-
C06	-	1	1	-	-	-	2	-	-	-

Legends :- High:03, Medium:02, Low:01, No Mapping: -
 *CO PSOs mapping to be formulated at department level

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	978-8-174-46781-2
2	Human Values	A.N. Tripathy, New Age International Publishers, 2003	978-8-122-42589-5
3	Teacher's Manual - A Foundation Course in Human Values and Professional Ethics	R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010	-
4	Science and Humanism, Towards a Unified World View	PL Dhar, RR Gaur, Commonwealth Publications, 1992	978-8-171-69222-4
5	Education for values in schools- a framework	NCERT	-
6	Value oriented education	E N Gawande	-

E-References:

- 1) https://youtu.be/kOJu1vj_BVk (The 10 Most Important Human Values)
- 2) Dr. Prakash Baba Amte- Movie
- 3) <https://youtu.be/QeogOlzG2ls> (Value of Education -short film)

E-References for mentors:

- 1) <https://www.edutopia.org/>

Universal Human Values - II (UV23302)

(Approved copy)

(P23 Scheme)

- Government Polytechnic Mumbai
- 2) <https://sdgs.un.org/goals>
- 3) <https://www.mahayouthnet.in/>

Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Dr. L.A. Patil	Principal (Retired)	Pratap College, Amalner
2	Dr. Nitin Deshpande	Lead Consultant	Dnyanpeeth Academy, Pune
3	Dr. Chandrakant Shahasane	Founder Trustee	Karnala Charitable Trust, Pune
4	Mr. K. V. Patil	Lecturer, Mechanical Engineering	Government Polytechnic, Mumbai
5	Mrs. P. A. Khande	Lecturer, Electronics Engineering	Government Polytechnic, Mumbai
6	Mrs. Vrushali A. Patil	Lecturer, Computer Engineering	Government Polytechnic, Mumbai
7	Mrs. Sanjana Londhe	Lecturer, Civil Engineering	Government Polytechnic, Mumbai
8	Mrs. Swati Shinde	Lecturer, Instrumentation Engineering	Government Polytechnic, Mumbai


Institute Coordinator,
Curriculum Development,




Principal
Government Polytechnic, Mumbai

APPROVED COPY

CDC Co-ordinator
G. P. Mumbai