

GOVERNMENT POLYTECHNIC, PUNE

‘120-NEP’ SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	ADVANCED SURVEYING
COURSE CODE	CE31204
PREREQUISITE COURSE CODE & TITLE	SURVEYING -1 (CE31201)
CLASS DECLARATION COURSE	YES

I. LEARNING AND ASSESSMENT SCHEME:

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme									
			Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TSL				Based on SL		Total Marks			
			CL	TL	LL						Practical		SLA							
											FA-TH	SA-TH	FA-PR	SA-PR	SLA					
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min									
ADVANCED SURVEYING	SEC	3	--	4	1	8	4	2	15	35	50	20	50	20	50#	20	25	10	175	

Total IKS Hrs. for Semester: 6Hrs.

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

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

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are (CL + LL + TL + SL) hrs. * 15 Weeks
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
- 6.* Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Technology has brought significant advancements in the field of surveying. This will help civil engineers for accurate measurements of physical features of various construction projects and with utmost accuracy, speed and easy operation of these surveying equipment. The data obtained by various advanced surveying equipment includes information on topography, grading, elevation, distances etc. Such data obtained helps civil engineers for future project planning and effective execution. Advanced surveying also helps in identifying potential risks associated with construction projects. This course will help students to acquire skills associated with surveying off and buildings.

III. COURSE LEVEL LEARNING OUTCOMES (CO's):

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

- CO1 - Use the Tacheometer to obtain relevant details of the terrain in a given situation.
- CO2 - Set out a Simple Circular curve to finalize the alignment of the given element.
- CO3 - Prepare layout plans using relevant surveying instruments.
- CO4 - Locate the coordinates of given stations using the relevant technology.
- CO5 - Interpret the images of given terrain using Photogrammetric Techniques.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's	Suggested Learning Pedagogies	Relevant CO's
UNIT I– TACHEOMETRIC SURVEYING (CL Hrs.- 10, Marks-08)				
1	<p>TLO 1.1 Explain the principles of Tacheometric surveying.</p> <p>TLO 1.2 Use the tacheometer to determine the reduced level of horizontal and vertical distance in the given situation.</p> <p>TLO 1.3 Select the relevant method of Tacheometric surveying in the given situation.</p> <p>TLO 1.4 Calculate the constants of a Tacheometer from the given data.</p> <p>TLO 1.5 Specify the Limitations of tacheometry with examples.</p>	<p>1.1 Principle of Tacheometry, Use of Tacheometry</p> <p>1.2 Tacheometer and its parts, Analytic lens.</p> <p>1.3 Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.</p> <p>1.4 Methods of Tacheometry: Stadia and fixed hair method. Field method for determining constants of tacheometer.</p> <p>1.5 Limitations of Tacheometry.</p>	<p>Video Demonstrations</p> <p>Presentations</p> <p>Collaborative learning</p> <p>Hands-on</p> <p>Model Demonstration</p> <p>Lecture Using Chalk-Board</p> <p>Demonstration</p>	CO1
UNIT II– CURVES SETTING (CL Hrs.- 08. Marks 08)				
2	<p>TLO 2.1 Classify the curves used in surveying to fix the alignment.</p> <p>TLO 2.2 Draw the labelled diagram of a simple circular curve.</p> <p>TLO2.3 Derive the relationship between the Radius and Degree of the curve.</p> <p>TLO 2.4 Set a simple circular curve using the relevant method of curve setting in the given situation.</p>	<p>2.1 Curve: Definition, Necessity of Curves, Types of curves used in roads and railway alignments.</p> <p>2.2 Elements of the simple circular curve, Designation of the curve by Radius and Degree of the curve.</p> <p>2.3 Radius and Degree of Curve.</p> <p>2.4 Setting out a simple circular curve by offsets from long chord and Rankine's method of deflection angles.</p>	<p>Presentations</p> <p>Lecture Using Chalk-Board</p> <p>Collaborative Learning</p> <p>Video Demonstrations</p> <p>Demonstration</p> <p>Model Demonstration</p> <p>Hands-on</p>	CO2
UNIT III ADVANCED SURVEYING EQUIPMENT (CL Hrs.- 11, Marks 10)				
3	<p>TLO 3.1 Use the EDM to measure the distance between two given stations.</p> <p>TLO 3.2 Use Electronic Digital Theodolite to measure the required angle.</p> <p>TLO 3.3 Explain the procedure to measure the angle between the given lines using the Total Station instrument.</p> <p>TLO 3.4 Undertake the site layout operation for the given building structure using the Total Station instrument.</p>	<p>3.1 Electronic Distance Meter (EDM): Principle of Electronic Distance Meter (EDM), parts and their Functions, use of EDM.</p> <p>3.2 Electronic Digital Theodolite: Construction and Features of Electronic Digital Theodolite, procedure of angle measurement.</p> <p>3.3 Total Station: Introduction, parts with their functions, and Applications of Total Station.</p> <p>3.4 Temporary adjustments, sources of errors in Total Station.</p> <p>3.5 Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station. Traversing.</p> <p>3.6 Profile Survey and Contouring with Total Station.</p> <p>Building Site layout using Total Station: Procedure.</p>	<p>Model Demonstration</p> <p>Video Demonstrations</p> <p>Hands-on Presentations</p> <p>Lecture Using Chalk-Board</p> <p>Collaborative learning</p> <p>Demonstration</p> <p>Site/Industry Visit</p>	CO3

Sr. No.	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's	Suggested Learning Pedagogies	Relevant Cos
UNIT- IV – REMOTE SENSING, GPS AND GIS (CL HRS.- 08, MARKS 05)				
4	<p>TLO 4.1 Propose the relevant system of remote sensing to be used for the given situation.</p> <p>TLO 4.2 Describe the procedure to find out the coordinates of the given station using GPS.</p> <p>TLO 4.3 Use the GIS technology to solve the given civil engineering problem.</p>	<p>4.1 Remote Sensing: Definition, Electro-Magnetic Energy, Active and Passive system.</p> <p>4.2 Applications of remote sensing in Mining, land use / Land cover, mapping, disaster management and environment.</p> <p>4.3 Global Positioning System: Introduction, Construction and Use of Global Positioning System (G.P.S.)</p> <p>4.4 Geographic Information System (GIS): Overview, Component, Sources of errors, applications, Software's in GIS.</p>	<p>Presentations</p> <p>Video</p> <p>Demonstrations</p> <p>Collaborative Learning</p> <p>Lecture Using Chalk-Board</p> <p>Demonstration</p> <p>Site/Industry Visit</p> <p>Case Study</p> <p>Hands-on</p>	CO4
UNIT-V AERIAL SURVEYING AND PHOTOGRAMMETRY (CL HRS.- 08, MARKS 04)				
5	<p>TLO 5.1 Suggest the relevant method of aerial surveying for the given situation.</p> <p>TLO 5.2 Classify the type of drones as per DGCA</p> <p>TLO 5.3 Explain the principles of photogrammetry</p> <p>TLO 5.4 Explain the type of Photogrammetry.</p> <p>TLO 5.5 Specify the Merits and Demerits of Photogrammetry surveying.</p> <p>TLO 5.6 Use the photogrammetry techniques to solve civil engineering problems.</p>	<p>5.1 Aerial surveying: Definition, principle, uses, methods.</p> <p>5.2 DGCA Classification of Drones, Silent Features of Drone Rules, 2021 as per DGCA.</p> <p>5.3 Definition of photogrammetry Basic Principles of photogrammetry. Types of Photogrammetry: Terrestrial and Aerial Photogrammetry. Types of photographs.</p> <p>5.4 Terminology in Aerial Surveying. Merits and demerits of photogrammetry surveying.</p> <p>5.5 Applications of Photogrammetry in civil engineering.</p>	<p>Case Study</p> <p>Video</p> <p>Demonstrations</p> <p>Demonstration</p> <p>Hands-on</p> <p>Collaborative Learning</p> <p>Lecture Using Chalk-Board</p> <p>Presentations</p> <p>Site/Industry Visit</p>	CO5

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL /TUTORIAL EXPERIENCES.

Sr. No.	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles/Tutorial Titles	No. of Hrs.	Relevant Cos
1	LLO1- Use theodolite as a Tacheometer to determine the Tacheometric Constant	*Determine the Tacheometric Constant	2	CO1
2	LLO2- Use theodolite as a Tacheometer to compute reduced levels and horizontal distances	*Determine reduced levels of given stations and horizontal distances by Tacheometric Method (Part I)	2	CO1
3	LLO3- Use theodolite as a Tacheometer to compute reduced levels and horizontal distances	*Determine reduced levels of given stations and horizontal distances by Tacheometric Method (Part II)	2	CO1
4	LLO4- Use the offsets from the Long Chord Method to Set out a circular curve	*Setting out of a circular curve by offsets from the Long Chord Method.	2	CO2

5	LLO5- Apply the technique of Rankine's Method of Deflection Angles to Set out a circular curve	*Setting out a circular curve by Rankine's Method of Deflection Angles. (Project) (Part I). Plot the curve details on an A1-sized imperial drawing sheet.	2	CO2
6	LLO6- Apply the technique of Rankine's Method of Deflection Angles to Set out a circular curve	*Setting out a circular curve by Rankine's Method of Deflection Angles. (Project) (Part II). Plot the curve details on an A1-sized imperial drawing sheet.	2	CO2
7	LLO7-1 Use EDM to measure the horizontal and vertical distance	*Determine horizontal and vertical distance by using EDM.	2	CO3
8	LLO8- Use Electronic Digital Theodolite to determine Horizontal and vertical angles	*Determine Horizontal and vertical angles using Electronic Digital Theodolite	2	CO3
9	LLO9- Setup the Total Station instrument.	Setting up the Total Station instrument on-site for surveying. *Determine horizontal, vertical and slope distances using Total station equipment (Part I)	2	CO3
10	LLO 10- Use the Total station instrument to measure horizontal, vertical and slope distances	*Determine horizontal, vertical and slope distances using Total station equipment. (Part II)	2	CO3
11	LLO11- Use the Total station instrument to measure the given horizontal and vertical angles	*Determine horizontal and vertical angles using Total Station. (Part I)	2	CO3
12	LLO12- Use the Total station instrument to measure the given horizontal and vertical angles	*Determine horizontal and vertical angles using Total Station. (Part II)	2	CO3
13	LLO13- Use Total station to determine Reduce Levels	*Determine the Reduced Levels of given stations (Minimum 10 stations)	2	CO3
14	LLO14 –Use the Total station instrument to measure the Reduced Level for the given road profile project.	Road profile of 100m length using Total Station instrument	2	CO3
15	LLO15 – Use GPS technology to locate the coordinates of a station.	*Locate the coordinates of a station with the help of GPS.	2	CO4
16	LLO 16- Use relevant software for the preparation of contour maps using the given image data	*Write a brief report on the visit to a nearby surveying software laboratory for visualization of image creation of a contouring map of a given area using given data OR Arrange Expert Lecture OR Show study videos of Photogrammetry surveying.	2	CO5
17	LLO17- Use Total Station to prepare the Building site layout	*Prepare Building site layout by using Total Station (Project) (Part I). Plot the project details on an A1-sized imperial drawing sheet.	2	CO3

18	LLO18 – Use Total Station to prepare the building site layout	*Prepare Building site layout by using Total Station (Project) (Part II). Plot the project details on an A1-sized imperial drawing sheet.	2	CO3
19	LLO19 – Use Total station to carry out five-sided closed traverse Surveying Project	*Carry out a 5-sided closed traverse Surveying project by using Total Station. (Project) Plot the traverse details on an A1-sized imperial drawing sheet.	2	CO3

VI. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF LEARNING)

Microproject:

Carry out a comparative study of the following survey instruments of different make and brands: Total station/ EDM/GPS/Digital theodolite.

- Collect the relevant technical and commercial information of a minimum of five advanced survey instruments available in the market with specifications.
- Determine the R Ls of the existing structures like lintels, chajja, slab, and beam using a Tacheometer and Total
- Download specifications for Total Station /EDM / GPS and make a chart.
- Set the profiles of curves at the changes in the alignment of the road on the premises of the institute (minimum two).
- Study the specifications of Mobile devices used for distance measurement. Collect the information on 360-degree laser
- Collect information on software required for mapping of images for photogrammetry. Collect the Information about the Drone survey.
- Collect the information on the Rover survey for land measurement
- Visit to Survey Dept of India to study advanced surveying equipment.

VII. LABORATORY EQUIPMENT / INSTRUMENTS/ TOOLS / SOFTWARE REQUIRED

Sr. No.	Equipment Name with broad specifications	Relevant LLO
1	Twenty-Second Transit theodolite with accessories.	1,2,3,4,5,6
2	G P S Instrument	25
3	Electronic Distance meter (+or- 2mm accuracy) with accessories.	7
4	Electronic Digital Theodolite with accessories.	8
5	Total Station (+ or - 2mm accuracy) instrument with accessories	9,10,11,12,13,14,15,16,17,18,19,

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

Unit	Unit Title	Aligned COs	Learning Hours	R Level	U Level	A Level	Total marks
I	TACHEOMETRIC SURVEYING	CO1	10	2	0	6	08
II	CURVES SETTING	CO2	08	0	4	4	08
III	ADVANCED SURVEYING EQUIPMENT	CO3	11	2	6	2	10
IV	REMOTE SENSING, GPS AND GIS	CO4	08	2	3	0	05
V	AERIAL SURVEYING AND PHOTOGRAMMETRY	CO5	08	4	0	0	04
	TOTAL		45	10	13	12	35

IX. ASSESSMENT METHODOLOGIES / TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Term work, Assignment, Microproject (60% Weightage to process and 40% weightage to product), Question and Answer	Pen and Paper Test (Written Test), Practical Exam

X. SUGGESTED COS-POs-PSOs 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	1	3	2	1	2	3	3	2
CO2	3	3	2	2	2	1	2	2	3	3
CO3	3	3	3	3	2	2	3	3	3	3
CO4	3	2	2	2	2	1	3	2	3	1
CO5	3	1	1	2	2	2	2	3	3	3

Legends:-High:03, Medium:02, Low:01, No Mapping:-
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/ BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Kanetkar T.P. & Kulkarni S. V.	Surveying and Levelling Volume I & II	Pune Vidyarthi Gruh Prakashan, Pune ; ISBN :978- 81-858-2511-3
2	Basak N.N.	Surveying and Levelling	McGraw Hill Education, New Delhi ISBN 93- 3290-153-8
3	S.K. Duggal	Surveying I & II	McGraw Hill Education, New Delhi, ISBN: 978- 00-701-5137-6
4	Punmia B.C, Ashok Kumar Jain, Arun Kumar	Surveying I&II	Laxmi Publications., New Delhi. ISBN: 8- 17- 008853-4
5	Shivam Pandey	Basic Concept of Remote Sensing, GPS, and GIS	Sankalp Publication, Gaurav Path, Bilaspur Chhattisgarh-4955001 ISBN: 978-81-94-77801-1

XII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module7/html/100.htm	Tacheometry Surveying
2	https://www.youtube.com/watch?v=7UhaCqea7IY	Curve Setting
3	https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module11/index.htm	Curve Setting
4	https://nptel.ac.in/courses/105104100	Lecture on Total Station
5	https://www.youtube.com/watch?v=bbs5AEPstl4	Total Station
6	https://www.youtube.com/watch?v=1KCqxx8r5Y4	Electronic Digital Theodolite
7	https://www.youtube.com/watch?v=QLgwwVdMaWU	Remote sensing GIS and GPS
8	https://archive.nptel.ac.in/courses/105/103/105103193/	Remote Sensing and GIS
9	https://onlinecourses.nptel.ac.in/noc22_ce84/preview	Remote Sensing and GIS
10	https://archive.nptel.ac.in/courses/105/104/105104101/	Aerial Surveying and Photogrammetry
11	https://nptel.ac.in/courses/105104100	Aerial Surveying and Photogrammetry

Name & Signature:



Shri. S. S. Mude
Lecturer in Civil Engineering
(Course Experts)

Name & Signature:



Shri. V. G. Tambe
(Programme Head)



Shri. V. B. Kondawar
(CE HOD II Shift)

Name & Signature:



Shri. S. B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE
'120-NEP'S SCHEME

PROGRAMME	DIPLOMA IN CIVIL ENGINEERING
PROGRAMME CODE	01
COURSE TITLE	HIGHWAY AND BRIDGE ENGINEERING
COURSE CODE	CE31206
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING AND ASSESSMENT SCHEME:

Course Code	Course Title	Course Type	Learning Scheme						Credits	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH	Paper Duration Hrs.		Theory				Based on LL & TSL				Based on SL		
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
												Max	Min	Max	Min	Max	Min	Max	Min	
	HIGHWAY AND BRIDGE ENGINEERING	DSC	4	-	2	-	6	3	3	30	70	100	40	25	10	50@	20	-	-	175

Total IKS Hrs for Term: 02 Hrs

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

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that course.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- * Self-learning hours shall not be reflected in the Timetable.
- *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Highway and Bridge Engineering is an important aspect in Civil Engineering; as the progress and integration of nation can well be judged by good network of highways and bridges. This course is expected to develop the competency to execute the construction and maintenance of Highway and Bridges. In order to professionally contribute in the field of highway engineering, the associated engineers and supervisors must have adequate knowledge and skills. The civil engineering diploma holders (also called technologists) have to do the related construction and maintenance activities safely and effectively.

The aim of this course is to attend following industry identified competency through various teaching learning experiences:

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

- a. Identify the types of roads as per IRC recommendations
- b. Identify the geometrical physical design features of different highway.
- c. Undertake construction, drainage and maintenance of roads.
- d. Evaluate traffic flow characteristics.
- e. Diagnose the condition of bridges.
- f. Undertake construction and maintenance of different types of bridges

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No.	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's	Suggested Learning Pedagogies	Relevant Cos
UNIT I. INTRODUCTION (CLHrs-08, Marks- 10)				
1	1a. Describe key features of the given type of road. 1b. Explain road alignment and its requirement. 1c. List the factors affecting given type of alignment in plain and hill area. 1d. Suggest the requirements of alignment in plain and hilly area.	1.1 Necessity and benefits of roads 1.2 Classification of roads according to location, importance, tonnage. 1.3 Highway planning in India. 1.4 Alignment of roads: Requirements and factors affecting alignment of roads in plain and hill area.	Lecture Using Chalk-Board Video Demonstrations Hands-on Presentations	CO1
UNIT II GEOMETRIC DESIGN OF ROADS (CL Hrs.- 14, Marks- 18)				
2	2a. Explain various functional terms related to geometrics of given type of highway with sketches. 2b. Describe the given type of road curves and their necessity. 2c. Calculate SSD, super-elevation and widening of roads required for the given road construction problem 2d. Sketch the cross sections of roads in embankment and cutting for the given site conditions.	2.1 Highway cross-section, c/s of hill road -Right of way, width of carriageway, shoulders, formation width 2.2 Camber-Definition, object 2.3 Gradient-Definition object of providing gradients, Factors affecting gradient 2.4 Sight distance- necessity, factors affecting, Types of sight distance 2.5 Curves- necessity, factors affecting design of curves 2.6 Types of curves-horizontal, vertical, hill road curves	Lecture Using Chalk-Board Video Demonstrations Hands-on Presentations	CO2

		<p>2.7 Widening of carriageway on horizontal curves – necessity</p> <p>2.8 Super elevation – Definition, necessity, methods of providing super elevation.</p> <p>2.9 Design speed, maximum speed, average running speed-definition, factors affecting. (I.R.C. recommendations for each geometric design elements.)</p> <p>2.10 Traffic volume study.</p> <p>2.11 Traffic control devices – necessity, markings, islands, traffic signs, signals.</p>		
<p>UNIT III HIGHWAY CONSTRUCTION, DRAINAGE AND ARBORICULTURE (CLHrs-14, Marks- 18)</p>				
3	<p>3a. Describe the properties of given type of road materials.</p> <p>3b. Explain functions of components of given type of pavements with sketches/s.</p> <p>3c. Describe with sketches the construction method for the given type of road pavement.</p> <p>3d. Explain procedure for testing the given parameter of road construction.</p> <p>3e. Describe with sketches the road construction method for the given situation.</p> <p>3f. Suggest preventive measures to check landslides for given condition with justification.</p>	<p>3.1 Highway pavements – definition, classification – Flexible and rigid pavements, difference between Flexible and rigid pavements.</p> <p>3.2 Earthwork and WBM method of preparation of sub grade, in embankment and cutting, balancing of earthwork, borrow pits, spoil bank, lead and lift Deadman/ Mutam.</p> <p>3.3 Earth roads – construction and Soil stabilization – Necessity, methods.</p> <p>3.4 W.B.M. roads – specification of materials used as per IRC recommendations, construction, maintenance.</p> <p>3.5 Bituminous pavements – Definitions of bitumen, asphalt, cutback, tar and emulsion, Prime coat, tack coat, seal coat, surface dressing,</p> <p>3.6 Premix methods – Bituminous carpet, asphaltic concrete, sheet asphalt.</p> <p>3.7 Cement concrete pavements - materials used, method of construction, types of joints in cement concrete pavements.</p> <p>3.8 Highway Drainage-Definition, necessity, surface, sub-surface and</p>	<p>Lecture Using Chalk-Board</p> <p>Video Demonstrations</p> <p>Hands-on Presentations</p>	CO3

		cross drainage, catch water drains 3.9 Arboriculture-Necessity, selection of trees. 3.10 landslides-types, causes of landslides, prevention and control of landslides.		
UNIT IV OVERVIEW OF BRIDGE ENGINEERING (CL Hrs.- 08, Marks- 10)				
4	4a. Propose the relevant type of bridge for the given situation on the basis of relevant criteria with justification. 4b. Identify the components of a given type of bridge with their functions. 4c. Explain with sketches the bridge section for the given site conditions. 4d. Propose the relevant type of foundation for the given type of bridge for the given situation with justification.	4.1 Definition, factors affecting selection of site for a bridge 4.2 Sub-Structure-Foundation, pier, abutment, wing wall, Approaches-in cutting and embankment. - function and types. 4.3 Superstructure-Bearings- Necessity, function, Types-Fixed bearing, neoprene, Pot-type PTFE bearing. Necessity of keeping one bearing free and Other fixed. 4.4 Bridge girders-function and type. 4.5 Bridge floors-open and solid floors. 4.6 Approaches-in cutting and embankment.	Lecture Using Chalk-Board Video Demonstrations Hands-on Presentations	CO4
UNIT V CONSTRUCTION AND MAINTENANCE OF BRIDGE (CL Hrs-12, Marks- 14)				
5	5a. Suggest the type of bridge for the given site condition with justification. 5b. Describe types of culverts and type of causeways. 5c. Describe the maintenance and repair procedure for the given type of bridge.	5.1 Types depending upon function, span, materials used in construction, relative levels of bridge floor. 5.2 Selection criteria for suitable type of bridge 5.3 Definition, types of culverts- R.C.C. slab culvert, Pipe culvert, Box culvert. 5.4 Cause ways, classification of cause ways. 5.5 Check list for inspection of bridges. 5.6 Routine and special maintenance.	Lecture Using Chalk-Board Video Demonstrations Hands-on Presentations	CO5

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES.

Sr. No.	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles/Tutorial Titles	No. of Hrs.	Relevant Cos
1	LLO1- Visit to Road under construction and prepare a visit report showing all components, construction procedure used.	Visit to Road under construction and prepare a visit report showing all components, construction procedure used.	04	1,3
2	LLO2- Draw standard cross sections of NH/SH/MDR/ODR in embankment and cutting showing all components.	Draw standard cross sections of NH/SH/MDR/ODR in embankment and cutting showing all components.	02	2
3	LLO3- Prepare report of drainage arrangement and arboriculture for experiment no.1	Prepare report of drainage arrangement and arboriculture for experiment no.1	04	3
4	Conduct softening point test on bitumen	Conduct softening point test on bitumen	02	3
5	LLO5- Conduct penetration test on bitumen	Conduct penetration test on bitumen	02	3
6	LLO6- Conduct ductility test on bitumen	Conduct ductility test on bitumen	02	3
7	LLO7- Conduct extraction test on bitumen	Conduct extraction test on bitumen	02	3
8	LLO8- Carry out traffic volume study and represent it diagrammatically for an intersection.	Carry out traffic volume study and represent it diagrammatically for an intersection.	04	4
9	LLO9- Visit existing bridge and prepare a report about its constructional components.	Visit existing bridge and prepare a report about its constructional components.	04	5

10	LLO 10- Prepare a report on different types of bridges. (at least 4 types)	Prepare a report on different types of bridges. (at least 4 types)	02	5,6
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Note

- i. A judicious mix of minimum 10 or more practical LOs/tutorials need to be performed, out of which, the practical marked as ‘*’ is compulsory, so that the student reaches the ‘Precision Level’ of Dave’s ‘Psychomotor Domain Taxonomy’ as generally required by the industry.

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be individually undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should not exceed three.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs. A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Collect all the details of all types of existing NH,SH/ types of bridge across the country
- Evaluate the camber and gradient of any one road of each type of pavement in the vicinity of area of college
- Develop the photographic model of typical pavement structure/bridge for actual visited site
- Advance Techniques of repairs like White topping, preventive maintenance, overlays, MSA (Million Standard Axle Load), utility system, encroachment, forest land under roads
- Inspect the nearby bridge to enumerate the defects and prepare the report suggesting the remedial measures for ensuring its stability.

suggested student-related co-curricular activities: -

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student’s) portfolio which will be useful for their placement interviews:

- Collect the information of NH and SH constructed and under construction across the country.
- Visit the crowded area i.e city/town/village and note down the traffic control devices to suggest the possible action to smooth traffic flow.

- c. Collect the typical samples of drawings and legal documents required for road project.
- d. Prepare the scaled bridge model of any one type using ice-cream sticks.
- e. Visit to any one type of bridge to summarize its components and its present condition and prepare the detailed report with site photographs
- f. Prepare power point presentation or animation for understanding different principles of the course under consideration.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practical, as well as aid to procure equipment by authorities concerned.

Sr.No.	Major Equipment/ Instruments Required	PrO. No.
1	Ring And Ball test apparatus	4
2	Standard Penetrometer with penetration needle	5
3	Ductility Testing Machine with ductility mould and base plate	6
4	Bitumen Extraction Test apparatus-centrifuge machine, oven, weighing balance	7

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	08	02	04	04	10
II	Geometric Design of Roads	14	04	06	08	18
III	Highway Construction, Drainage and Arboriculture	14	04	06	08	18
IV	Overview of Bridge Engineering	08	02	04	04	10
V	Construction and Maintenance of Bridge	12	04	04	06	14
Total		64	18	28	34	70

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Term work, Assignment, Microproject (60% Weightage to process and 40% weightage to product), Question and Answer	Pen and Paper Test (Written Test), Practical Exam

X. SUGGESTED COs- POsMATRIXFORM

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 Engineer- ing 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	3	3	2	2	2	3	3	2
CO2	3	3	3	3	2	3	3	2	3	3
CO3	3	3	3	3	2	2	1	3	3	3
CO4	3	3	3	3	2	2	2	2	3	1
CO5	2	3	3	3	2	2	3	3	3	3

Legends:-High:03, Medium:02, Low:01, No Mapping:-
 *PSOs are to be formulated at the institute level

XI. SUGGESTEDLEARNINGMATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	Khanna S.K.,Justo,C E G and Veeraragavan,A	Highway Engineering	Nem Chand and Brothers, Roorkee, 2010, ISBN 978-8185240800
2	Kadiyali, L.R.	Traffic Engineering and Transport Planning	Khanna Publishers, New Delhi,2008, ISBN: 9788174092205
3	Sharma, S.K.	Principles, Practice and Design of Highway Engineering Sharma, S.K. Design of HighwayEngineering	S. Chand Publication, New Delhi, 2012, ISBN:9788121901314
4	Duggal, Ajay K. And Puri,V.P.	Laboratory Manual in Highway Engineering	New Age International (P) Limited, Publishers, New Delhi, 2010, ISBN: 788122403107
5	Ponnuswamy, S.	Bridge Engineering	Khanna Publishers, New Delhi,2008, ISBN: 978-8174092205
6	Birdi, Ahuja,	Road, Railways, Bridge and Tunnel Engineering	Standard Book House, New Delhi, March 2010, ISBN: 978-8189401337

XII. LEARNING WEBSITES & PORTALS

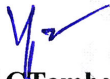
Sr.No.	Link/Portal	Description
1	https://nptel.ac.in/courses/105/101/105101008/	All content related to highway engineering
2	https://nptel.ac.in/courses/105/101/105101087/	All content related to highway engineering
3	https://nptel.ac.in/courses/105/105/105105107/	All content related to highway engineering
4	https://nptel.ac.in/courses/105/107/105107123/	All content related to highway engineering
5	https://nptel.ac.in/courses/105/101/105101008/	All content related to highway engineering

Name & Signature:

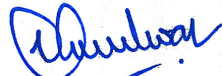


(Mr. D.K. Bhandare)
Lecturer in Civil Engineering
(Course Experts)

Name & Signature:

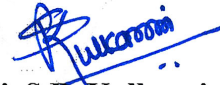


Shri. V.G. Tambe
(Programme Head)



Shri. V.B. Kondawar
(CE HOD II Shift)

Name & Signature:



Shri. S.B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120-NEP'S SCHEME

PROGRAMME	DIPLOMA IN CE
PROGRAMME CODE	01
COURSE TITLE	MECHANICS OF STRUCTURES
COURSE CODE	AM31201
PREREQUISITE COURSE CODE & TITLE	ENGINEERING MECHANICS (AM21201)
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TSL				Based on SL			
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
												Max	Min	Max	Min	Max	Min	Max	Min	
	MECHANICS OF STRUCTURES	DSC	4	--	2	--	06	03	03	30	70	100	40	25	10	50@	20	0	0	175

Total IKS Hrs for Term: Hrs

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

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

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- * Self-learning hours shall not be reflected in the Timetable.
- *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Structural Analysis is the core subject before designing a structure. It gives the way of how a structural member reacts under loads. It is studied in two parts. The first part deals with analysis of structural members & the second part deals with method used in calculating the force in different type of structures.

Thus, the first part of structural analysis is covered in this subject Mechanics of Materials and Structures. This subject deals with the study of properties of engineering and construction materials; computing deformations, stresses, and strains in solid materials; thus, to determine the strength of a structure. Thus, also helping in the selection of material for construction works as well as in the design calculation of structures.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's):

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1-Evaluate practical applications of moment of inertia of symmetrical & unsymmetrical sections.
- CO2 - Interpret structural behaviour of materials & its stresses-strains under various loading conditions.
- CO3 - Compute shear force and bending moment in a beam subjected to point load and UDL.
- CO4 - Determine the bending and shear stresses in beams under different loading conditions.
- CO5 - Understand perfect truss & compute the member forces in trusses by method of joints & sections

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I Moment of Inertia (CL Hrs-6, Marks-12)				
1.	<p>TLO 1.1 Calculate Centroid, Moment of Inertia of Plane Area, radius of gyration of a given standard shape.</p> <p>TLO 1.2 Explain Parallel and Perpendicular axes theorems.</p> <p>TLO 1.3 Calculate Moment of inertia of standard solid shapes.</p> <p>TLO 1.4 Calculate Moment of inertia of hollow rectangular & circular shapes.</p> <p>TLO 1.5 Calculate MI of composite plane figures such as I, Channel, T & L-sections.</p> <p>TLO 1.6 Understand M.I. for built-up section.</p>	<p>1.1 Concept of Moment of Inertia (M.I.) M.I. of plane lamina, radius of gyration</p> <p>1.2 Parallel and perpendicular axes theorems (without derivation)</p> <p>1.3 M.I. of standard basic shapes like rectangle, square, triangle, circle, semi-circle, quarter-circle etc.</p> <p>1.4 M.I. for Hollow Rectangular & Circular sections. (without derivation).</p> <p>1.5 M.I. of Composite plane figures such as symmetrical and unsymmetrical I-section, channel section, T-section, angle section. (Lamina consisting of maximum 03-shapes).</p> <p>1.6 Introduction to M.I. for built-up sections. (No numerical)</p> <p>(IKS*: Concept of Centre of Gravity & M.I. used in ancient constructions like temples, forts etc.)</p>	<p>Demonstration Assignment, Video Demonstration, Chalk-Board, Presentations</p>	CO1
UNIT-II Simple Stresses, Strains & Elastic Constants (CL Hrs-10, Marks-16)				
2	<p>TLO 2.1 Understand Hook's law, elastic limit, Linear and lateral strain, Poisson's ratio.</p> <p>TLO 2.2 Understand concept of stresses and strains in deformable bodies.</p> <p>TLO 2.3 Understand Linear and lateral strain, Poisson's ratio.</p> <p>TLO 2.4 Determine modulus of elasticity, modulus of rigidity and bulk modulus for given material.</p>	<p>2.1 Concept of deformation of elastic body under various forces, definition of stress, strain, elasticity, Hook's law, elastic limit, modulus of elasticity, SI units.</p> <p>2.2 Type of stresses-normal (or direct), bending and shear and nature of direct stresses i.e. tensile and compressive stresses</p> <p>2.3 Linear and lateral strain, Poisson's ratio, changes in lateral dimensions.</p> <p>2.4 Young's Modulus, Shear Modulus, Modulus of Elasticity & Relation between these three moduli.</p>	<p>Demonstration Assignment, Video Demonstration, Chalk-Board, Presentations</p>	CO2

	<p>TLO 2.5 Articulate practical significance of stress- strain curve for given material under given loading conditions for their relevant use.</p> <p>TLO 2.6 Compute the total deformation for given homogeneous (compound) sections under axial load.</p> <p>TLO 2.7 Determine the stresses in each material for given composite section.</p> <p>TLO 2.8 Compute strain along x, y and z-direction for a given bi-axial or tri-axial stress system.</p> <p>TLO 2.9 Determine volumetric strain & change in volume for given cube or cuboid.</p>	<p>2.5 Standard stress strain curve for mild steel bar and Tor steel bar under tension test, Yield stress, proof stress, ultimate stress, breaking stress, and working stress, strain at various critical points, percentage elongation and factor of safety.</p> <p>2.6 Deformation of body subjected to axial force for uniform and stepped sections. Deformation of uniform body subjected to forces at its intermediate sections.</p> <p>2.7 Concept of composite section, stresses induced and load shared by each material under axial loading only.(No numerical on stepped sections).</p> <p>2.8 Uni-axial, Bi-axial and Tri-axial stress systems, strain in each direction.</p> <p>2.9 volumetric stress condition, change in the dimensions and volume, volumetric strain.</p>		
UNIT-III Shear Force & Bending Moment (CL Hrs-10, Marks-14)				
3	<p>TLO 3.1 Enlist Types of Supports & Types of Beams</p> <p>TLO 3.2 Enlist types of loads acting on a beam.</p> <p>TLO 3.3 Understand the relation between SF, BM and rate of loading.</p> <p>TLO 3.4 Draw SFD and BMD for Simply supported beams, Cantilever beams.</p> <p>TLO 3.5 Draw SFD and BMD for overhanging beams.</p> <p>TLO 3.6 Locate point of maximum BM and point of contra-flexure.</p>	<p>3.1 Types of Beams (Simply supported with or without overhang, hinge & cantilever)</p> <p>3.2 Types of loads – concentrated or Point load, Inclined point load & Uniformly Distributed load</p> <p>3.3 Meaning of SF and BM, Relation between them, Sign convention</p> <p>3.4 SFD & BMD for Simply Supported & Cantilever beams subjected to any two types of load combination as per 3.2</p> <p>3.5 SFD & BMD for Overhanging beams subjected to vertical point load & udl only.</p> <p>3.6 Drawing SFD and BMD, Location of Point of Contra-Shear, maximum BM, Location of Point of Contra-flexure.</p>	<p>Demonstration Assignment, Video Demonstration, Chalk-Board, Presentations</p>	CO3
UNIT- IV Bending and Shear Stresses in beams (CL Hrs-12, Marks-16)				
4	<p>TLO 4.1 Understand concept of pure bending , Neutral Axis and radius of gyration of a given lamina and section modulus.</p>	<p>4.1 Theory of pure bending, assumptions in pure bending, Concept of Neutral Axis and section modulus.</p> <p>4.2 Flexural Equation (without derivation)</p>	<p>Demonstration Assignment Video Demonstrations</p>	CO4

	<p>TLO 4.2 Determine Moment of Resistance (M.R.) & section modulus (Z) using Flexural Formula.</p> <p>TLO 4.3 Determine the Bending stresses at given location in simply supported & cantilever beams subjected to standard loading cases (Point load & UDL only).</p> <p>TLO 4.4 Compute & draw maximum and average shear stress for rectangular and circular section.</p> <p>TLO 4.5 Draw shear stress distribution diagram for given section across its depth.</p> <p>TLO 4.6 Determine shear stresses in hollow rectangular section.</p>	<p>with meaning of each term used in equation, bending stresses and their nature, bending stress distribution diagram.</p> <p>4.3 Bending stress variation diagram across depth of given cross section for cantilever and simply supported beams for symmetrical sections only.</p> <p>4.4 Shear stress equation (without derivation), meaning of each term used in equation, relation between maximum and average shear stress for square, rectangular and circular section (numerical), shear stress distribution diagram.</p> <p>4.5 Shear stress distribution diagram for square, rectangular, circle, hollow square, hollow rectangular, hollow circle, T-section and symmetrical I- section only. (no numericals)</p> <p>4.6 Use of shear stress equation for determination of shear stresses in hollow rectangular section.</p>	<p>Chalk-Board Presentations</p>	
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UNIT –V Analysis of Trusses (CL Hrs-7, Marks-12)

5	<p>TLO 5.1 Identify perfect and imperfect trusses.</p> <p>TLO 5.2 Determine member forces in a given truss by Method of joints.</p> <p>TLO 5.3 Determine member forces in a given truss by Method of Sections.</p>	<p>5.1 Concept of perfect and imperfect Trusses. Assumptions made in analysis of perfect Trusses.</p> <p>5.2 Truss analysis by-Method of joints & Method of sections. (simple numericals).</p> <p>5.3 Introduction to Graphical method. (No problems in theory examinations on graphical method).</p>	<p>Demonstration Assignment Video Demonstrations Chalk-Board Presentations</p>	<p>CO5</p>
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V. 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 Identify different components of UTM	Study of Universal Testing Machine	02	CO2
2	LLO 2.1 Perform Tension test on mild steel as per IS:432(1)	Tension test on mild steel as per IS:432(1)	02*	CO2

3	LLO 3.1 Perform tension test on Tor steel as per IS:1608, IS:1139	Tension test on Tor steel as per IS:1608, IS:1139	02*	CO2
4	LLO 4.1 Conduct compression test on sample test piece using Compression Testing Machine	Compression test on sample concrete cube using Compression Testing Machine	02*	CO2
7	LLO 7.1 Determine Compressive strength of dry and wet bricks	Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077	04	CO2
8	LLO 8.1 Perform Single Shear and double shear test on given metals as per IS:5242	Single Shear and double shear test on any two metals e.g. Mild steel/ brass/ Al/copper / cast iron etc. as per IS:5242	02*	CO2 CO4
9	LLO 9.1 Conduct Compression test on timber section along the grain and across the grain	Compression test on timber section along the grain and across the grain as per IS:2408	02	CO2
10	LLO 10.1 Plot Shear force and Bending Moment diagrams beams subjected to different types of loads.	Shear force and Bending Moment diagrams of cantilever, simply supported and overhanging beams for different types of loads (02 problems on each type of beam)	04*	CO3
11	LLO 11.1 Conduct Flexural test on timber beam on rectangular section.	Flexural test on timber beam on rectangular section in both orientations as per IS:1708, IS:2408	02*	CO1 CO4
12	LLO 12.1 Perform Field test on TMT bars.	Field test on TMT bars.	02	CO2
13	LLO 13.1 Conduct Flexure test on floor tiles/roofing tiles.	Flexure test on floor tiles IS:1237, IS:13630 or roofing tiles as per IS:654, IS:2690	02	CO4

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES OR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Microproject:

- 1 Collect the IS related to methods of testing and specifications for five materials used in actual practice.
- 2 Select ten materials from day-to-day life and compare their mechanical properties and present it in a format of report.
- 3 Prepare a report about beam sections subjected to bending and shear stresses from actual field/design office along with photographs and its justification.
- 4 Collect information and present in tabular form, values of Brinell Hardness and Rockwell hardness of commonly used metals
- 5 Prepare demonstration model of Torsion testing machine.
- 6 Prepare excel program for calculation of SF and BM at any given location for Simply supported and cantilever beams.
- 7 Prepare excel program for calculation of Bending stresses for any one type of Simply supported (or cantilever) beam subjected to point load or UDL.

Suggested Student Activities (SLS)

- 1 Compute Polar Moment of Inertia of solid & Hollow circular sections. (any 02 numerical)
- 2 Make a PPT on temperature stresses and strain developed due to temperature variation in homogeneous simple bar. (Also include composite section)

- 3 Make a PPT on strain energy and instantaneous stress induced due to Gradual, Sudden and Impact load and corresponding deformations.
- 4 Make a PPT on Retaining Walls subjected to horizontal pressure & stress distribution at its base.
- 5 Allot any 03 different Video links related to Strength of Materials & write a brief Report on it.
- 6 Difference between 3-point bending & 4-point bending.
- 7 Collect information comprising of any 04 machine components subjected to bending stresses.
- 8 Gather brief information about any 02 Software's (like MDSolids, STAAD etc.) related to mechanics of materials
- 9 Collect the information of Indian Knowledge System (IKS) given in different units.

Assignment: -

Students should conduct the following activities in groups and prepare reports of about five pages for each activity, also collect/record physical evidence for their (student's) portfolio, which will be helpful in their placement interviews:

- a. Prepare journals based on practicals performed in a laboratory.
- b. Prepare charts of maximum bending moment and shear force values in standard beams.
- c. Collect information and standard values of important mechanical properties for five standard materials used in mechanical field.
- d. Present a seminar on different testing methods used in the construction industry.
- e. Collect information comprising of different machine components subjected to bending stresses.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Universal Testing Machine: Capacity - 100 Tons. Type: Mechanical type digital, electrically Operated. Accessories: (1) Tensile test attachment for flat and round specimen up to 32 mm. (2) Compression test attachment (3) Shear test attachment with sizes of bushes 8, 10 mm, (4) Transverse test attachment with bending Punch, (5) Service tools, (6) Operation and maintenance manuals - 2 nos.	LLO1.1
2	Digital/Mechanical Extensometer: Least count - 0.001 mm. Max. Extension = 5 mm. Single dial gauge for 30, 40 mm, 60 mm, 80 mm, 100 mm, 125 mm gauge length.	LLO1.1
4	Impact Testing Machine: IZOD Impact Test Apparatus: Pendulum drop angle: 90°-120; Pendulum effective Wt: 20-25 kg; Striking velocity of a pendulum: 3-4 m/sec; Pendulum impact energy: 168 j; Min scale graduation: 2 J; Distance of axis of pendulum rotation from center of a specimen to specimen hit by pendulum: 815 mm	LLO5.1
5	Compression Testing Machine: Digital display manual control compression testing; machine; Max. Capacity (KN): 2000; Max. distance between two platen (mm): 330; Compression platen size (mm): 220×220; Column clearance (mm): 300×200; Oil pump motor power (KW): 1.5	LLO2.1
6	Tile Testing Machine	LLO6.1
7	Freeware for SF and BM diagrams	LLO7.1

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Moment of Inertia	CO1	06	2	2	12	12
2	II	Simple Stresses & Strains	CO2	10	2	2	8	16
3	III	Shear Force & Bending Moment	CO3	10	2	2	10	14
4	IV	Bending & Shear Stresses in beams	CO4	12	2	2	12	16
5	V	Analysis of Trusses	CO5	07	2	2	8	12
Grand Total				45	10	10	50	70

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
1. Two-unit tests of 30 marks each will be conducted and average of two-unit tests considered. 2. For formative assessment of laboratory learning 25 marks	1. Pen and Paper Test (Written Test) 2. Internal Assessment / ORAL of 50 marks

X. CO-PO MAPPING

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	3	1	2	NA
CO2	3	3	3	2	1	1	3	1	1	NA
CO3	3	3	3	2	1	1	3	1	1	NA
CO4	3	3	3	2	1	1	3	1	1	NA
CO5	3	3	3	2	1	1	3	1	1	NA

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

*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Punmia B. C.	Ashok Kumar Jain	Arun Kumar Jain . Mechanics of Materials Laxmi Publications (p) Ltd. New Delhi
2	Khurmi, R.S.	Strength of Materials	S Chand and Co. Ltd. New Delhi, 2015, ISBN 978-8121928229

3	Ramamurtham, S	Strength of Materials	Dhanpat Rai and sons, New Delhi, 2015, ISBN 9788187433545
4	Rajput R. K.	A Textbook of Strength of Materials	S. Chand Publishing 9789352533695, 9352533690
5	Rattan S.S.	Strength of Materials	McGraw Hill Education; New Delhi 2016, ISBN-13: 978-9385965517

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link/Portal	Description
1.	https://youtu.be/DzyIEz3dKXQ?si=beGDRqJ1olZ70LUe	Concept of Stress and Strain.
2.	https://youtu.be/RSImDKHDMUY?si=FHCxXE1QSaa0FqBn	Stress-strain curve for mild steel & Tor steel bar.
3.	https://www.youtube.com/watch?v=MFZ18Ed4HI8	Field Test on TMT.
4.	https://www.youtube.com/watch?v=C-FEVzi8oe8	Concept of SFD and BMD.
5.	https://www.youtube.com/watch?v=yvbA4mk36Kk	Practical examples of SFD and BMD.
6.	https://www.youtube.com/watch?v=f2eGwNUopws	Concept & Numerical on Point of Contra-flexure.
7.	https://www.youtube.com/watch?v=f08Y39UiC-o	Bending Stresses & Shear Stresses in Beams.
8.	https://skyciv.com/structural-software/beam-analysis-software	Calculation & Drawing of SFD & BMD freeware Software.
9.	https://www.youtube.com/watch?v=9LtW7cknnT0	Trus analysis by method of joints
10.	https://www.youtube.com/watch?v=PXS9n-b5CA8&t=257s	Trus analysis by method of sections

Name & Signature:



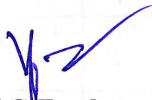
Shri. S.V. Khadake
Lecturer in Applied Mechanics



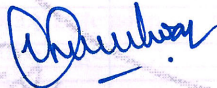
Shri. K.B. Kale
HOD Applied Mechanics

(Course Experts)

Name & Signature:



Shri. V.G. Tambe
(Programme Head)



Shri. V.B. Kondawar
(CE HOD II Shift)

Name & Signature:



Shri. S.B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE**'120 – NEP' SCHEME**

PROGRAMME	DIPLOMA IN CE
PROGRAMME CODE	01
COURSE TITLE	SOIL MECHANICS
COURSE CODE	AM31203
PREREQUISITE COURSE CODE & TITLE	----
CLASS DECLARATION COURSE	NO

I. LEARNING&ASSESSMENTSCHHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration (Hrs.)	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL &TSL		Based on SL					
			CL	TL	LL					FA-TH	SA-TH	Total		Practical		SLA				
			Max	Max	Max	Min	Max					Min	Max	Min	Max	Min				
1	SOIL MECHANICS	DSC	02	--	02	02	06	03	2	15	35	50	20	50	20	50@	20	25	10	175

Total IKS Hrs. for Term: 0 Hrs.

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

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

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

- If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that semester.
- If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
- Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
- 1 credit** is equivalent to **30 Notional hours**.
- * Self-learning hours shall not be reflected in the Timetable.
- *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

All Civil Engineering structures are resting on a soil base. Hence the knowledge of soil and its behavior is essential for technicians. In the laboratory, the experiments integrate the knowledge and develop desired skills in the students.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's) :

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

- CO1 - Know the properties and behavior of soils.
 CO2 - Know & understand various theories and various principles of the course.
 CO3 - Develop the ability to interpret results.
 CO4 - Understand the procedure of testing soil in the Laboratory & in the field.
 CO5 - Comprehend, think and understand other skills.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I PHYSICAL AND INDEX PROPERTIES OF SOIL (CL HRS-16, MARKS-12)				
1.	<p>TLO 1.1 Explain the phases of soil</p> <p>TLO 1.2 Explain various physical properties of soil</p> <p>TLO 1.3. Understand and calculate various physical properties of soil</p> <p>TLO 1.4 Calculate C_u & C_c of soil</p> <p>TLO 1.5 Understand the classification of soil.</p>	<p>1.1 Definition: Soil, Soil Mechanics, Scope in Civil Engineering</p> <p>1.2 Soil as a three-phase system</p> <p>1.3 Physical properties: Void ratio, porosity, sp. Gravity, bulk density, dry density, unit wt., Water content, degree of saturation.</p> <p>1.4 Relation between: Void ratio and porosity, void ratio, sp. gravity & degree of saturation. Sieve analysis, Mechanical analysis (Dry only), particle size distribution curve, C_u & C_c</p> <p>1.5 Soil classification: I.S. classification, plasticity chart. Consistency of soil: LL, PL, SL, Plasticity index, Laboratory determination of G, γ_b, γ_d,</p> <p>1.6 Determination of LL & PL. And w.</p>	<p>Demonstration Assignment Video Demonstrations Chalk-Board Presentations</p>	CO1 & CO2
UNIT-II COMPACTION & CONSOLIDATION (CL HRS-16, MARKS-12)				
2	<p>TLO 2.1 Explain the concept of compaction and consolidation</p> <p>TLO 2.2 Compute degree of compaction</p> <p>TLO 2.3 explains factors affecting compaction and consolidation</p>	<p>2.1 Concept of Compaction & consolidation.</p> <p>2.2 Compaction: Light and Heavy compaction, zero air void line, O.M.C, Std. Procter test. Modified Procter test. Factors affecting compaction.</p> <p>2.3 Field Compaction: Requirement of compaction, compaction control.</p> <p>2.4 Consolidation: Concept of consolidation. Difference between consolidation and compaction.</p>	<p>Demonstration Assignment Video Demonstrations Chalk-Board Presentations</p>	CO3 & CO4
UNIT-III PERMEABILITY OF SOIL (CL HRS-12, MARKS-11)				
3	<p>TLO 3.1 Explain Darcy's law of permeability</p> <p>TLO 3.2. Explain the concept of permeability and the coefficient of permeability</p>	<p>3.1 Definition, concept of permeability, coefficient of permeability, Darcy's law, Factors affecting permeability.</p> <p>3.2 Determination of K by Constant Head permeability test, falling head permeability test (Numerical problems on permeability of soil.)</p>	<p>Demonstration Assignment</p>	CO4 & CO5

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	TLO 3.3 Determination of coefficient of permeability.		Video Demonstrations Chalk-Board Presentations	

V. 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 Identify and calculate the moisture content of the soil	. To determine the moisture content of soil by oven drying method	02	CO2
2	LLO 2.1 Perform Pycnometer test on soil	To determine the specific gravity of soil by pycnometer method	02*	CO2
3	LLO 2.2 Perform Field Density test on soil	To determine bulk & dry density of soil by core cutter method	02*	CO2&3
4	LLO 2.2 Perform Field Density test on soil	To determine bulk & dry density of soil by sand replacement method	02*	CO2
5	LLO 1.4 Determine Cu and Cc of soil	Dry sieve analysis of soil & to plot graph	04	CO2&3
6	LLO 1.5 Identify and classify the soil	To classification of soil using A line chart.	02*	CO2 CO4
7	LLO 2.1 Determine OMC and MDD of soil	To determine OMC & MDD of soil by Standard proctor test.	02	CO2&3
8	LLO 3.1 Determine K of soil.	To determine coeff. of permeability by the variable head method.)	04*	CO3
9	LLO 1.5 Identify and determine the LL of the soil	To determine the LL and PL of soil by Casagrande's apparatus	2	CO3

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES OR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Suggested Student Activities (SLS)

Assignment: -

Students should conduct the following activities in groups and prepare reports of about five pages for each activity, also collect/record physical evidence for their (student's) portfolio, which will be helpful in their placement interviews:

- Prepare journals based on practicals performed in a laboratory.
- Prepare charts of various types of soils in nearby areas.
- Collect information and standard values of important mechanical properties for five different soil materials used in the field.
- Present a seminar on different testing methods used in the construction industry.
- Collect information comprising different soil compacting equipment subjected to different purposes.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Casagdrande's apparatus With std grooving tools	LLO1.5
2	Standard Core cutter:	LLO2.2
3	Standard pycnometer:	LLO2.1
4	Standard sand replacement Soil density apparatus	LLO2.2
5	Standard Proctor Test Apparatus:	LLO2.1
6	Standard Laboratory oven:	LLO1.1
7	Standard falling head permeameter	LLO3.1

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS &ASSESSMENT PURPOSE

(Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	PHYSICAL AND INDEX PROPERTIES OF SOIL	CO1&2	16	4	4	4	12
2	II	COMPACTION & CONSOLIDATION	CO3&4	16	2	2	8	12
3	III	PERMEABILITY OF SOIL	CO4&5	13	2	2	7	11
Grand Total				45	8	8	19	35

IX.ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Term work, Assignment, Question and Answer	Pen paper test 50% and 50% practical performance

X. CO-PO MAPPING

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 Engineer- ing 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	1	2	2	1	3	1	2	NA

CO2	3	3	1	2	2	1	3	1	1	NA
CO3	3	3	1	2	2	1	3	1	1	NA
CO4	3	3	1	2	2	1	3	1	1	NA
CO5	3	3	1	2	2	1	3	1	1	NA

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

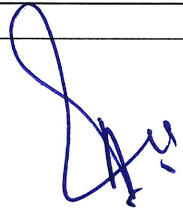

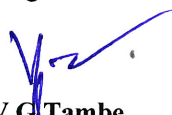


*PSOs are to be formulated at the institute level

XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	B.J.Kasmalkar	Introduction to Soil Mechanics	Pune Vidyarthi Gruha Publication
2	Khurmi, R.S.	Soil Mechanics and Geotechnical Engineering	S Chand and Co. Ltd. New Delhi, 2015, ISBN 978-8121928229
4	Punmia B C	Soil Mechanics	Laxmi Publications (p) Ltd. New Delhi, 2015, ISBN-13: 978-8131809259

XII. LEARNING WEBSITES & PORTALS

Sr. No	Link/Portal	Description
1.	www.nptel.com	All contents of Soil mechanics
2.	nptel.iitm.ac.in/courses/.../IIT.../lecture%2023%20and%2024.html	All contents of soil engineering
3.	en.wikipedia.org/wiki/soil.Liquid_limit	Contents related to Liquid Limit

Name & Signature:		Name & Signature:	
 Shri. H.P. Naiknavare Lecturer in Applied Mechanics (Course Experts)		 Dr. K.B. Kale HoD Applied Mechanics	
Name & Signature:		Name & Signature:	
 Shri. V.G. Tambe (Programme Head)	 Shri. V.B. Kondawar (CE HOD II Shift)	 Shri. S.B. Kulkarni (CDC In-charge)	

GOVERNMENT POLYTECHNIC, PUNE
'120-NEP'SCHEME

PROGRAMME	DIPLOMA IN CE
PROGRAMME CODE	01
COURSE TITLE	CONSTRUCTION MANAGEMENT
COURSE CODE	CE41203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME:

Course Code	Course Title	Course Type	Learning Scheme					Credits	Paper Duration (hrs)	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SLH	NLH			Theory Practical			Based on LL & TSL				Based on SL			
			CL	TL	LL					FA-TH	SA-TH	Total	FA-PR		SA-PR		SLA			
			Max	Max	Max	Min	Max						Min	Max	Min	Max	Min			
CE41203	CONSTRUCTION MANAGEMENT	DSC	1	0	2	1	04	02	----	----	---	---	---	25	10	---	---	25	10	50

Total IKS Hrs. for Term: 1 Hrs.

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

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

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

The construction industry is in continuous need of skilled professionals, capable of managing projects efficiently in the capacity of project engineers, construction managers, site supervisors, and project coordinators, among others. It is required for a civil engineer to plan, manage and execute Civil Engineering works with utmost precision within the time frame to optimize the resources. Therefore, it is necessary to develop a perfect blend of knowledge, skills, and attitudes in the form of competencies among the learners to tackle such engineering projects effectively and efficiently leading towards sustainable development. This course will help in developing these basic competencies among the students which will enable them to get employment in the market.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's):

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Conduct the project feasibility analysis of the given project.

CO2: Apply the relevant scheduling technique in the given situation to decide the ethical element of the project.

CO3: Manage the inventory using relevant inventory control techniques.

CO4: Execute the project as per the prevailing safety practices.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's	Suggested Learning Pedagogies	Relevant Cos
UNIT 1. PROJECT INITIATION AND ITS FEASIBILITY (CL Hrs-06, Marks-NIL)				
1.	<p>TLO 1.1 Explain the term, "Project Life Cycle" with its importance.</p> <p>TLO 1.2 Identify the characteristics of the given project with relevant constraints.</p> <p>TLO 1.3 Select the project from the available options based on feasibility analysis.</p> <p>TLO 1.4 Justify the importance of project management frameworks and standards.</p>	<p>1.1 Project: Basic Definitions, management functions, ethics, project life cycle- Project Initiation, Project Planning, Project execution, Project Monitoring and Controlling, Project Closing.</p> <p>1.2 Project Characteristics and Constraints- Scope, time, cost, quality; Stakeholder.</p> <p>1.3 Project Feasibility Analysis- Market analysis, financial analysis- Net Present Value (NPV), Payback Period, examine the business problem / opportunity, Identify the requirements, undertake a feasibility study, Rank the feasibility results- Define the criteria, give ranking scores, Identify the feasibility outcome.</p> <p>1.4 Project Management Frameworks and Standards, Project Management consultant (PMC)- roles & responsibilities.</p>	Lecture Using Chalk-Board, Presentations Site/Industry Visit, Presentations	CO1
UNIT - II PROJECT MANAGEMENT AND SCHEDULING (CL Hrs-05, Marks-NIL)				
2.	<p>TLO 2.1 Identify the broad activities involved in a given construction project.</p> <p>TLO 2.2 Apply the relevant technique of analysis to get the required information about the given project.</p> <p>TLO 2.3 Explain the process of developing the critical path line in solving the given problem.</p>	<p>2.1 Broad activities in construction work – earthwork, foundation, RCC work, brickwork, scaffolding, plastering, painting etc. & duration required for completing the activity.</p> <p>2.2 Methods of Scheduling-Gantt Chart, Bar chart, Development of Bar charts and Gantt chart, merits & limitations of Bar chart & Gantt chart.</p> <p>2.3 Concept of CPM & PERT: Introduction to Critical path method (CPM), Program evaluation & review techniques (PERT), Network Diagramming of Projects Activity-on arrow (AOA) Diagrams- Concept of Activity and Event, Time-Analysis of Networks- Forward Pass, Backward Pass, Probabilistic Durations- Optimistic Time, Pessimistic Time, Most Likely Time, Project Scheduling- ES and LS Schedules as Limits, Resource Scheduling, Time/Cost Trade-off</p>	Lecture Using Chalk-Board, Video Demonstrations, Hands-on Presentations	CO2

UNIT – III MATERIAL MANAGEMENT (CL Hrs-02, Marks-NIL)				
3.	TLO 3.1 Apply the relevant material management techniques in the given construction project. TLO 3.1 Identify Storage and stacking of construction materials.	3.1 Material Management-Introduction, Inventory and inventory control, EOQ (Economic order of quantity), ABC technique, V-E-D analysis, Just in Time Strategy (JIT), store management & various records related to store management. 3.2 Identify Storage and stacking of construction materials as per Indian standard.	Lecture Using Chalk-Board Video Demonstrations, presentations Site/Industry Visit	CO3
UNIT - IV SAFETY & LABOUR LAWS IN CONSTRUCTION (CL Hrs-02, Marks-NIL)				
4.	TLO 4.1 Explain the remedial measures with preventative strategies for the relevant identified cause of accidents on construction sites. TLO 4.2 Follow the relevant legal provisions related to labor laws in project execution.	4.1 Importance of Safety in construction work, causes of accidents on construction site & remedial measures, precautions to avoid accidents at site, safety policies. 4.2 Introduction to Labor laws related to construction- Workman Compensation Act, Minimum Wages Act, The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, Janshree Vima Yojna.	Lecture Using Chalk-Board Video Demonstrations Presentations Site/ Industry Visit	CO4

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Sr. No.	Practical /Tutorial /Laboratory Learning Outcome (LLO)	Laboratory Experiment /Practical Titles /Tutorial Titles	No. Of Hrs.	Relevant COs
1	LLO 1.1 Identify the roles and responsibilities of manpower required for a construction project.	*Draw the flow chart of manpower required for a given type of project.	2	CO1
2	LLO 2.1 Select the relevant resources required for foundation, RCC or Brickwork for a given construction project/data	*Draw the resource allocation plan for the Foundation or RCC or Brickwork activity on the construction site.	2	CO1
3	LLO 3.1 Select the relevant resources required for Structural members of the beam or column for a given construction project /data.	Draw resource allocation plan for Structural members for beam or column or slab for G+5 activity on site.	2	CO1
4	LLO 4.1 Select the relevant resources required for plastering or flooring for a given construction project/data.	Draw resource allocation plan for plastering painting or flooring activity on site.	2	CO1
5	LLO 5.1 Select different equipment used to carry out the construction of the building	Write a brief report of the site inspection with special reference to construction equipment used in the project with relevant photographs, video etc.	2	CO1

6	LLO 6.1 Apply the concept of a bar chart /Gantt chart to get the required information about the given project.	Draw the bar chart / Gantt chart for the activities of a given construction project by using MS Excel/MS Project.	2	CO2
7	LLO 7.1 Apply the concept of a network diagram to get the required information about the given project.	Forecast the time duration required for various activities of the given construction project to represent them through a network diagram.	2	CO2
8	LLO 8.1 Determine/Find the duration of the project and the sequence of critical activities.	*Solve the numerical on CPM for finding the duration of project and the critical path of any one problem for the given data.	2	CO2
9	LLO 9.1 Apply the concept of the PERT technique to get the required information about the given project.	*Solve the numerical on PERT to represent the sequence of activities and critical path of any one problem for the given data.	2	CO2
10	LLO 10.1 Determine the Economic Order Quantity (EOQ) based on the given data.	*Determination of EOQ (Economic order quantity) based on the given data. (Solve one Numerical)	2	CO3
11	LLO 11.1 Identify the most important product in a given construction project/data.	*Carry out the ABC analysis for the given problem/data (Solve one Numerical)	2	CO3
12	LLO 12.1 Select the causes and remedial measures for a given construction project/data.	*Prepare a report on a minimum of five expected causes of accidents on construction sites with their remedial measures. (Visit any one Industrial/ Residential/Public construction building)	2	CO4
13	LLO 13.1 Select the action plan measures for a given construction project/data.	*Prepare a brief report of the observation made on-site concerning safety on site (Visit any one Industrial /Residential/ Public construction building)	2	CO4
14	LLO 14.1 Select various safety devices used at the given construction site	Prepare the charts/report on various safety devices used at a given construction site (Visit any one Industrial / Residential /Public construction building)	2	CO4
<p>Note: Out of the above suggestive LLOs -</p> <p>*' Marked Practical's (LLOs) Are mandatory.</p> <ul style="list-style-type: none"> A minimum of 80% of the above list of lab experiments are to be performed. Judicial mix of LLOs is to be performed to achieve desired outcomes. 				

VI. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment:

- Prepare a brief report on an overview of Construction Professional Practice in India.
- Solve the numerical on bar chart, CPM and cost optimization for the given data.
- Collect and interpret various store forms from PWD, WRD, and MJP.
- Download the labor laws documents from the internet and write a summary on it.
- Learn material management modules from the SAP website.
- Visit a Site to study the construction technique and use of major construction equipment.
- Students should watch any 3-learning website link given in the XIII learning websites & portal and prepare a brief report on it.
- Prepare a brief report on the role of the construction industry in national development.
- Compile a minimum of 10 safety slogans displayed at various sites with sources and write a summary on it.
- Prepare project cost analysis for small construction projects.
- Collect & interpret bar chart/CPM network for existing construction projects.

Micro project:

- Prepare a report on different forms of inventory storage along with your interpretation and collect the information about the latest safety measures adopted at construction projects.
- Collect information and prepare a report on any one top construction companies in India.
- Compare any 3-construction management software.
- Use any one free open ware software to collect information about modern techniques of material management like JIT / SAP / ERP / MSP / MS EXCEL / Primavera.
- Collect information and prepare a report on various construction equipment used in the construction industry.
- Use any one free open ware software of Construction Management to prepare the scheduling of a project.
- Use any one free open ware software of Construction Management to determine the critical path for the given construction project.
- Interpret the network figures used in given civil engineering projects.

Note:

- The above is just a suggestive list of microprojects and assignments; faculty must prepare their bank of microprojects, assignments, and activities similarly.
- The faculty must allocate a judicious mix of tasks, considering the weaknesses and/or strengths of the student in acquiring the desired skills.
- If a micro project is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have an associated SLA component, the above suggestive listings apply to Tutorials and may be considered for FA-PR evaluations.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with broad specifications	Relevant LLO
1	Free Open ware software- 1. Just-In-Time (JIT), 2. System Application & Product in Data Processing (SAP), 3. Microsoft Project (MSP) 4. Microsoft Excel (MS Excel) 5. Primavera 6. Enterprise Resource Planning (ERP)	2,3

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE
(Specification Table)

NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES / TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Term work, Self-Learning Assessment (Assignment & Microproject). Note: Each Practical will be assessed considering 60% weightage to process-related and 40 % weightage to product-related.	—

X. SUGGESTED COS-POs–PSOs 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	1	2	2	2	2	2	2	2
CO2	3	3	1	2	2	2	2	2	3	3
CO3	3	3	1	2	1	2	2	3	3	2
CO4	2	1	2	2	2	2	2	1	2	2

Legends: -High:03, Medium:02, Low:01, No Mapping: -
*PSOs are to be formulated at the institute level





XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	S.C. Sharma, S.V. Deodhar	Construction Engineering and Management	Khanna Book Publishing Co (P) Ltd. ISBN 9789386173980
2	IGNOU	Project Management	Indira Gandhi National Open University(eKumbh-AICTE)
3	K. K. Chitkara	Construction Project Management- Planning, Scheduling & Controlling	McGraw Hill Education ISBN-10 0070680752, ISBN-13 978-0070680753
4	L. S. Srinath	PERT And CPM Principles and Applications	East-West Press (Pvt.) Ltd. ISBN-10 8185336202 ISBN-13 978-8185336206
5	Jack Gido, Jim Clements, Rose Baker	Successful Project Management	Cengage Publication ISBN: 9781337363853

XII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://archive.nptel.ac.in/courses/105/103/105103206/	Construction Method and Equipment Management
2	https://www.youtube.com/watch?v=Cx7i2wXB0kA&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=16	Project Scheduling
3	https://www.youtube.com/watch?v=j6VIIIXT0Vs&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=22	Accidents in the Construction Industry
4	https://www.youtube.com/watch?v=EVsi1QamfU0&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=26	Safety Organization and Safety Officer
5	https://www.youtube.com/watch?v=QoXvRBrFWyI&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=25	Implications of Construction Accidents

6	https://archive.nptel.ac.in/courses/105/104/105104161/	Introduction to planning and scheduling, resource levelling and allocation, crashing of networks
7	http://www.cidc.in/	Construction Industry Development Council (CIDC)
8	https://onlinecourses.nptel.ac.in/noc22_ce39/preview	Safety in the Construction Industry
9	https://www.youtube.com/watch?v=Tm2HhqMu5Jg	PERT and CPM
10	https://www.youtube.com/watch?v=GAGoqqZSPH4&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=3	Overview of steps in the execution of a project
11	https://www.youtube.com/watch?v=kuCHsNXeNMc&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=5	Resource Management in Construction Projects
12	https://www.youtube.com/watch?v=Bh_LYZh3KH4&list=PLWnoy5z_3BObBvFtBlowxM05D-q0VAWEs&index=21	Introduction to Construction Safety

Name & Signature:		
 Mr. S.R. Panapalli Lecturer in Civil Engineering (Course Experts)		
Name & Signature:	Name & Signature:	Name & Signature:
 Shri. V.G. Tambe (Programme Head)	 Shri. V.B. Kondawar (CE HOD II Shift)	 Shri. S.B. Kulkarni (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE
PROGRAMME CODE	01
COURSE TITLE	CIVIL ENGINEERING DRAWING
COURSE CODE	CE31203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SL	H	NLH			Theory	Practical	Based on LL & TSL				Based on SL				
			CL	TL	LL								Practical				SLA				
													FA-TH	SA-TH	Total		FA-PR		SA-PR		
Max	Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min									
	CIVIL ENGINEERING DRAWING	SEC	2	--	6	--	8	4	--	--	--	--	--	50	20	50@	20	--	--	100	

Total IKS Hrs. for Term: 0 Hrs.

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, 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 semester.
2. If a candidate is not securing minimum passing marks in FA-PR (Formative Assessment - Practical) of any course, then the candidate shall be declared as 'Detained' in that course.
3. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as 'fail' and will have to repeat and resubmit SLA work.
1. Notional learning hours for the semester are (CL + LL + TL + SL) hrs. * 15 Weeks
4. 1 credit is equivalent to 30 Notional hours.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

This subject is a core technology subject, enabling the principles of planning for drafting the content into graphical form and thereafter its execution. This course explores drafting as a tool for technical communication. Civil Engineer has to convert design parameters and process details into actual practice. The principles of planning for buildings include the entire facilities to be provided as per individual's requirements, economic status and suitable to the users. Therefore, students are required to understand, interpret and prepare working drawings. This will further lead to reading and understanding of drawing that will make the execution and implementation easy in the field. In the long run construction industry should have an orientation towards skillful design, software skills and energy-efficient techniques. This will create confidence and share a grain of salt in building a nation in a beautiful way of approach.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's):

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1:** Interpret the symbols, signs and conventions from the given drawing.
- CO2:** Prepare line plans of residential and public buildings using principles of planning.
- CO3:** Prepare submission and working drawing from the given requirement for Load Bearing Structure and framed structure.
- CO4:** Draw a two-point perspective for a given small object.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I CONVENTIONS AND SYMBOLS (CL Hrs-02, Marks-NIL)				
1.	<p>TLO 1.1 Draw the conventions, signs and symbols used in given civil engineering drawings</p> <p>TLO 1.2 Explain the use of various types of lines in the given building drawing.</p> <p>TLO 1.3 Select a relevant scale in a given situation.</p>	<p>1.1 Conventions as per IS 962-1989, symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork, Plaster and glass are used in civil engineering construction.</p> <p>1.2 Graphical symbols for door and window, Abbreviations, and symbols for sanitary and electrical installations.</p> <p>1.3 Types of lines- visible lines, centre lines, Hidden line, section line, dimension line, extension line, pointers, arrowhead or dots. Appropriate size of lettering and numerals For Titles, subtitles, notes and dimensions.</p> <p>1.4 criteria for Proper Selection of scale for Various types of drawing.</p>	<p>Chalk-Board, Site/ Industry Visit, Model Demonstration, Video Demonstrations, Case Study Presentations.</p>	CO1
UNIT - II PLANNING OF BUILDING (CL Hrs-10, Marks-NIL)				
2	<p>TLO 2.1. Apply principles of planning for a given residential and public building.</p> <p>TLO 2.2Apply the norms for minimum dimensions to various units in a given residential building.</p> <p>TLO 2.3 Describe rules and bylaws of governing authority in a given area for construction.</p> <p>TLO 2.4 Compute built-up,</p>	<p>2.1 Principles of Planning of Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Furniture requirements Flexibility, Roominess, Circulation, Sanitation, Economy.</p> <p>2.2 Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962-1989.</p> <p>2.3 Rules and Bylaws of sanctioning authorities for construction work.</p> <p>2.4 Plot area, built-up area, super built-up area, plinth area, carpet area, floor area,</p>	<p>Chalk-Board, Site/ Industry Visit, Model Demonstration, Video Demonstrations, Case Study Presentations.</p>	CO2

	carpet and plinth, super built-up area, TDR for the given building. TLO 2.5 Draw line plans for the given public building.	TDR and FAR (Floor Area Ratio) / FSI. 2.5 Line plans for public building-school building, primary health centre, canteen, bank, post office, hostel, community hall and Library.		
UNIT- III DRAWING OF LOAD BEARING AND FRAMED STRUCTURE (CL Hrs-16, Marks-NIL)				
3	TLO3.1 Draw the developed plan, elevation section, and site plan from the given line plan for load-bearing residential buildings. TLO3.2 Prepare submission drawing of the given load-bearing residential building. TLO3.3 Prepare the foundation plan of the given load-bearing residential building. TLO3.4 Draw a developed plan, elevation, section, and site plan from the given line plan for a framed structure Residential building TLO3.5 Prepare submission drawing of the given framed structure residential building. TLO3.6 Prepare the foundation plan of the given framed structure residential building.	3.1. Drawing of Single-storey Load Bearing residential building (2 BHK) 3.2. Data drawing - developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, and area statement. 3.3. Foundation plan of load-bearing structure. 3.4. Drawing of single storey Framed Structure residential building (2 BHK) 3.5. Data drawing: developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement. 3.6. Foundation plan of framed structure.	Chalk-Board, Site/ Industry Visit, Model Demonstration, Video Demonstrations, Case Study Presentations.	CO3
UNIT-IV PERSPECTIVE DRAWING CL Hrs-04, Marks-NIL)				
4	TLO 4.1 Select the type of perspective drawing in the given situation. TLO 4.2 Apply the step-wise procedure to draw the perspective view of the given object. TLO 4.3. Draw a perspective drawing of the given object.	4.1 Definition, Types of perspective, and terms used in Perspective drawings. 4.2 Two Point Perspective of small objects only such as steps, monuments, and pedestals.	Chalk-Board, Site/ Industry Visit, Model Demonstration, Video Demonstrations, Case Study Presentations.	CO4

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. Of Hrs.	Relevant COs
(A) SKETCHBOOK				
1	LLO1.1: Draw various types of lines, graphical symbols for materials in sections, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962:1989.	Various types of lines, graphical symbols for materials in sections, doors and windows, symbols for sanitary, water supply and electrical installations and abbreviations as per IS 962:1989.	8	1
2	LLO2.1: Write a summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional's architect or civil engineer. (Group activity in 4 students)	Summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional's architect or civil engineer. (Group activity in 4 students)	4	2
3	LLO3.1(A) Measure the units of an existing building (Load Bearing / Frame structure) (B) Draw a line plan of the measured existing building at serial no 3A to the suitable scale	A) Measure the units of an existing building (Load Bearing / Frame structure) (B) line plan of measured existing building at serial no 3a to the suitable scale	6	2
4	LLO 4.1: (A) Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom) (B) Residential Bungalows (Minimum three plans) (C) Apartment (Minimum two plans)	(A) Line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom) (B) Residential Bungalows (Minimum three plans) (C) Apartment (Minimum two plans)	6	3
5	LLO 5.1: Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, canteen, Community Hall and Library)	Line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, canteen, Community Hall and Library)	10	3
6	LLO 6.1 Draw the following plans for a Framed Structure (One/Two BHK) from the given line plan. (A) Developed plan, Elevation (B) Section for the above-developed plan. (C) Site plan for above drawings including area statement, Schedule of opening and construction notes.	The following plans for a Framed Structure (One/Two BHK) from the given line plan. (A) Developed plan, Elevation (B) Section for the above-developed plan. (C) Site plan for above drawings including area statement, Schedule of opening and construction notes.	12	3
(B) FULL IMPERIAL SIZE SHEET				

1	LLO 1.1 Draw submission drawing to the scale 1:100 of a single-storey load-bearing residential building (2BHK) with a flat roof and staircase showing. (A) Developed plan and elevation. (B) Section passing through Stair or W.C. and Bath. (C) Foundation plan and schedule of openings. (D) Site plan (1:200), area statement, construction notes.	Submission drawing to the scale 1:100 of a single-storey load-bearing residential building (2BHK) with a flat roof and staircase showing. (A) Developed plan and elevation. (B) Section passing through Stair or W.C. and Bath. (C) Foundation plan and schedule of openings. (D) Site plan (1:200), area statement, construction notes.	12	3
2	LLO 2.1 Draw submission drawing, to the scale 1:100, of (G+1) Framed Structure Residential Building (3BHK) with partly Flat Roof and partly pitched roof, staircase showing: a) Developed plan (Ground Floor and First Floor). b) Elevation c) Section passing through stair, W.C / bath d) Site plan (1:200) and area statement e) Schedule of openings and construction notes.	Submission drawing, to the scale 1:100, of (G+1) Framed Structure Residential Building (3BHK) with partly Flat Roof and partly pitched roof, staircase showing: f) Developed plan (Ground Floor and First Floor). g) Elevation h) Section passing through stair, W.C / bath i) Site plan (1:200) and area statement j) Schedule of openings and construction notes.	14	3
3	LLO 3.1 Draw a working drawing for above mentioned drawing at serial number (B-2) showing: a) The foundation plan to the scale 1:50. b) Detailed enlarged section of RCC column and footing with required plinth filling. c) Detailed Enlarge section of RCC Beam, Lintel and Chajjas. d) Detailed enlarged section of RCC staircase and slab.	Working drawing for the above-mentioned drawing at serial number (B-2) showing: e) The foundation plan to the scale 1:50. f) Detailed enlarged section of RCC column and footing with required plinth filling. g) Detailed Enlarge section of RCC Beam, Lintel and Chajjas. h) Detailed enlarged section of RCC staircase and slab.	08	3
4	LLO 4.1 Draw a two-point perspective drawing of small objects - steps, monuments, pedestals (any three) a) Draw plan, elevation, eye level, picture plane and vanishing points b) Draw a perspective view	Two-point perspective drawing of small objects - steps, monuments, pedestals (any three) a) Draw plan, elevation, eye level, picture plane and vanishing points b) Draw a perspective view	10	4
<p>Note: Out of the above suggestive LLOs –</p> <ul style="list-style-type: none"> All Practical's (LLOs) Are mandatory. 				

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

NOT APPLICABLE

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with broad specifications	Relevant LLO
1	Measuring Tape	3a

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
For laboratory learning 50 marks	End Semester Assessment of 50 marks.

X. 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	2	2	2	2	2	1	2	3	2
CO2	3	2	2	2	3	2	2	2	3	2
CO3	3	2	3	2	2	2	2	2	3	2
CO4	2	2	2	2	3	3	2	1	3	1


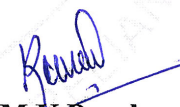



Legends: - High:03, Medium:02, Low:01, No Mapping: -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Building Drawing	Shah. M.G. Kale, CM, Patki, S.Y.	Mcgraw Hill Publishing Company Ltd. New Delhi 2002 ISBN: 9780074638767
2	Civil Engineering Drawing	Malik and Mayo	Computech Publication Ltd New Asian Publishers, 2009, New Delhi ISBN:978-8173180026
3	Principles of Perspective Drawing	M. G. Shah & C.M. Kale	Mcgraw Hill Publishing Company Ltd. New Delhi, Edition 2002
4	Building Planning and Drawing	N. Kumra swami, A. Kameshwara Rao.	Charotar Publication, ANAND ISBN: 978-93-85039-12-6 (Ed.2015)
5	M RTP Act	Government of Maharashtra	Government of Maharashtra
6	Building Planning and Drawing.	S.S Bhavikatti M.V Chitawadagi	I K International Publishing House ISBN-13:978-9382332565
7	Planning and design of Building	Sane Y. S	Allied Publishers, New Delhi ASIN: B0007JVH92

XI. LEARNING WEBSITES & PORTALS

Sr.No.	Link/Portal	Description
1	https://youtu.be/Q9AQDiVRQp0?si=1j4-ENX0ySIHmFrT	Process of drawing Doors in Plans
2	https://youtu.be/ALue8iHhfuU?si=GCUcoSf14A4XiJun	Drawing Line Plan of Public Building
3	https://youtu.be/DNjGqqOQU04?si=8Ute8MM-72B0oaId	Principals of planning in Building
4	https://youtu.be/_Whnb7EyOfA?si=X14ZLtCcQp7IUlft	Process of drawing developed plan from line plan
5	https://youtu.be/w_LbQviO1K4?si=uGZjyZTR_AkimkTO	Process of drawing two-point perspective drawing.

Name & Signature:		
 Mrs.S.R Panapalli Lecturer in Civil Engineering		 Shri.M.K.Panchwate Lecturer in Civil Engineering
(Course Experts)		
Name & Signature:	Name & Signature:	Name & Signature:
 Shri.V.G Tambe (Programme Head)	 Shri.V.B.Kondawar (CE HOD II Shift)	 Shri. S.B. Kulkarni (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	INDIAN CONSTITUTION: CORE CONCEPTS AND VALUES
COURSE CODE	HU21203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
			Actual Contact Hrs./Week			SL	H	NLH			Theory		Based on LL & TSL				Based on SL				
			CL	TL	LL						Total	Practical		FA-PR		SA-PR		SLA			
												FA-TH	SA-TH	Max	Min	Max	Min	Max	Min		
HU21203	INDIAN CONSTITUTION: CORE CONCEPTS AND VALUES	VEC	1	--	--	1	2	1	--	--	--	--	--	--	--	--	--	50	20	50	

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, 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 semester.
2. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as '**Detained**' in that course.
3. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as '**fail**' and will have to repeat and resubmit SLA work.
1. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Introducing a course on the Indian Constitution can provide students with a comprehensive understanding of the country's legal framework and democratic principles. Such a course could cover the historical context of its creation, the structure and functions of the government it establishes, and the fundamental rights and duties of citizens. It could also explore the significant amendments and judicial interpretations that have shaped its evolution over time. This foundational knowledge is not only for fostering informed and engaged citizens who can contribute to the nation's democratic processes but also enriches the educational experience by fostering a sense of national identity and ethical responsibility among future engineers. Furthermore, embedding Electoral Literacy and Voter Education in diploma engineering programs strategically empowers these future professionals with an awareness of their electoral privileges and the workings of democracy.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's):

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1:** Foster comprehension of the fundamental principles and goals embedded in the Indian constitution.
- CO2:** Elaborate on the core rights and duties conferred upon Indian citizens by the Constitution.
- CO3:** Comprehend the distribution of legislative, executive, and financial powers between the Union and the States.
- CO4:** Understand the functioning of Indian democracy, encompassing its frameworks and mechanisms at local, state, and national levels.
- CO5:** Cultivate the skills and perspectives required for active participation in electoral processes, the conscientious exercise of voting rights, and the promotion of informed democratic participation within society.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I INTRODUCTION TO INDIAN CONSTITUTION(CL Hrs-03, Marks-NIL)				
1.	<p>TLO 1.1 Understand the historical context and events leading to the drafting of the Indian Constitution.</p> <p>TLO 1.2 Comprehend the essential features and understand the significance of the Indian Constitution in shaping India's democratic governance and societal ethos.</p> <p>TLO 1.3 Analyze the vision and ideals articulated in the Preamble and their relevance in contemporary Indian society.</p>	<p>1.1 Historical background and making of the Indian Constitution</p> <p>1.2 Salient features and significance of the Indian Constitution</p> <p>1.3 Preamble: Vision and Ideals of the Indian Constitution</p>	<p>Presentations</p> <p>Case Studies and Analysis</p> <p>Role-Playing and Simulations</p> <p>Project-Based Learning</p>	CO1
UNIT - II FUNDAMENTAL RIGHTS, FUNDAMENTAL DUTIES AND DIRECTIVE PRINCIPLES (CL Hrs-04, Marks-NIL)				
2	<p>TLO2.1 Understand the introduction and structure of Fundamental Rights in Part III of the Indian Constitution.</p> <p>TLO2.2 Understand the principles of the Right to Equality, Right to Freedom, and Right to Life.</p>	<p>2.1 Fundamental Rights: Introduction & its Scheme under Part -III</p> <p>2.2 Right to Equality (Article 14-18)</p> <p>2.3 Right to Freedom (Article 19-22)</p> <p>2.4 Right to Life (Article 21)</p> <p>2.5 Fundamental Duties and their Significance under Part IV-A</p> <p>2.6 Directive Principles of State Policy under Part – IV: importance and</p>	<p>Presentations</p> <p>Case Studies and Analysis</p> <p>Role-Playing and Simulations</p> <p>Project-Based Learning</p>	CO2

	<p>TLO2.3 Identify fundamental duties in general and in particular with the engineering field.</p> <p>TLO2.4: Grasp the significance and practical application of Directive Principles of State Policy outlined in Part IV of the Indian Constitution.</p>	implementation.		
UNIT- III UNION AND STATE EXECUTIVE(CL Hrs-03, Marks-NIL)				
3	<p>TLO 3.1 3.1: Gain insight into the structure and functions of the Union executives and the jurisdiction of the Supreme Court.</p> <p>TLO 3.2 3.2: Understand the organization and responsibilities of the State Executives and the functions of the State Judiciary(High Courts).</p>	<p>3.1 Union Government, Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister of India (with Powers and Functions), Union Judiciary (Supreme Court), Jurisdiction of the Supreme Court.</p> <p>3.2 State Government, State Legislature (Legislative Assembly/ Vidhan Sabha, Legislative Council / Vidhan Parishad), Powers and Functions of the State Legislature, State Executive, Governor Of the State (with Powers and Functions), The Chief Minister Of the State (With Powers and Functions) State Judiciary (High Courts).</p>	<p>Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning</p>	CO3
UNIT-IV AMENDMENTS AND EMERGENCY PROVISIONS(CL Hrs-03, Marks-NIL)				
4	<p>TLO 4.1 Comprehend the meaning and significance of constitutional amendments, as well as the procedural rules detailed in Article 368 of the Indian Constitution.</p> <p>TLO 4.2 Recognize the roles of various branches of government in the amendment process,</p> <p>TLO 4.3 Examine the significant procedures and historical context of major constitutional amendments</p>	<p>4.1 Introduction to Constitutional Amendments: Definition and significance of constitutional amendments. Constitutional provisions governing the amendment procedure (Article 368).</p> <p>4.2 Types of Amendments: Simple majority amendments, Special majority amendments, Amendments requiring ratification by states.</p> <p>4.3 Role of the Executives Amendments: Role of Parliament: Lok Sabha and Rajya Sabha, Role of President: Assent to amendments, Role of State Legislatures: Ratification of certain amendments.</p> <p>4.4 Major Constitutional</p>	<p>Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning</p>	CO4

		<p>Amendment procedures: Major Constitutional Amendment procedures - 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, 102nd</p>		
UNIT –V ELECTORAL LITERACY (CL Hrs-02, Marks-NIL)				
5	<p>TLO5. Electoral Literacy: Develop understanding and proficiency in electoral processes, voter registration, rights and responsibilities of voters, electoral reforms, and initiatives promoting electoral literacy.</p>	<p>5.1 Understanding the Electoral Process : Overview of the electoral process: registration, voting, counting, and declaration of results, Role and functions of the Election Commission of India Types of elections: Lok Sabha, Rajya Sabha, State Legislative Assembly, Local Body elections</p> <p>5.2 Voter Registration and Electoral Rolls: Importance of voter registration Eligibility criteria for voter registration Process of voter registration: online, offline, and special drives Checking and updating voter details in electoral rolls</p> <p>5.3 Rights and Responsibilities of Voters: Understanding fundamental rights related to elections Responsibilities of voters towards ensuring free and fair elections Consequences of electoral malpractices and non-participation</p> <p>5.4 Electoral Reforms and Initiatives: Overview of electoral reforms aimed at enhancing transparency, inclusivity, and integrity of elections Role of technology in improving electoral processes: Voter Verifiable Paper Audit Trail (VVPAT), Online voter registration, e-voting Initiatives by the Election Commission and civil society organizations to promote electoral literacy</p>	<p>Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning</p>	CO5

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

NOT APPLICABLE

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

- i) **Case Study Analysis:** Select a few landmark Supreme Court cases related to Fundamental Rights (e.g., Kesavananda Bharati v. State of Kerala, Maneka Gandhi v. Union of India) and analyze the court's interpretation and impact on these rights.
- ii) **Comparative Analysis:** Compare the provisions of the Right to Equality under Articles 14-18 with similar provisions in the constitutions of other countries. Highlight similarities, differences, and the reasoning behind them.
- iii) **Public Awareness Campaign:** Design a public awareness campaign to educate citizens about their Fundamental Rights and Duties. Create informative posters, social media content, and interactive workshops to engage people in discussions about constitutional rights and responsibilities.
- iv) Write a reflective essay discussing the historical context and debates surrounding the inclusion of Fundamental Rights in the Indian Constitution.
- v) Create a visual timeline depicting the evolution of laws related to equality in India, from independence to the present day. Include major legislative reforms and judicial decisions.
- vi) Conduct a comparative analysis of the implementation of Directive Principles in different states of India, identifying successful initiatives and areas needing improvement.
- vii) **Case Study Analysis:** Choose a recent constitutional or political issue that has been debated in Parliament. Analyze the roles played by the Lok Sabha and Rajya Sabha in addressing the issue and the impact of their decisions.
- viii) **Case Study Analysis: Analyze a landmark constitutional amendment in India (e.g., the 42nd Amendment) and its impact on governance, fundamental rights, and the balance of power between different branches of government.**
- ix) **Infographic Creation:** Create an infographic illustrating the process of amending the Indian Constitution as outlined in Article 368. Highlight key steps and requirements for different types of amendments.
- x) **Timeline Project:** Create a timeline highlighting major constitutional amendments in India, such as the 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, and 102nd amendments. Include key provisions and the political context surrounding each amendment.
- xi) **Debate:** Organize a debate on the topic "Should the President have the power to refuse assent to constitutional amendments?" Encourage students to research and present arguments from legal, political, and ethical perspectives.
- xii) **Campaign Design:** Design a social media campaign to raise awareness about the importance of voter participation and responsible voting. Create visually engaging posters, infographics, and videos highlighting the consequences of electoral malpractices and non-participation.
- xiii) **Online Tutorial:** Create a step-by-step tutorial video or guide demonstrating the voter registration process, both online and offline. Include instructions for checking and updating voter details in electoral rolls.
- xiii) **Survey Project:** Conduct a survey to assess the awareness and accessibility of voter registration

facilities among different demographic groups in your locality. Analyze the results and propose strategies to improve voter registration rates.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

NOT APPLICABLE

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Assignment, Self-learning and Terms work Seminar/Presentation	—

X. 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
CO1	--	--	--	--	2	--	2		
CO2	--	--	--	--	3	--	2		
CO3	--	--	--	--	3	--	2		
CO4	--	--	--	--	3	--	2		
CO5	--	--	--	--	3	--	2		




Legends:- High:03, Medium:02, Low:01, No Mapping: -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	M. Laxmikanth	"Indian Polity"	McGraw Hill Education: ISBN-13: 978-9352603633
2	D. D. Basu	Introduction to the Constitution of India	LexisNexis: ISBN-13: 978-8180386477
3	Subhash C. Kashyap	Our Constitution: An Introduction to India's Constitution and Constitutional Law	National Book Trust, India ISBN-13: 78-8123748462
4	Arun K. Thiruvengadam	The Constitution of India: A Contextual Analysis	Oxford University Press ISBN-13: 978-0199467078
5	Oxford University Press	The Making of India's Constitution	Oxford University Press Oxford University Press

XI. LEARNING WEBSITES & PORTALS

Sr.No.	Link/Portal	Description
1	https://prsindia.org/	In-depth analysis of parliamentary affairs, legislative processes, and policy Issues in India.
2	https://awmin.gov.in	Official repository providing access to the full text of the Indian Constitution.
3	https://constitution.org.in	Interactive platform offering the text of the Constitution along with annotations and historical context.
4	https://indiankanoon.org	Legal search engine offering a vast database of Indian case law, including constitutional judgments.
5	https://nptel.ac.in	Offers video lectures and course materials on studies of law and the constitution.

Name & Signature:		
<p>Mr. S.B. Kulkarni Lecturer in Mechanical Engineering (Course Experts)</p>		
Name & Signature:	Name & Signature:	Name & Signature:
 Shri. V.G. Tambe (Programme Head)	 Shri. V.B. Kondawar (CE HOD II Shift)	 Shri. S.B. Kulkarni (CDC In-charge)