Government of Karnataka
Department of Technical Education

Diploma in Civil Engineering

C-25 Scheme of Studies

(Effect from the AY 2025-26)

Government of Karnataka

DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

III Semester Scheme of Studies

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	CE	25CE31I	Advanced Surveying	4	0	4	8	6	50	20	50	20	-	-	100
2	CE	25CE32I	Construction Techniques	4	0	4	8	6	50	20	50	20	-	-	100
3	CE	25CE33I	Engineering Mechanic and Strength of Materials	3	0	4	7	5	50	20	-	-	50	20	100
4	CE	25CE34I	Building Planning & Drawing	3	0	4	7	5	50	20	-	-	50	20	100
Audit Course															
5	KAN	25KA31T	Kannada –I (ಸಾಹಿತ್ಯ ಸಿಂಚನ-I/ಬಳಕೆ ಕನ್ನಡ-I)	2	0	0	2	2	50	20	-	-	-	-	50
Total				**16**	**0**	**16**	**32**	**24**	**250**	**-**	**100**	**-**	**100**	**-**	**450**

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	III
Course Name	ADVANCED SURVEYING	Type of Course	Integrated
Course Code	25CE31I	Contact Hours	104 Hrs./Sem. 8 Hrs./Week
Teaching Scheme	L:P :: 4:4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

The rationale for including advanced surveying as a subject in education lies in its critical role in shaping the world we live in. With technological advancements and increased reliance on spatial data, advanced surveying has become essential in many professional fields. By integrating traditional surveying principles with new technologies, the subject provides students with the skills and knowledge needed to adapt to the evolving demands of the industry, ensuring they contribute to a more precise, efficient, and sustainable future.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Effectively use a theodolite for angular measurement, traverse surveying ensuring students to develop both theoretical knowledge and practical skills in the use of theodolites for accurate surveying.
CO-02	Effectively use theodolites to measure vertical angles and horizontal distances to determine the elevation differences between points.
CO-03	Gaining hands-on experience with total station equipment and understand its theoretical foundations and applications in various surveying and engineering contexts.
CO-04	Understanding of remote sensing and GPS technologies, their applications, and how to use them effectively in real-world situations.
CO-05	Understand the basics of Drone Technology and GIS

3. Course Content

WEEK	CO	PO	Theory	Practice
1	**1**	**1,4,7**	1.Component parts of transit theodolite and their functions. 2. Reading the Vernier, Salient features and relationship between the fundamental axis of transit theodolite. 3 & 4. Technical terms used, Temporary adjustments, errors in Theodolite surveying.	1. Conduct temporary adjustments of transit theodolite. Practice reading the Vernier of circular scales in transit theodolite.
2	**1**	**1,2,4, 6,7**	1. Theodolite traversing. Open and Closed Traverse, traversing by direct observation of angles. 2. Theodolite traversing by deflection angle method. 3 & 4. Checks for closed traverse, Calculation of bearing from angles.	2. Measure horizontal angle between the given points by repetition method. 3. Measure horizontal angle between the given points by reiteration method.
			1. Traverse computation - Latitude, Departure, closing error.	4. Conducting a Closed traverse of a given area and balancing it by

3	**1**	**1,2,4, 6,7**	2.Numerical problems on Computing latitude and departure 3 & 4. Consecutive coordinates and independent coordinates.	a. Bowditch rule b. Transit rule
4	**1,2**	**1,2,4, 6,7**	Balancing the traverse – Bowditch method, Transit method.	5.Measure vertical angle between the given points.
5	**2**	**1,2,4, 6,7**	1.Trigonometrical Survey and its applications. 2.Elevations and Distances of accessible points whose base is Accessible. 3 & 4. Base is accessible Single Plane Method-Simple problems.	6. Measure height of an object whose base is accessible. 7. Determination of height of an object whose base is inaccessible (single plane method instrument axes at different levels – case 1 IHT at A>B)
6	**2**	**1,2,4, 6,7**	1 & 2. Elevations and Distances of inaccessible points whose base is inaccessible. 3 & 4. Base is inaccessible, Single plane method Simple problems.	8.Determination of height of an object whose base is inaccessible (single plane method instrument axes at different levels –case 2 IHT at B>A)
7	**3**	**1,4,6, 7**	1. Total Station: Introduction, Integral parts, Applications. 2. Advantages, Disadvantages. Fundamental measurements. 3 & 4. Coordinate calculations from fundamental measurements.	9. Study the basic operations in total station. 10. Conduct 3 point closed traverse in coordinate system using total station and find the error.
8	**3**	**1,4,6, 7**	1. Total station setting up – Occupied point, Back sight, Fore sight, P code, Instrument Height (IH), Reflector height (RH). 2.Change point - Procedure for re orientation in total station during traverse surveying. 3.Data transfer from total station to computer, transmission software, file types. 4. Stake out – Procedure, Resection – Procedure.	11. Conduct topographic survey of a given area using total station and plot topographic, contour maps in open source software like SWDTM & CAD.
9	**3,4**	**1,4,6, 7**	1.Remote sensing - Basic components of remote sensing, Remote sensing process, electromagnetic spectrum regions. 2.Energy interaction with earth surface. Types of remote sensing, sensor systems, remote sensing platforms. 3.Data acquisition and data interpretation. Applications of remote sensing in civil engineering. 4. GPS - Introduction, Segments of GPS	12.Find out the height of a remote point like tip of a transmission tower or chimney using Total Station. (i) With Reflector. (ii) Without reflector. 13. Stake out using Total Station – Mark the given coordinate on the field.
10	**3,4**	**1,4,6, 7**	1.Principle of position determination using GPS. 2.Application of GPS, Errors in GPS. 3 & 4. Differential GPS- Introduction, Principle of DGPS/GNSS, Working with DGPS/GNSS.	14. Resection using total station – Find the missing coordinate of the occupied/station point on field from two known coordinate points.
11	**4**	**1,4,6, 7**	1. GNSS constellations. Components of GNSS-Receiver (base and rover).	15.Record co-ordinaries of any given point in field using hand held GPS and

			2.Types of survey – Post processing survey and real time kinematic survey (RTK). 3. Accuracy and precision, Applications of GNSS-Topo survey, Road stake, Surface stake. CAD stake. 4. Latest trends and Future in India.	transfer to google earth through KML file.
12	**5**	**1,4,6, 7**	1.GIS – Main elements of GIS, component subsystems of GIS. 2.Spatial data, attribute data. Applications of GIS. 3.Introduction to open source GIS like QGIS, Overview of the software, Installation. 4.Preparation of base map.	16. Prepare topographic survey map of given area using DGPS.
13	**5**	**1,4,6, 7**	1. Aerial Surveying - Type of aerial Survey-Introduction to UAV survey. 2&3. Merits & demerits of UAV (drones) survey, Types of drones used in construction industry. 4.Utilizing drone technology in civil engineering field.	17. Prepare base plan using open sources GIS software like QGIS

4. References:

1 Duggal, S. K., Surveying Vol. I & II, Tata Mcgraw Hill, New Delhi

2 Subramanian, R., Surveying & Levelling, Oxford University Press, New Delhi

3 Punamia, B.C., Surveying Vol. I, II & III, Laxmi Publications

4 Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling Vol. I & II, Pune Vidyarthi Gruh

5 Arora, K.R., Surveying Vol. I, II & III, Standard Book House. New Delhi

6 Basak, N.N., Surveying and Levelling, Tata Mcgraw Hill, New Delhi

7 A.Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., NewDelhi

8 Agor, R., Surveying and Levelling, Khanna Publishers, New Delhi

9 Agor, R. Advanced Surveying, Khanna Publishers, New Delhi

10. https://www.earthpoint.us/ExcelToKml.aspx

11https://www.advancednavigation.com/tech-articles/global-navigation-satellite-system-gnss-and-satellite-navigation-explained/

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE – Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	Civil Engineering			Semester -III	
Course Name	Advanced Surveying			Test	I/III
Course Code	25CE31I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section – 1			
1	a) b) c)	U/R	1/2,3	5 10 10
2	a) b) c)	U/R	1/2,3	5 10 10
	SECTION - 2			
3	a) b) c)	U/Ap/An	1/3,4	5 10 10
4	a) b) c)	U/Ap/An	1/3,4	5 10 10
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Practice Test 1 model question paper

Program	**Civil Engineering**			**Semester**	**III**
Course Name	**Advanced Surveying**			**Test**	**II**
Course Code	**25CE31I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
1. Conduction of any one exercise on theodolite survey / trigonometric levelling / Total station.				**1 , 2, 3**	**45**
Scheme of assessment **Experiment 1.** a) Procedure & Tabulation = 15 b) Setting & Conduction = 20 c)Observation and result =10 Total marks = 45					
2. Viva-voce					**05**
					50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test 2 model question paper

Program	**Civil Engineering**			**Semester**	**III**
Course Name	**Advanced Surveying**			**Test**	**IV**
Course Code	**25CE31I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
1. Conduction of any one exercise Total station. **(30 marks)**				**3**	**45**
2. Conduction of anyone exercise on GPS/DGPS/QGIS. **(15 marks)**				**4, 5**	
Scheme of assessment **Experiment 1.** a) Procedure & Tabulation = 5 b) Setting & Conduction = 15 c)Observation and result = 10 Total marks = 30	**Experiment 2.** a) Procedure & Tabulation = 5 b) Setting & Conduction = 5 c)Observation and result = 5 Total marks = 15				
3. Viva -voce					**05**
				Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	**Suggestive Activities**
01	Setting out footing marking using total station
02	Fix the boundary points of college campus using total station
03	Prepare a report on Continuously Operating Reference Stations (CORS) in Karnataka
04	Prepare a map of Government Polytechnics in Karnataka using QGIS importing base map data from

	K-GIS

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	StudentsScore
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
	Average Marks=(20+30+40+50)/4=35						**35**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Tape	Fiberglass tape	8
02	Ranging rods	Circular/ Octagonal Ranging rods preferably circular with 3 to 5 cm dia made up of either seasoned solid bamboo sticks or metal conduit pipe of length 2 to 3 meters, with conical metallic shoe fitted at bottom & fully pained with 20 cm. long colour bands of either of the following combination	30
03	Vernier transit Theodolite	Angle Measurement Accuracy 20 secs, Display Panel Single Side, Magnification 30x, Measuring Time 30 Sec, Field of View 2.6 m at 100 meters	8
04	Total station with prism	Magnification 24x, Field of View 1–30-inch, Minimum Focusing Distance1.5 Meter, Singles Prism Distance Measurement 4.0 Km, Accuracy 3mm +2ppm	4
05	DGPS Receiver (Base & Rover)	GNSS Receiver	2
06	Drone	Surveying purpose	1
07	Hand held GPS	screen Size 3.5 Inch, Type Wireless, Usage Land Survey, Width 69 mm, Depth 30 mm	1
08	Computers	All in One Desktop Set: Intel i5 3470, 8GB, 500GB HDD, 19 inches HD Monitor, Keyboard, Mouse, HD Webcam, Mic, Speakers, WiFi, Display Port, Windows 10 Pro, MS Office	10

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	III
Course Name	CONSTRUCTION TECHNIQUES	Type of Course	Integrated
Course Code	25CE32I	Contact Hours	104 Hrs./Sem. 8 Hrs./Week
Teaching Scheme	L : P :: 4 : 4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. **Rationale:** Civil engineering is the oldest discipline of Engineering. Since the very beginning of human existence, it has been an aspect of life. Construction is an important sector of civil engineering that contributes greatly in the economic growth of a nation. Construction techniques in civil engineering are crucial for ensuring the efficient, safe, and sustainable development of infrastructure. These techniques provide systematic methods for executing construction projects, enabling the transformation of design concepts into functional structures. It is expected that the students should know the basics of the same to apply it in the field. Through this course student will develop the desired skills and competencies which are expected from them for construction related works.

2. **Course Outcomes:** At the end of the Course, the student will be able to:

CO-01	Identify basic construction tools, type of soil, soil improvement techniques, test it to confirm properties and strength, recommend suitable excavation methods and type of foundations.
CO-02	Identify different type of masonry and list various structural components to be built, classifications and suitability of pre stressed pre-cast members
CO-03	Select a suitable type of surface works, list the various work and recommend the appropriate construction techniques and services to be used for a required building structure.
CO-04	Identify various interior and furnishing works, utility services and provide recommendations to adopt the same in the structure.

3.Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,2,4	1. Physical properties of soil: Porosity, Density, Specific Gravity, Saturation, Moisture Content and Void Ratio 2. Classification of soils based on particle size distribution, classification of soil based on Indian Standard Soil Classification System, and their suitability for the construction of different structures. 3. Bearing capacity of soil, Safe bearing capacity of soil. Determination of Bearing capacity by Standard penetration test (SPT). 4. Determination of Bearing capacity by plate load test. SBC Values for various types of Soils.	1. Identification and explanation of construction tools: Spirit level, Plumb Bob, Trowel, Shovel, Tube level etc. 2. Identify the type of soil based on visualization and validate the type of soil by conducting sieve analysis test - Particle size distribution using semi-log graph. 3. Tests on Moisture content of soil (Oven drying method)
2	1	2,4,7	1. Site/ground clearance, Excavation for foundation – a.	4.Test on soil:

			General excavation, b. Deep excavation. 2. Soil improvement techniques - Compaction Piles, Geotextiles, Cement Soil Mixing, Dynamic compaction. 3. Soil nailing – Advantages. 4. Dewatering – Necessity, Methods of dewatering of foundations.	a) Liquid limit b) Plastic limit c) Shrinkage limit.
3	**1**	**1,2,4, 7**	1. Foundation: Purpose of foundation, classification of foundation - Shallow foundation: Isolated footing, spread footing, combined footing, Strap footing and Raft foundation. 2. Foundation in Black Cotton Soil: Causes for failure of foundation and preventive measures. 3. & 4. Deep foundation: Pile foundation – classification, Necessity of pile foundation. Suitability of foundation for different types of structure	5. Field density of soil by core cutter.
4	**2**	**2,4,7**	1. Stone masonry- terms used - Facing, Backing, hearting, through stone, Corner stone, Cornice. Types of stone masonry - Rubble stone masonry, Ashlar stone masonry 2. Brick masonry: Terms used in brick Masonry-Header, stretcher, closer, quoins, course, face, back, hearting, bat, bond, joints, lap, frog, in line, level and plumb. 3. Bonds in brick masonry - English bond (one brick thick), & Flemish Bond (one brick thick), header bond, stretcher bond. 4. Concrete Block masonry – types, advantages. Autoclaved aerated concrete block masonry – advantages & disadvantages.	6. Conduct Standard Proctor test on soil compaction.
5	**2**	**1,2,3. 7**	1. Lintels: definition, types of lintels based on method, shape, and materials. 2. & 3. Doors and windows - classification based on materials, classification based on working operation. 4. Chejja, canopy, portico, and balcony – Purpose of providing in buildings. Classification based on materials.	7. Construct one brick thick masonry in English Bond. 8**.** Construct stretcher bond masonry wall.
6	**2**	**1,2,3, 7**	1.. Staircase: Definition, terms used in stairs, types of stairs based on shapes. Components of dog legged staircase, Ramps – definition, purpose. 2. Flat Reinforced cement concrete roof - slab with beam, flat slab, flat plate. 3. Pitched roof – Advantages, components of king post truss. 4. Pre stressed concrete slab - construction, advantages, Suitability, comparison, Pre cast members	9. Construct one brick thick masonry in Flemish Bond. 10. Construct one brick thick pier
7	**3**	**1,3**	1. Scaffolding: Necessity, component parts, process of erection and dismantling of steel scaffolding. Shoring: Purpose. 2. Form work: Purpose, types of form work - plastic formwork, plywood framework, fabric formwork, steel framework, and timber Formwork. Requirements of good formwork 3. Process of formwork for slab concreting, Panel floor formwork, climbing formwork system, Table formwork system 4. De-shuttering - De-shuttering time for columns, slabs,	11. Test on brick - Dimensionality tolerance test. 12. Compression test on brick/concrete block 13. Water absorption test of bricks

			beams. Factors affecting the de-shuttering time, and Precautions during de-shuttering.	
8	**3**	**2,3,7**	1. Plastering: Necessity of plastering, Tools used in plastering, Cement plastering - construction methodology for internal wall plastering, ceiling plastering, external wall plastering, 2. Gypsum plastering – materials, Construction methodology, advantages. Pebble dash plastering – materials, construction methodology, advantages. 3. Curing: Objective of curing, Duration of water curing for different surfaces – slab concrete, plastered surface, column concrete masonry surface and others. 4. Curing compounds for concrete applications - properties, process of application, uses.	14. Geometrical design of a dog legged staircase.
9	**3**	**1,2,5, 7**	1. Flooring, Factors affecting the selection of suitable type of floors. 2. Construction methodology - Cement concrete floorings. Vitrified tile flooring, epoxy flooring. 3. Construction methodology - Granite flooring, Wooden flooring, Vinyl flooring, Vacuum dewatered flooring. 4. Wall Cladding – Definition, advantages, construction methodology.	15. Prepare a checklist and process manual for Cement Plastering and Gypsum Plastering.
10	**3**	**1,2,4, 7**	1. Painting: Purpose of painting, methodology of painting new surfaces on internal and external walls for high rise buildings. 2. Defects in painting, Whitewashing and Color Washing – definition Purpose.. 3. Roof slab leakages or dampness and arresting it. Pressure and injection grouting - necessity, materials, methodology. 4. Water proofing: Necessity and importance, materials, methods used for Reinforced cement concrete terrace slab water proofing , bathroom.	16. Prepare a checklist and process manual for Internal wall Painting and External wall Painting.
11	**4**	**1,2,5, 7**	1.& 2. Building façade - Toughen glass work, Aluminum work, Aluminum Composite panel. 3 & 4. False ceiling- necessity, types, construction methodology – Plaster of Paris ceilings, Gypsum ceilings.	17. Transfer of levels using tube level. 18. Erection of doors and windows using spirit level and plumb bob.
12	**4**	**1,2,5, 7**	1 & 2. Monolithic concrete construction using aluminum or composite formwork – materials, construction methodology, 3 & 4 Mivan formwork system.	19. Demonstrate Mivan formwork system through videos .
13	**4**	**2,3,5, 7**	1 & 2. Heating, Ventilation and Air Conditioning. – Importance & Components of HVAC system. 3. & 4. 3D-Printing technology in Construction – Introduction , Benefits , Applications	20. Demonstration of 3D-Printing In Construction.

4. References:

a. B C Punmia, “Building Construction”, Laxmi Publications
b. Building construction by Rangwala :Charotar publications”
c. Building construction by Sushil kumar :” standard publishers distributors”
d. Bureau of Indian Standards, “HandBook of Functional Requirements of Buildings, (Sp-41 &Sp- 32)", BIS 1987 and 1989.

e. https://3dprintingindustry.com/news/lt-and-iit-madras-develop-indias-first-3d-printed-post-office-in-just-43-days-224284/

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE - Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	**Civil Engineering**			**Semester - III**	
Course Name	**Construction techniques**			**Test**	**I**
Course Code	**25CE32I**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) Explain soil classification based on particle size (5 m) b) List five necessities of dewatering. Explain any one method of dewatering (10 m) c) Explain any five properties of soil (10m)	R/U R/U R/U	**CO 1**	25
2	a) Determination of Bearing capacity by plate load test. (15 m) b) Explain soil improvement technique by compaction piles (10m)	R/U	**CO 1**	
	Section - 2			
3	a) List any five necessity of pile foundation(5m) b) Explain soil improvement technique by cement soil mixing	R/U R/U	**CO 1** **CO1**	25

	(10 m) c)With a neat sketch explain 1 brick thick English bond(10m)		**CO2**	
4	a) Write advantages of soil nailing(5m) b) With a neat sketch explain (i) Raft footing (ii) combined footing(10m) c) List advantages of (i) autoclaved aerated concrete block (ii) concrete block masonry. (10 m)	R/U R/U R/U	**CO 1** **CO1** **CO2**	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

7. CIE Practice Test model question paper

Program	Civil Engineering			**Semester**	**III**
Course Name	Construction Techniques			**Test**	**II**
Course Code	25CE32I	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
1. **Tests on soil:** Identify the type of soil based on visualization and validate the type of soil by conducting sieve analysis test - Particle size distribution using semi-log graph / Tests on Moisture content of soil (Oven drying method) / Test for Atterberg Limits / Field density of soil by core cutter / Conduct Standard Proctor test on soil compaction. 2. **Tests on bricks:** Dimensionality tolerance test / Compression test on brick/concrete block / Water absorption test of bricks.				**1,2,3**	**50**
Scheme of assessment **a) Tests on soil - 20** Procedure – 05 Conduction – 10 Results – 05 **b) Tests on Bricks – 20** Procedure – 05 Conduction – 10 Results – 05 **c) Viva - 10**					
				Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper

Program	**Civil Engineering**			**Semester**	**III**
Course Name	**Construction Techniques**			**Test**	**IV**
Course Code	**25CE32I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
1. **Geometrical design of a dog legged staircase** 2. **Tests on Masonry:** Construct 1 brick thick masonry in English Bond / Construct 1 ½ brick thick masonry in English Bond / Construct 1 brick thick masonry in Flemish Bond / Construct 1 ½ brick thick masonry in Flemish Bond. 3. **Checklist and process manual:** Prepare a checklist and process manual for - Cement Plastering / Gypsum Plastering / Internal wall Painting / External wall				**1,2,3**	**40**

Painting		
Scheme of assessment **a) Geometrical Design - 10** **b) Tests on Masonry – 20** Procedure – 10 Conduction – 10 **c) Process manual and Checklist - 10**		
Viva		**10**
	Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
01	Study and prepare a report on anti-termite treatment in buildings
02	Study the construction methodology of basement and Retaining wall.
03	Study & prepare a report on various precast partition panels.
04	Study the suitability of elevators and escalators in different type of buildings.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
	Average Marks= (40+30+50+10)/4 = 32.5						**32.5**

Note: Dimension and descript or shall be defined by the respective course coordinator as per the activities

10.Equipment/software list with Specification for a batch of 30 students

Sl No	Particulars	Specification	Quantity
1	IS Sieve 20 mm 10 mm 4.75 mm, 2.00 mm,1.18 mm, 600 µm, 425 µm, 300 µm, 212 µm, 150 µm, 75 µm, Pan.	IS sieve for soil testing	3 set
2	Measuring Jars of 1000, 500, 100, 10ml	Plastic measuring JAR	3 set

3	Digital weighing Balance 12 kg capacity with minimum 1 gm. accuracy.	0.5gm accuracy	2 no
4	Hot air Oven	Stainless Steel Member Lab Oven	1no
5	Core cutter with dolly	Soil Testing Machine	3 set
6	Standard proctor compaction apparatus	Cylindrical Metal Mold, having internal diameter 4" or 6", the internal height of 4.6" and the mold should have detachable base plate& collar of 2 inches (5.08 cm), Rammer, weighing 5.5 lbs (2.5 kg) & having fall of 12 inches (30.5cm), with a flat circular face of 2"diameter.	1set
7	Atterberg limits apparatus	Soil testing apparatus	5 set
8	Portable core drilling machine	350mm core cutting machine	1set
9	Pick Axe	For digging soil	10 no
10	Spirit level	1mtr length	10 no
11	Trowel	Small	10 no
12	Oil can	250ml (for pouring water)	5 no
13	Right angle 1*1.5m	1*1.5m	10 no
14	Measuring tape	metal tape 3mtr	5 no
15	Safety goggle	Engineer's safety goggle	10 no
16	Wheelbarrow	Small	1no
17	Portable Air blower	Hand blower type power 600w	1no
18	CTM	Material: Mild Steel, Display Type: Digital, Motor Power: 1 hp, Voltage: 220 V, Capacity: 2000KN, Automation Grade: Semi-Automatic, Frequency: 50 Hz, Least Count: 1 N, Motor: 1HP, Power Supply: 440 VOLTS.	1no

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	**CIVIL ENGINEERING**	**Semester**	**III**
Course Name	**ENGINEERING MECHANICS AND STRENGTH OF MATERIALS**	**Type of Course**	**Integrated**
Course Code	**25CE33I**	**Contact Hours**	**91 Hrs./Sem. 7 Hrs./Week**
Teaching Scheme	**L: P:: 3:4**	**Credits**	**5**
CIE Marks	**50**	**SEE Marks**	**50 (Practice)**

1. Rationale:

The study of strength of materials often refers to various methods of calculating the stresses and strains in structural members such as beams, columns and shafts. The methods employed to predict the response of a structure under loading and its susceptibility to various failure modes takes into account the properties of the materials such as its yield strength, ultimate strength, Young's modulus, and Poisson's ratio. In addition, the mechanical elements, geometric properties such as its length, width, thickness, boundary constraints and abrupt changes in geometry such as holes are considered.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Explain the potential impact of forces / stresses on structural elements / materials in a given condition.
CO-02	Calculate the Moment of Inertia for given symmetrical or asymmetrical geometric sections validate using CAD software.
CO-03	Calculate shear force and bending moments for different loading conditions and support conditions, draw the SFD & BMD and validate using analysis software.
CO-04	Calculate bending, shear stresses and slope deflection in beams under different load conditions and validate the analysis using any open-source software.
CO-05	Calculate and validate the safety of a column for various given loads and end conditions.

3. Course Content

WEEK	CO	PO	Theory 3 hours/week (per batch)	Practice 4 hours/ week (2 hours/ batch twice in week)
1	**1**	**1,2,3, 4,7.**	1.Force and characteristics of a force. Force system: Classification of force system according to plane and line of action- Principle of transmissibility of forces, moment of a force, Resolution & composition of forces.	1 & 2 Verification of Lami's Theorem.
			2. Resultant force, Law of moments, Resultant of Concurrent and non-concurrent force system. Equilibrium conditions.	

			3. Simple Problems on determination of resultant of concurrent & non concurrent force systems.	
2	**1**	**1,2,3, 4,7.**	1. Rigid body, plastic body Mechanical properties of metal- Rigidity, Elasticity, Plasticity.	1. Hardness test to evaluate a hardness of given material Example: Mild Steel, cast iron, Brass and Aluminium.
			2. Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility	
			3. Malleability, Creep, Fatigue, tenacity, durability. Importance of each property of materials.	2. Impact test to evaluate toughness of a given material Example: Mild Steel and cast iron (Izod and Charpy)
3	**1**	**1,2,3, 4,7.**	1. Stress, strain, Hooke's law Types of stresses – Normal stress and Shear stress Types of normal stress – Tensile stress and Compressive stress	1&2. Conduct tensile test on following materials and plot Stress-strain curve. a) Mild steel b) TMT / HYSD bar Determine Young's modulus, yield stress/ proof stress, Ultimate stress, breaking stress, percentage of elongation and percentage of reduction in area.
			2. Types of strains- Normal strain and Shear strain Types of normal strain - Longitudinal strain, Lateral strain and volumetric strain Types of Lateral strain – Tensile strain and Compressive strain	
			3. Problems	
4	**1**	**1,2,3, 4,7.**	1. Elongation and Contraction - Poisson's Ratio and Modulus of Elasticity.	1&2. Collect and discuss the stress strain curve of different Civil Engineering building material and Modulus of Elasticity.
			2. Problems	
			3. Problems	
5	**1**	**1,2,3, 4,7.**	1. Stresses in bars of composite section (Modular ratio).	1. Problems on axially loaded composite sections.
			2. Principles of superposition, Deformation of uniform bars and bars of varying cross section subjected to constant load.	
			3.Volumetric strain & change in volume, Relation among elastic constants, Thermal stresses.	2. Analysis of Composite Section - Interpretation of Results. (Analysis by any analysis software)
6	**2**	**1,2,3, 4,7.**	1. Centre of gravity & centroid, Moment of Inertia for Plane lamina: radius of gyration, parallel and perpendicular axes theorems.	1. Calculation of Centroid of different sections using CAD software.
			2. Moment of Inertia for rectangle, square, circle, semi- circle, and quarter circle and triangle section.	2. Determine the centroid and moment of inertia (w.r.t. Centroidal axes) of I-section and Channel section by manual method and validate using CADD software.
			3. M.I of symmetrical and unsymmetrical I-section, Channel section.	
7	**2**	**1,2,3, 4,7.**	1. MI of T- section, L- section about Centroidal axes and any other reference axis. (Problems)	1. Determine the centroid and moment of inertia (w.r.t. Centroidal axes) of T -section and L -section by manual method and validate using CADD software.
			2. MI of hollow sections about Centroidal axes and any other reference axis. (Problems)	

			3. MI of built-up sections about Centroidal axes and any other reference axis. Problems	2.Finding the centroid and moment of inertia (w.r.t. Centroidal axes) of built-up sections (I section with cover plates) by CADD software. Comparison of MI with manual calculation and CADD software.
8	**3**	**1,2,3, 4,7.**	1. Types of beams –Simply Supported, Cantilever, Fixed, Continuous and Overhanging beams. Types of supports: Roller support, Hinged support, Fixed support and Pinned support.	1.Calculation of Bending Moment and shear force for simply supported beams with UDL and point load.
			2. Determinate structures: Types of loading- Axial load, Transverse load, Point load, uniformly distributed load, uniform varying load, moment, support reactions for determinate structures.	2. Analyse simply supported beams, subjected to different types of loads (Point load & UDL) for SFD and BMD using any open-source analysis software.
			3. Concept of shear force and bending moment, sign convention. Relation between bending moment, shear force and rate of loading.	
9	**3**	**1,2,3, 4,7.**	1. Calculation of Bending Moment and shear force for cantilever beams with UDL and point load and Draw Shear force and bending moment diagrams.	1&2. Analyse cantilever beams, subjected to different types of loads (Point load & UDL), for SFD and BMD using any open-source analysis software.
			2. Problems.	
			3. Problems.	
10	**3**	**1,2,3, 4,7.**	1. Calculation of Bending Moment and shear force for overhanging beams with UDL and point load Draw Shear force and bending moment diagrams for overhanging beams with UDL and point load and Locate points of contra- flexure.	1&2. Analyse overhanging beams, subjected to different types of loads (Point load & UDL), for SFD and BMD using any open-source analysis software.
			2. Problems.	
			3. Problems.	
11	**4**	**1,2,3, 4,7.**	1. Bending stress in beam, Assumptions in simple bending theory, bending equations.	1&2. Flexure Test on materials like steel & wood specimens - Two Point Load system. Determine Young's modulus, bending stress and flexural rigidity.
			2. Neutral axis, Modulus of rupture, section modulus, flexural rigidity, moment of resistance.	
			3. Bending and Shear Stresses across the cross section of the beams- rectangular and T section.	
12	**4**	**1,2,3, 4,7.**	1. Slope and deflection using Moment area method for simply supported and cantilever beams subjected to point loads and UDL.	1&2. Calculation and analysis of beams for slope and deflection by Open-Source analysis software.
			2. Problems.	
			3. Problems.	

13	**5**	**1,2,3, 4,7.**	1. Introduction - Short and long columns - Euler's theory	1&2. Calculation and analysis of crippling load by Open-Source analysis software for Axial load, eccentric load and column with different materials
			2. Effective length, slenderness ratio - radius of gyration, buckling load, crippling load.	
			3. Assumptions, Euler's Buckling load for different end conditions, Limitations of Euler's theory.	

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The Activity criteria shall be conducted / executed by the student and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. References:

i. Ramamurtham. S., *"Strength of Materials",* Dhanpat Rai Publications

ii. S.S. Bhavikatti & K.G. Rajashekarappa., "*Engineering Mechanics*", New Age International (p) Limited, Publishers.

iii. S.S. Bhavikatti., "*Strength of Materials*", Vikas Publishing House PVT LTD.

iv. P N Chandramouli.," *Fundamentals of strength of materials* ", PHI New Delhi.

v. Relevant IS Codes

vi. https://www.thestructuralengineer.info/software/linpro-275

vii. https://app.clearcalcs.com/freetools/free-moment-of-inertia-calculator/au

viii. https://skyciv.com/free-moment-of-inertia-calculator/

ix. https://app.clearcalcs.com/freetools/beam-analysis/au

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6.SEE – Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper (CIE I/III)

Program	Civil Engineering			Semester -III	
Course Name	Engineering Mechanics and Strength of Materials			Test	I/III
Course Code	25CE33I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) b) c)	R/U/Ap /An	1/2	25
2	a) b) c)	R/U/Ap /An	1/2	
	Section - 2			
3	a) b) c)	R/U/Ap /An	1/3	25
4	a) b) c)	R/U/Ap/An	1/3	

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature
Course Coordinator

Signature
Programme Coordinator

Signature
IQAC Chairman

7. CIE Practice Test model question paper (CIE 2)

Program	Civil Engineering			Semester	III
Course Name	Engineering Mechanics and Strength of Materials			Test	II
Course Code	25CE33I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl. No	Questions	CO	Marks
1	One Question on forces and its validation with Lami's theorem	1	10
2	One Experimental Question to Conduct Hardness test/Tensile test/Impact test for a given specimen. Writing Observations and Tabular column, Equation with all notation-10 Conduction of Experiment-5 marks Calculation and result with graph-5 marks	1	20
3	Manual Calculation of Centroid and Moment of Inertia of given section and validate using CADD (10 + 5) marks	2	15
4	Viva- voce		5
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper (CIE 4)

Program	Civil Engineering			Semester	III
Course Name	Engineering Mechanics and Strength of Materials			Test	II/IV
Course Code	25CE33I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl.No	Questions	CO	Marks
1	Manual Calculation of Shear force and Bending moment - 10 marks Draw SFD & BMD for Simply supported beam / cantilever beam / overhanging beam with point load and UDL - 5 marks Validation with any analysis software- 5 marks	3	20
2	One Experimental Question on UTM to Conduct a flexural test for a given specimen Writing Observations and Tabular column, Equation with all notation-5 marks Conduction of Experiment-5 marks Calculation and result -5 marks	4	15
3	One question on slope deflection of beams/ column analysis and its validation with any analysis software (5 + 5) marks	4 or 5	10
4	Viva- voce		05
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
1	For any 10 different materials identify their mechanical properties and uses. Prepare note on it and submit with neat Pictures.
2	Calculate the CG and MI of different sections using open-source online tools.
3	Visit the nearby ongoing construction work. Identify the different types of beams and their supports in building. Prepare note on it with photographs.
4	Calculate the deflection for different beams using any open-source online tools.
5	Prove that the column with Fixed supports will take more load as compared with different end conditions.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
	Average Marks=(20+40+30+50+40)/8						**36**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE- Model Practice Question Paper

Program	**Civil Engineering**		**Semester**	**III**
Course Name	**Engineering Mechanics and Strength of Materials**	**Course Code:25CE33I**	**Duration**	**180 min**

Sl.no	Questions	CO	Marks
1	One Experimental Question to Conduct hardness test/tensile test/Impact test/ flexural test for a given specimen. Writing Observations, Tabular column and Equation with all notation-5 marks Conduction of Experiment-5 marks Calculation and result with graph-5 marks	**1 or 4**	**15**
2	Manual Calculation of Shear force and Bending moment - 5 marks Draw SFD & BMD for Simply supported beam / cantilever beam / overhanging beam with point load and UDL - 5 marks Validation with any analysis software- 5 marks	**3**	**15**
3	a. Manual Calculation of Centroid and Moment of Inertia of given section and validate using CADD – 5+5 marks **OR** b. One question on slope deflection of beams/ column analysis and its validation with any analysis software – 5+5 marks	**2 or 5**	**10**
4	Viva- voce		**10**
		Total Marks	**50**

Note for the External Examiner: The Choice between the questions 3a and 3b shall be done by the external examiner

1) Signature of the Examiner **2) Signature of the Examiner**

11. Equipment/software list with Specification for a batch of 30students

Sl. No.	Particulars	Specification	Quantity
01	Lami's apparatus	It Consists of a board of about 65 x 50cm, with two aluminium pulleys, on clamp, for mounting on board in any desired position. Complete with three mass hangers and 12 slotted masses, each of 50g each.	4
02	Hardness test apparatus	Model Number: TRSN. Test Loads: 60,100,150 kgs (Rockwell) Initial Loads: 10 (kgs) Maximum Test Height: 222 mm. Depth of Throat: 130 mm. Machine Height: 627 mm. Net weight: Approx. 65 kg. Size of base: Approx. 450 * 265 mm.	1
03	Universal Hardness test apparatus	Screen display of hardness value and scale with 0.1-unit resolution Built-in x50 total magnification Variable test sequence timing from 1 to 50 s Multiple loads available - Vickers: 3, 5, 10, 30 and 100 kgf - Brinell: 5, 10, 30, 62.5 and 187.5 kgf	1
04	Impact test apparatus	Model 50 Maximum Capacity Units- J 500 Maximum Scale Graduation Units- J 0.1 Overall Size without Protection Guard (Approx.) L x W x H Units- m 1.1 x 0.45 x 1.65 Overall Size with Protection Guard (Approx.) L x W x H Units- m 2.2 x 1.2 x 2.1 Net Weight of Machine (Approx.) Units- kg 500	1
05	UTM	Force range: 10kN, 20kN, 30kN, 50kN, and 100kN. ... Crosshead speed: 0.05 to 500 mm/min. Speed accuracy: < 0.5% Load cell accuracy: ± 0.5% of reading. Software: software for tensile, compression + bending incl. Electrical supply: 220-230Vac, 50Hz, 1kVA, single phase 3 wires. Accessories	1
06	Dial Gauge With magnetic stand	Clamping Force (N): 600 N Overall Height (mm): 220 mm Applicable for: For Dial Test Indicator Size (mm): 10 mm	4
07	Desktop Computers / Laptops	8 GB RAM, 512GB HARD DRIVE, i5 and above 2.5 GHz PROCESSOR,	15
08	Computer Aided Drafting Software	Any Open source/licensed	1 / computer
09	Any FEM analysis software	Any Open source/licensed	1 / computer

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	III
Course Name	BUILDING PLANNING AND DRAWING	Type of Course	Integrated
Course Code	25CE34I	Contact Hours	91 Hrs./Sem. 7 Hrs./Week
Teaching Scheme	L: P:: 3:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

Building Planning and Drawing is a cornerstone of civil engineering education, as it integrates essential skills like design, technical drawing, regulatory knowledge, and sustainability. This subject not only prepares students for the professional challenges they will face in the field but also ensures they have a thorough understanding of how buildings are planned, designed, and executed in real-world scenarios.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Prepare site plans as per standard/local building bye laws and climatic factors.
CO-02	Develop Plan, Elevation and Cross Sections for a given type of building.
CO-03	Prepare Water Supply and Sanitary Layouts for a building as per standards.
CO-04	Prepare Electrical layout and Firefighting layout as per standards.
CO-05	Prepare Standard Drawings of Rain Water Harvesting Systems Septic tank, Soak Pit and Manhole and Basic 3D Drawings of Buildings.

3. Course Content

WEEK	CO	PO	Theory 3 hours/week	Practice 4 hours/ week
1	1	1,5,7	1. Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. Introduction to Rules and bye-laws of sanctioning authorities for construction work as per NBC and Local Building Bye laws.	1. Symbols and Sign Conventions used in building drawings as per IS standards by manual drawing.
			2. Margin and Maximum Built up Area, Plinth areas for different types of buildings, Permissible built-up areas in margins,	

			Projections in margins, Margins from common plot, Open spaces, Floor area ratio, Carpet area, Super Built-up Area, Key plan (Layout plan), Site plan, building plan and Working plan. Discuss Space requirement and norms for minimum dimension of different units in the residential and public buildings.	
			3. Parking area, Ventilation, Headroom, Mezzanine floor, Corner Plot. Provisions for Persons with Disability and Elderly Persons. Discuss Approvals from Town and Country Planning Department, Read and interpret readymade Architectural building drawing (To be procured from Architect, Planning Consultants, Planning Engineer)	2. Calculation of Floor area ratio, Plinth area and Carpet area for a given building plan.
2	**1**	**1,2, 4,5**	1. Drawing of Site Plan for a residential building When Set back distances are given. Drawing of Site Plan for a residential when percentage area coverage of building is given.	1. Execute the site plan for a residential building using set back distance/building coverage using CAD.
			2. Manual Drawing of the Cross Section through the wall footing for the given details.	
			3. Manual Drawing of the Cross Section through the wall footing while section line passes through Door and Window for the given details.	2. Drawing of the Cross Section through the wall footing while section line passes through Door and Window using CAD.
3	**2**	**1,4, 5,7**	1 & 2. Sketch line plan for a 2 BHK residential building including water closet (WC), bath and staircase as per principles of planning.	1. Execution of line plan a residential building of minimum three rooms including water closet (WC), bath and staircase using CAD.
			3. Sketch line plan for a public building such as School building/Hostel building as per principles of planning.	2. Execution of line plan of public building such as School building/Hostel building using CAD.
4	**2**	**1,4, 5,7**	1 & 2. Draw the following views for a Single Room Building by Manual drawing. i) Plan ii) Elevation iii) Section	1. Draw the following views for a Single Room Building using Manual Drawing. i) Plan ii) Elevation iii) Section
			3. Draw the following views for a Two Room Building by manual drawing. i) Plan ii) Elevation iii) Section	2. Draw the following views for a Two Room Building using Manual Drawing. i) Plan ii) Elevation iii) Section

5	**2**	**1,4, 5,7**	1,2 & 3. Draw the following views for 1 BHK residential Buildings with schedule of openings. i) Plan, ii) Elevation, iii) Section	1. Execute the building drawing (Plan, Elevation and Section) using CAD software for 1 BHK residential building. 2. Preparation of footing layout and center line/ grid line (using layers concept) for 1 BHK residential building.
6	**2**	**1,4, 5,7**	1,2 & 3. Draw the following views for 2 BHK residential Buildings with staircase showing schedule of openings. i) Plan, ii) Elevation, iii) Section	1. Execute the building drawing (Plan, Elevation and Section) using CAD software for 2 BHK residential building 2. Preparation of footing layout and center line/ grid line (using layers concept) for 2 BHK residential building.
7	**2,3**	**1,4, 5,7**	1. Introduction to plumbing: Pipe Materials used in building construction works for water supply work - Plastic Pipes, High Density Polyethylene Pipes, Densified cast iron pipes, GI pipes, Stoneware pipes, Asbestos Cement pipes, and Concrete pipes, Hot water pipes with insulation. 2. Water supply fittings, their description and uses, water main, service pipes, supply pipe, distribution pipe, domestic storage tank, stop cock, ferrule, gooseneck, water tap, aerators, water meter. 3. Merits and Demerits. Connections from water main to buildings. Factors affecting the suitability of plumbing material and accessories for Water supply work, Water pressure test for leakage during installation of pipes.	1. Marking of footing layout and center line/ grid line of 1 BHK building on the field. 2. Prepare the furniture Layout/Kitchen cabinets/ wardrobe arrangements for a 1BHK residential building (For the Problem Executed in week 6).
8	**2,3**	**1,4, 5,7**	1. Importance of Sanitary work for building. Different types of Sanitary pipes and pipe materials used in building construction works for drainage and waste disposal. 2. Sanitary Fittings- Water Closets, Flushing Cisterns, Urinals, Inspection Chambers, Traps, Anti-svphonage. Connections from building to sewer main. 3. Inspection, Testing and Maintenance of Sanitary line in building. Factors affecting the suitability of sanitary material and accessories for Sanitary work.	1. Execute the building drawing (Plan, Elevation and Section) using CAD software for Primary Health Centre. 2. Continued.
9	**2,4**	**1,4, 5,7**	1. Wiring accessories: SP (single pole switch), DP (double pole switch), ICDP (Iron Clad Double Pole main switch), ICTP (Iron Clad	1. Execute the building drawing (Plan, Elevation and Section) using CAD software for

			Triple Pole switch), change over switch, modular switches, 2 pin socket ,3 pin socket, 2 pin plug top, 3 pin plug top, ceiling rose, round block, switch boards, switch plates, modular switch enclosures, blank insert gang box, junction box, fan box.	School/Hostel building.
			2. Safety devices: Types of fuse units and Materials for fuse wire, Glass cartridge fuse, types of HRC fuse, Kit Kat fuse. Types of MCB, MCCB, RCCB, ELCB Types of Earthing- Pipe earthing, Plate earthing, Lightning arrestors.	
			3. Types of wiring systems and their applications: Surface conduit, concealed conduit, PVC casing capping. Types of wires, cables used for different current and voltage rating, Connection from Electric source to building based on electricity load.	2. Continued.
10	**3,4**	**1,4, 5,7**	1. Building Basic Services Preparation of water supply Layout for a residential building using layers command.	1 & 2. Prepare basic service layouts like Water supply, Sanitary, Electrical layouts for residential building using CADD with layers (For the Problem Executed in week 6).
			2. Preparation of Sanitary Layout for a residential building using layers command.	
			3. Preparation of Electrical Layout for a residential building.	
11	**4,5**	**1,4, 5,7**	1. Fire classifications, Importance of providing Firefighting system and fire safety requirements in Commercial and Industrial Building.	1. Prepare firefighting layout for a Commercial building in CADD.
			2. Components of the firefighting system and its applications in Commercial and Industrial Building, Fire ratings.	2. Prepare rainwater harvesting unit layout for residential building drawings in CADD.
			3. Importance of conservation of rain water by Rain water harvesting unit in buildings. Components of the rainwater harvesting system.	
12	**5**	**1,4, 5,7**	1. Methods of Rainwater harvesting, Benefits of rainwater harvesting unit in buildings.	1. Execute septic tank with soak pit for a building using CADD.
			2. Purpose of using Soak pit with Septic tank and its sizing based on the requirement for different typologies of building.	
			3. Purpose of using Manhole and its sizing based on the requirement for different typologies of building.	2. Execute Manhole drawings for a building using CADD.
13	**5**	**1,4, 5,7**	1. 2 & 3. Develop a 3D model of a single room building using any 3D Modelling tool.	1 & 2. Develop a 3D model of a single room building using any 3D Modelling tool.
Total in Hours			**39**	**52**

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The Activity criteria shall be conducted / executed by the student and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. References:

i. Civil engineering drawing by "M. Chakraborti", Bhaktivedanta book trust
ii. Building Planning and Drawing- S.S. Bhavikatti, M.V. Chitawadagi, I. K International Publishing House Pvt.Ltd.
iii. Civil Engineering Drawing and design – D.N. Ghose (CBS Publishers)
iv. A textbook of Draughtsman Civil (Theory and Practical) – R.S. Mallik and G.S. Meo(Asian publishers, New Delhi).
v. CAD in Civil Engineering a Laboratory Referral- Dr M.A. Jayaram, D.S.Rajendra Prasad, Sapna Book House.
vi. Making a simple floor plan using AUTOCAD https://www.youtube.com/watch?v=hO865EIE0p0&t=384s
vii. https://www.youtube.com/watch?v=U0gbU_EAPRE
viii. https://www.youtube.com/watch?v=1jN2QiQOkr4
ix. https://www.youtube.com/watch?v=p1j92IdDPEM
x. https://www.youtube.com/watch?v=c4dIlVvy_yU

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					**50 Marks**

6. SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	Civil Engineering			Semester -III	
Course Name	Building Planning and Drawing			Test	I
Course Code	25CE34I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) Discuss the importance of byelaws in building construction. b) Draw the Conventional Representation of Different Building Construction Materials.	R/U/Ap	1/2	25
2	a) For a given building plan Calculate the values of Floor Area Ratio, Plinth area and Carpet area. b) Draw the Site Plan for a residential when percentage area coverage of building is given.	R/U/Ap	1/2	
	Section - 2			
3	a) Draw the Cross Section through wall for the given details. b) Sketch line plan for a 2 BHK residential building including water closet (WC), bath and staircase	R/U/Ap	1/2	25
4	a) Draw the following views for a Single Room Building by Manual drawing.(using mini drafter) i) Plan, ii) Elevation & iii) Section	R/U/Ap	1/2	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature **Signature** **Signature**

Course Coordinator **Programme Coordinator** **IQAC Chairman**

7. CIE Practice Test model question paper (CIE 2)

Program	Civil Engineering			Semester	III
Course Name	Building Planning and Drawing			Test	II
Course Code	25CE34I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl. No	Questions	CO	Marks
1	Portfolio evaluation for practice sessions and activity -Performance criteria (Observations and report)	-	05
2	Sketch line plan for a 2 BHK residential building including water closet (WC), bath and staircase as per principles of planning using CAD.	2	10
3	Draw the following views for 2 BHK residential Buildings with staircase showing schedule of openings using CAD. i) Plan, ii) Elevation, iii) Section	2	30
4	Viva Voce		05
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper (CIE 4)

Program	Civil Engineering			Semester	III
Course Name	Building Planning and Drawing			Test	IV
Course Code	25CE34I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl.No	Questions	CO	Marks
1	Portfolio evaluation for practice sessions and activity -Performance criteria (Observations and report)	-	05
2	Execute the building drawing (Plan, Elevation and Section) using CAD software for a Primary Health Centre/ School Building	2	20
3	Prepare basic service layouts like Water supply/Sanitary/ Electrical layouts/Firefighting/ Rain water harvesting for residential building using CAD with layers.	3/4	20
4	Viva Voce		05
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic. (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
1	Study and Prepare report on local building byelaws of your local authority.
2	Take the physical measurement of an existing building and Prepare Plan, Elevation and Sectional Details.
3	Preparation of approval drawing to be submitted to Corporation or Municipality showing required details in one sheet such as a) Site Plan (Land boundary, Building boundary, Car Parking, Passage, sanitary layout, septic tank location etc. b) G.F. Plan, F.F. Plan, Section and Elevation (line diagram is enough) c) Key Plan d) Septic tank Plan and section (line diagram) e) Rain water harvesting pit (with all detail) f) Typical foundation details (Column foundation or spread footing) g) Title block showing – joinery details, Specification, Area statement, color Index, Title of the property, space for owners Signature and Licensed Surveyor's Signature with address.
4	Prepare a 3D Model of a single room building using Google sketch/Revit Architecture/3DS Max

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
	Average Marks=(20+40+30+50)/4						**35**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE- Model Practice Question Paper

Program	Civil Engineering		Semester	III
Course Name	Building Planning and Drawing	Course Code:25CE34I	Duration	180 min

Sl.No	Questions	CO	Marks
1	Execute the building drawing (Plan, Elevation and Section) using CAD software for 1 BHK/2 BHK residential building/Primary Health Center/ School Building.	2	30
2	Prepare basic service layouts like Water supply/Sanitary/ Electrical layouts for residential building using CADD with layers.	3/4	15
3	Viva- voce		05
		Total Marks	50

1) Signature of the Examiner **2) Signature of the Examiner**

11. Equipment/software list with Specification for a batch of 30students

Sl. No.	Particulars	Specification	Quantity
01	Computers with Latest Configuration	8 GB RAM, 512GB Hard Drive, I5 and above 2.5 GHz Processor	1/ student
02	Any latest licensed Computer Aided Drafting Software	Ver.2024	1/ Computer
03	Building Information Modelling Software's- Archi cad/Revit Architecture/3DS Max/Sketch Up	Ver.2024 and above	1/ Computer
04	Plotter of Size A0	24 Inch Large Format, Thermal Inkjet Plotter	1
05	LCD Projector	1800 Lumen, Large 120-Inch Display Projection with HDMI+ VGA+AUX+USB Connectivity	1
06	Power Backup	Battery + Inverter	1
07	Stylus For Drawing	Pen Deco01 V2 Digital Graphics Drawing Pen Tablet	1
08	Construction Practice Tool Kit, Pegs, Thread, Tri square, Arrows, Plumbing tool kit.		5 Set

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

IV Semester Scheme of Studies

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	CE	25CE41I	Estimation, Costing and Valuation	4	0	4	8	6	50	20	50	20	-	-	100
2	CE	25CE42I	Concrete Technology	4	0	4	8	6	50	20	50	20	-	-	100
3	CE	25CE43I	Hydraulics and Water Resources Engineering	3	0	4	7	5	50	20	-	-	50	20	100
4	CE	25CE44I	Design and Detailing of RC Structures	3	0	4	7	5	50	20	-	-	50	20	100
Audit Course															
5	KAN	25KA41T	Kannada –II (ಸಾಹಿತ್ಯ ಸಿಂಚನ-II/ಬಳಕೆ ಕನ್ನಡ-II)	2	0	0	2	2	50	20	-	-	-	-	50
Total				**16**	**0**	**16**	**32**	**24**	**250**	**-**	**100**	**-**	**100**	**-**	**450**

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	III
Course Name	ESTIMATION COSTING AND VALUATION	Type of Course	Integrated
Course Code	25CE41I	Contact Hours	104 Hrs./Sem. 8 Hrs./Week
Teaching Scheme	L:P:: 4:4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

The Estimation and Costing subject is vital for the effective management of construction projects, from planning and budgeting to execution and completion. It provides students with the essential skills to prepare accurate estimates, control costs, optimize resource allocation, and mitigate risks. These subject lays the groundwork for students to become proficient in cost estimation, making them capable of handling real-world challenges and contributing to the success of construction projects.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Understand the Role and Importance of Estimation in Construction Projects.
CO-02	Develop the necessary skills to prepare precise and reliable specifications and rate analysis that are crucial for accurate cost estimation in the field of construction engineering.
CO-03	Applying the learned techniques to generate accurate estimates for residential, commercial, and infrastructure projects , Utilizing software tools (e.g., CADD, spreadsheet, estimation software) for detailed estimation.
CO-04	Develop Ethical and Professional Valuation Practices

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,6,7	1.Introduction to estimation Types of estimates, Roles and responsibility of estimator, Different items of works, unit of measurement and units of payment of different items of work, 2. Bill of Quantities – Importance, preparation. 3.Analysis of rates - purpose, basic rates of different construction materials, Categories of labours and their skills, number of labours and daily wages for different items of work, 4.Load carrying capacity of different types of vehicles, transportation of materials and their hiring charges., GST charges, lead, lift,	1.Take the linear measurements of existing building and list out the different building components. 2. In an existing building list out the different materials used for its construction.

			overhead charges, water charges and contractor's profit. factors affecting rate analysis	
2	**2**	**1,5,7**	**Specifications** 1. a. Earthwork in excavation for foundation b. Cement concrete in foundation, c. Brick masonry, 2.a. Plastering in Cement mortar, b. Pointing with cement mortar c. Cement concrete flooring, 3.a. Granite flooring b. Vitrified flooring c. Marble flooring 4.a. Reinforcement b. RCC in slabs, columns, footing etc., c. Formwork	**3.Modern Excel Functions.** Exposure to excel commands, formulas required for preparing detailed and abstract estimate.
3	**2**	**1,2,3, 4,7**	**Specifications** 1. a. White washing b. Exterior painting(emulsion) 2. a. Interior painting(Emulsion), b. Woodwork for doors. c. UPVC and Aluminium windows **Method of Analysis of rates for the following items of works** 3. a) Earthwork excavation and filling b) Cement concrete bed in foundation 4. a) Size stone masonry in Cement mortar for substructure b)Brick masonry in C.M for superstructure	4.Prepare specification table in spreadsheet for different items of a residential building using recent Schedule rates . 5.Schedule of rates - compare the rate analysis done in class room to recent Schedule rates
4	**2**	**1,2,3, 4,7**	**Method of Analysis of rates for the following items of works** 1. a) Solid concrete blocks masonry in Cement mortar for superstructure b) R.C.C roof slab 2 & 3.a) CC Flooring, Granite / Vitrified / Marble flooring 4. a) Plastering with cement mortar b) Painting of wall surface.	6. Prepare the rate analysis using spreadsheet a) Cement concrete bed in foundation b) Size stone masonry in Cement mortar for substructure c) Brick masonry in C.M for superstructure
5	**3**	**1,2,3, 4,7**	1. Introduction to methods of estimation: long wall short wall method and center line method of estimation, Standard Format for measurement sheet. 2. Rules for deduction of doors, windows and openings.	7.Prepare the rate analysis using spreadsheet a) Plastering with cement mortar b) R.C.C roof slab

			3. Co-efficient for Painting and Varnishing. 4. Detailed and abstract estimate.	
6	**3**	**1,2,3, 4,5,7**	**Detailed & Abstract estimate** 1& 2. One room building- Ground floor with flat RCC roof (Long wall short wall method). 3& 4. Two room building- Ground floor with flat RCC roof (Long wall short wall method).	8.Execute the detailed and abstract estimate using **long wall short wall method using spreadsheet** - Two room building Residential building
7	**3**	**1,2,3, 4,5,7**	**Detailed & Abstract estimate** Single storied 1BHK Residential building (Long wall short wall method) **Detailed & Abstract estimate** Single storied 2 BHK Residential building (Long wall short wall method).	9.Execute the detailed and abstract estimate using **long wall short wall method using spreadsheet** - Single storied 1 BHK Residential building
8	**3**	**1,2,3, 4,5,7**	**Detailed & Abstract estimate** Single storied 1BHK Residential building (Center line method) **Detailed & Abstract estimate** Single storied 2 BHK Residential building (Center line method)	10.Execute the detailed and abstract estimate using **Center line method using spreadsheet** - Single storied 2 BHK Residential building
9	**3**	**1,2,3, 4,5,7**	**Detailed & Abstract estimate** Building with semicircular/ Hexagonal room walls – Ground floor with flat RCC roof (Center line method).	12.Prepare detailed and abstract estimate **of** Building with semicircular/ Hexagonal room walls – Ground floor with flat RCC roof **extracting measurement from CADD**
10	**3**	**1,2,3, 4,5,7**	Prepare detailed and abstract estimate – Single storied 2 BHK RCC framed building (any method)	11. Prepare detailed and abstract estimate using spreadsheet - Single storied 2 BHK RCC framed building **extracting measurement from CADD**
11	**3**	**1,2,3, 4,5,7**	**Detailed & Abstract estimate** of **framed commercial building (concrete quantity, Reinforcement quantity) for given structural details (only for CIE)** 1&2 a. Column with footing layout (Two storied building) 3&4. b. Ground floor slab with Beam	13.Prepare detailed and abstract estimate **of commercial building (concrete quantity, Reinforcement quantity) using spreadsheet**. a. Column with footing layout (Two storied building) b. Ground floor slab with Beam
12	**3**	**1,2,3, 4,5,7**	**Detailed & Abstract estimate** Public/Institution building Ground floor with flat RCC roof (long wall short wall method).	14.Prepare **Detailed & Abstract estimate** of a. septic tank & soak pit b. Manhole
13	**4**	**1,2,3, 4,5,7**	Valuation 1. Necessity of valuation, Important terms used in valuation, Scrap value, Salvage value, Market value, Book value and sinking fund. 2. Depreciation, Classification of buildings	15. Prepare **Detailed & Abstract estimate** of Canal.

			based on the life of a building and depreciation. 3 & 4. Methods of valuation & Fixation of rents.	

4. References:

1. Dutta B N, "Estimation and costing in civil engineering theory and practice", 27 edition, UBS Publishers Distributors (P) Ltd New Delhi. Chakra borty M, "Estimating, costing and specifications in Civil Engineering"-2006.
2. D.D.Kohli Ar.R.C.Kohli, "Estimating and Costing(CIVIL)"2013 edition, S.CHAND Publications
3. IS: 1200 Part 1 to 28, Method of Measurement of Building and Civil Engineering Works.
4. Rangwala S C, "Valuation of Real properties" Charotar Publishing House -2008.
5. Estimating, Costing, Specification & Valuation In Civil Engineering by M Chakraborti Publisher Chakraborti Edition Twenty-ninth revised & Enlarged Edition Publication Date 2006.

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE – Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	**Civil Engineering**			**Semester -IV**	
Course Name	**Estimation Costing & Valuation**			**Test**	**I/III**
Course Code	**25CE41I**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	**Questions**	**Cognitive Level**	**Course Outcome**	**Marks**
	Section – 1			
1	a) b) c)	U/Ap	CO1,CO2 /CO3	25
2	a) b) c)	U/Ap	CO1,CO2 /CO3	25
	SECTION - 2			
3	a) b) c)	U/Ap	CO2/CO3	25
4	a) b) c)	U/Ap	CO2/CO3	25
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE:2 Practice Test 1 model question paper

Program	**Civil Engineering**			**Semester**	**IV**
Course Name	**Estimation Costing & Valuation**			**Test**	**II**
Course Code	**25CE41I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					

Questions	**CO**	**Marks**
SECTION 1		
i. Prepare the rate analysis using spreadsheet (Any 2 items) (15 marks) **Or** ii. Prepare specification table in spreadsheet for different items (Any 3) of a residential building. (15 marks)	**2, 3**	**25**
iii. Calculate long wall and short wall length for the given residential 1BHK/2BHK building plan. (10marks)		
SECTION 2		
Execute the detailed and abstract estimate using long wall short wall method using spreadsheet for the above plan. Any 5 items **(25 marks)**	**3**	**25**
		50

Signature of the Course Coordinator Signature of the HOD

7. CIE Practice Test 2 model question paper

Program	**Civil Engineering**			**Semester**	**IV**
Course Name	**Estimation Costing & Valuation**			**Test**	**IV**
Course Code	**25CE41I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
SECTION 1					
i. Prepare detailed and abstract estimate of Building 1BHK/2BHK with semicircular/ Hexagonal room walls – Ground floor with flat RCC roof **extracting measurement from CADD.** **Or** ii. Execute the detailed and abstract estimate using **Center line method** using spreadsheet - Single storied 2 BHK Residential building				**3**	**25**
SECTION 2					
i. Prepare Detailed & Abstract estimate of septic tank & soak pit/ manhole (15 marks) **or** ii. Prepare Detailed & Abstract estimate of canal (15marks) iii. A building costing Rs. 15lakhs has been constructed on a free hold land measuring 100sqm. Recently in big city prevailing rate of land is the neighborhood of Rs. 4500 per sqm. Determine the net rent of the property if the expenditure on an outgoing including sinking fund is Rs. 42000 per annum. Work out also the gross rent of the property per month. (10marks) **or** iv. The estimated value of a building is Rs.5,00,000. The carpet area of the building is 70 sq.m If the plinth area is 20% more than this, what is the plinth rate of the building? (10marks)				**3, 4**	**25**
					50

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	**Suggestive Activities**
01	Collect basic rates of construction materials, labour rates prevailing in your locality.
02	Take linear measurements of residential /institutional/commercial existing building, plot in CADD, and prepare detailed and abstract estimate for all the items.
03	Prepare BOQ for single storied residential building (framed)
04	Make a case study on valuation of a existing building.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
	Average Marks=(30+20+30+40)/4=30						**30**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10.Equipment/software list with Specification for a batch of 30students

Sl.No.	Particulars	Specification	Quantity
01	Computers with Latest Configuration	8 GB RAM, 512GB HARD DRIVE, i5 and above 2.5 GHz PROCESSOR	1/student
02	licensed MS OFFICE	Latest version	1/computer
03	Power Backup	Battery + Inverter	1

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	IV
Course Name	CONCRETE TECHNOLOGY	Type of Course	Integrated
Course Code	25CE42I	Contact Hours	104 Hrs./Sem. 8 Hrs./Week
Teaching Scheme	L:P:: 4: 4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

Diploma holders in Civil Engineering are supposed to supervise ingredients of concrete and concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing, curing and testing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in fresh and hardened stage by testing, water cement ratio and workability; proportioning of concrete; concreting operations, repairs and maintenance of concrete structures.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Determine the properties of ingredients of concrete and Identify the type of admixture and its suitability.
CO-02	Understand the properties of fresh concrete, hardened concrete and different concrete operations.
CO-03	Design mix proportions as per Indian standards for standard concrete of desired strength
CO-04	Analyze modern and emerging applications of special concrete in the construction industry

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,4	**Concrete**-Ingredients of Cement concrete Cement – Chemical composition -Bogue's compounds, Hydration of cement. List the types of special cement. **Properties**- fineness (surface area), standard consistency, specific gravity, setting time, soundness and compressive strength. Effect of storage on properties of cement, Water -Quality of mixing water, Limits on the impurities as per IS.	1.Determination of fineness of cement (sieve test) and specific gravity of cement. 2.Determination of standard consistency of cement.

2	**1**	**1,4**	Fine aggregate – specific gravity, density, moisture content, bulking, fineness modulus and grading zone, silt content and their specification as per IS 383. Coarse aggregate - Importance of size, shape and texture, specific gravity, Water absorption and moisture content, grading, flakiness and elongation index of coarse aggregate. Crushing strength, toughness and abrasive resistance of coarse aggregate, storage of coarse aggregate at site, use of recycled concrete aggregates.	1. Determination of Initial setting time of cement. 2. Determination of Compressive strength of cement cube.
3	**1**	**1,4,5**	**Mineral admixture:** Properties, advantages and applications of Fly ash, GGBS, Silica fume. **Chemical Admixture:** Properties, advantages and applications of Superplasticizers, Accelerators and Retarders, Air Entraining and Integral Waterproofing compounds.	1. Determination Flakiness and Elongation index 2.Determination of specific gravity of fine aggregate 3. Determination of bulking of sand.
4	**1,2**	**1,4**	**Concrete:** Different grades of concrete as per IS-456, significance of w/c ratio, Gel-space ratio concrete for different exposure conditions as per IS 456. **Properties of fresh concrete:** Workability - Factors affecting workability of concrete. Workability requirement for different types of concrete works, Segregation, bleeding and preventive measures.	1.Determination of Fineness modulus of fine aggregate by sieve analysis. 2. Determination of specific gravity of coarse aggregates. 3. Determination of bulk density and water absorption of coarse aggregate.
5	**1,2**	**1,4,5**	**Properties of Hardened concrete:** (a) Strength(b) Durability (c) Permeability. Factors affecting strength and durability Compressive strength, split tensile strength, bond strength, modulus of rupture. Modulus of elasticity, Poisson ratio	1.Determination of Fineness modulus of coarse aggregates. 2. Determination of Crushing strength of coarse aggregates. 3. Determination of Aggregate Impact value of coarse aggregates.
6	**2**	**1,4**	**Shrinkage** – plastic shrinkage and drying shrinkage, factors affecting shrinkage. **Creep** –Factors affecting creep, effects due to the creep of concrete, **Factors contributing to cracks in concrete** – Settlement cracks, Thermal expansion, and structural design deficiencies.	1.Determination of workability of concrete by slump cone test (Nominal mix) 2. Determination of workability of concrete by compaction factor test (Nominal mix) 3. Casting of concrete cubes

7	**2,3**	**1,4**	**Concrete in Aggressive Environment:** • Alkali – Aggregate Reaction, • Sulphate Attack • Chloride Attack • Acid Attack • Effect of Sea Water • Carbonation • Freezing and thawing.	1.Determination of compressive strength of concrete cubes for 7 and 28 days (for nominal mix in week-06) 2. Determination of compressive strength of concrete cubes for 7 and 28 days by Non-Destructive Testing (NDT) equipment - Rebound Hammer
8	**2,3**	**1,4**	**CONCRETE OPERATIONS:** **Batching** (a) Volume Batching (b) Weigh Batching **Mixing** (a) Hand mixing (b) Machine mixing Types of mixers, choosing appropriate size of mixers	1. Determination/Demonstration of compressive strength of concrete for structural members by Non-Destructive Testing (NDT) equipment - Ultra-Sonic Pulse Velocity (UPV) and Rebound hammer 2. Prepare concrete mix design for "Standard Concrete" with chemical admixture as per IS 10262-2019 and Conduct Slump test and compaction factor test to determine the workability.
9	**2,3**	**1,4**	**Transportation** Transportation Modes - Pans, wheelbarrows, transit mixers, chutes, Skip and hoist type, belt conveyors, pumps, tower cranes. **Compaction:** Hand compaction Machine compaction- types of vibrators- internal and external vibrators suitability of vibrators for various situations.	1. Determination of compressive strength of concrete cubes for 7 and 28 days (for design mix in week-08) 2. Prepare concrete mix design for "Standard Concrete" grade with chemical and mineral admixture as per IS 10262-2019 and Conduct Slump test and compaction factor test to determine the workability.
10	**2,3**	**1,4**	**Finishing**- Screeding, Floating, and Troweling. **Curing: -** Objects of curing, Methods of curing: ➢ Water Curing – types of water curing ➢ Membrane Curing ➢ Steam Curing Duration for curing	1. Determination of compressive strength of concrete cubes for 7 days (for trial mix prepared in week-09) 2. Site visit/Video demonstration on working of RMC Plant (Components in RMC Plant)
11	**3,4**	1,4	**Ready Mix concrete (RMC)** Advantages, Precautions and care before, during and after concreting using RMC. **Self-compacting concrete (SCC)** Features of Fresh Self Compacting Concrete	1. Prepare concrete mix design of Self Compacted concrete (SCC) as per IS 10262:2019 and conduct Slump, flow test, V Funnel Test, L Box Test, U Box Test to determine workability.

			Design of SCC as per IS 10262-2019 *(* Design of SCC only for CIE-Theory/ Practice)*	*(* Design of SCC only for CIE-Theory/ Practice)*
12	**3,4**	1,4	**Ingredients, advantages and applications of** • High strength concrete • High performance Concrete • High density concrete • Lightweight Concrete	1. Determination of compressive strength of concrete cubes for 7 days (for trial mix prepared in week-11) 2. Prepare a report on different types of joints provided in concrete. (Construction, Contraction, Expansion Joints, Isolation Joints)
13	**3,4**	1,4	**Ingredients, advantages and applications of** • Fiber reinforced concrete • Geo-polymer concrete • Pavement Quality concrete (PQC) • Recycled aggregate Concrete	1. Video demonstration on ❖grouting ❖shotcreting ❖underwater concreting ❖Hot weather concreting

4. References:

i. Concrete Technology, Shetty, M.S, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi
ii. Concrete Technology, Gambhir, M.L, Tata McGraw Hill Publishing Co. Ltd., Delhi
iii. Concrete Technology, Santhakumar, A. R., Oxford University Press, New Delhi
iv. Concrete: Microstructure properties and Materials by P.K. Mehtha, McGrawhill Publications
v. Laboratory Manual in Concrete Technology, Sood, H., Kulkarni P. D., Mittal L. N., CBS Publishers, New Delhi.
vi. Concrete Technology, Neville, A. M , Pearson Education Pvt. Ltd., New Delhi.
vii. Relevant BIS codes

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE – Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	Civil Engineering			Semester - IV	
Course Name	Concrete Technology			Test	I
Course Code	25CE42I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) What are the effects of storage of cement on its strength? b) Write the chemical composition of cement? c) What are the effects of various W/C ratios hydration of cement.	**R/U**	**CO1**	10 08 07
2	A) Define i) Normal Consistency ii) Initial setting Time iii) Final Setting Time b) What are the limits on impurities in water used for concrete as per BIS standards? c) Define Bulking of fine aggregates.	**R/U**	**CO1**	09 10 06
	Section - 2			
3	a) Explain the effects of Segregation in concrete b) Explain Bogue's compounds. c) Explain the effects of GGBS on hardened concrete properties	**R/U**	**CO1**	07 10 08
4	a) Explain the significance of w/c ratio b) Explain the advantages of using superplasticizers in concrete c) Explain well graded aggregates	**R/U**	**CO1**	10 08 07
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Theory Test model question paper

Program	Civil Engineering			Semester - IV	
Course Name	Concrete Technology			Test	III
Course Code	25CE42I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) Explain the factors affecting strength of concrete b) Explain the factors contributing strength of concrete c) Explain Sulphate attack in concrete	R/U	CO2	10 10 05
2	a) Explain the factors affecting shrinkage of concrete b) Explain any three methods of curing c) Explain chloride attack in concrete	R/U	CO2	10 10 05
	Section - 2			
3	a) Explain the factors affecting strength of concrete b) Explain the factors affecting creep of concrete c) Explain freezing and thawing effect in concrete	R/U	CO2	10 10 05
4	a) Explain any three modes of transportation of concrete b) Explain weigh batching c) Explain carbonation in concrete	R/U	CO2	10 10 05
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	IV
Course Name	Concrete Technology			Test	II
Course Code	25CE42I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
1. Conduct any one test on cement/ fine aggregate/ coarse aggregate. **2.** Conduct Slump test / compaction factor test for nominal mix.	1,2	**20** **20**
Scheme of assessment (Q1 & Q.2) a) Procedure-05marks b) Tabular column/observation-05 marks c) Conduction of Experiment-05marks d) Calculation and Results-05 marks		
3. Viva-voce		**10**
Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper

Program	**Civil Engineering**			**Semester**	**IV**
Course Name	**Concrete Technology**			**Test**	**IV**
Course Code	**25CE42I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					

Questions	**CO**	**Marks**
1. Prepare Concrete mix design as per IS 10262-2019 for M30 grade with chemical admixture and with / without mineral admixture and Conduct Slump test / compaction factor test to determine the workability. **OR** 2. Prepare Concrete Mix design for M30 self-compacting concrete as per IS 10262-2019 for the given data. Conduct test to determine the workability of Self Compacting concrete: Slump test/ V Funnel Test / L Box Test / U Box Test for trail mix.	**CO 3**	**45**
Scheme of assessment a) Mix design-20marks b) Procedure-05marks c) Tabular column/observation-05 marks d) Conduction of Experiment-10marks e) Calculation and Results-05 marks		
2. Viva-voce		**05**
Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	**Suggestive Activities**
01	Conduct market analysis on price, grades and brand of cement.
02	Study on Recycled coarse aggregate and prepare a report.
03	Study the advantages and uses of concrete in comparison to other building materials.
04	Prepare Comparison report on different grades of concrete based on workability.
05	List the remedies for cracks in concrete.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	25
	Average Marks=(10+30+40+20+25)/5 =25						**25**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11.Equipment/software list with Specification for a batch of 30 students.

Sl. No.	Particulars	Specification	Quantity
1	90 micron sieve set Cement	As per IS	05
2	Vicat Apparatus	As per IS	05
3	Pycnometer	As per IS	10
4	Density bottle	As per IS	10
5	Universal Testing Machine	As per IS	01
6	Compression Testing Machine	200 Tonnes	01
7	Slump test apparatus	As per IS	05
8	Sieve sets for fine aggregate	As per IS	05
9	Sieve sets for Coarse aggregates	As per IS	10
10	UPV apparatus	As per IS	01
11	Digital Rebound Hammer	As per IS	01
12	Compaction factor test apparatus	As per IS	04
13	Self-compacting concrete test apparatus	As per IS	01 set
14	Laboratory Concrete Mixer with trolley	As per IS	01
15	Cube Moulds	150 x150x150 mm	05
16	Cube Moulds	70.6 x 70.6x 70.6 mm	05
17	Table Vibrator	As per IS	01
18	Cylinder	1000 ml	01
19	Bulk Density Appratus	As per IS	02
20	Aggregate Impact test apparatus	As per IS	02
21	Aggregate Crushing test apparatus	As per IS	01
22	Moisture meter	As per IS	02
23	Concrete mixing Equipment	Trowel, Hoe, tamping rod, mortar pan etc.	03 sets
24	Digital Weighing balance	50 kg capacity	02

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	IV
Course Name	HYDRAULICS AND WATER RESOURCES ENGINEERING	Type of Course	Integrated
Course Code	25CE43I	Contact Hours	91 Hrs./Sem. 7 Hrs./Week
Teaching Scheme	L:P :: 3:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

This curriculum outline for a fluid mechanics and irrigation course provides a logical progression of topics, building from fundamental fluid properties to complex hydraulic structures. It establishes a strong foundation in fluid mechanics principles, hydrological and irrigation engineering. The inclusion of practical laboratory exercises and field visits reinforces theoretical concepts and provides hands-on experience broaden the students' understanding of water resource management. This structured approach allows students to develop a comprehensive understanding of fluid mechanics and its application in irrigation engineering.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Understand and apply fundamental fluid properties and pressure concepts to solve related problems.
CO-02	Analyze fluid flow in pipes, channels, and through various hydraulic structures, including the ability to calculate discharge and head loss.
CO-03	Evaluate hydrological processes, water requirements for crops, and basic irrigation principles.
CO-04	Analyze and plot various irrigation structures, including canals, earthen bund, weirs, Sluice, cross drainage works and barrages.

3.Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,2, 4,7	**Fluid Properties and Fluid Pressure** 1. Definition of: Fluid, fluid mechanics, hydraulics, hydrostatics, hydrodynamics, ideal and real fluid. 2. Physical properties of fluid – density, specific volume, specific gravity, surface tension, capillarity, viscosity. 3. Definitions of - Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit. Pascal's law of fluid pressure.	Calculation of tank volume, actual discharge.
2	1	1,2,	**Fluid Pressure and Measurement**	1. Study of U-tube

		5,7	1. Simple problems on pressure. 2. Pressure measuring devices – piezometer, manometers, pressure gauges, types and uses. 3. U-tube – simple and differential only, Simple problems on monometers only.	manometer and calculate head of water. 2. Study of hook gauge and point gauge
3	**2**	**1,2, 3,7**	**Flow of Fluids** 1. Discharge and its unit, continuity equation of flow. Energy of flowing liquid: potential, kinetic and pressure energy. 2. Bernoulli's theorem: statement, assumptions, equation, Simple problems on continuity equation and Bernoulli's theorem. 3. Simple problems on Venturimeter.	Determination of Co-efficient of discharge for Venturimeter.
4	**2**	**1,2, 3,7**	**Flow Through Orifices and Notches** 1. Discharge measuring devices - orifice, mouthpieces and notches (only definitions & discharge formulas). 2 & 3. Notches (simple problems only), Orifices (Simple problems on hydraulic co-efficient)	1. Determination of Co-efficient of discharge for Triangular Notch. 2. Determination of Co-efficient of discharge for Rectangular Notch.
5	**2**	**1,2, 4,7**	**Flow Through Pipes** 1. Flow through pipes - head loss in pipe, Frictional loss and its computation by Darcy-Weisbach equation. 2. Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings. 3. Simple problems on losses in pipe flow.	1. Determination of Loss of Head due to friction in pipeline of different diameters. 2. Prepare a report on list the different types of pumps with specifications and their applications.
6	**3**	**1,2, 4,7**	**Hydrological cycles** 1. Importance of hydrological cycle, Measurement of precipitation by rain-gauges: Automatic gauges (tipping bucket or weighing type). 2. Measurement of precipitation by rain - gauges: Non - automatic gauges (Symon's rain gauge) 3. Computation of average rainfall over a basin. (Arithmetic Mean Method, Thiessen Polygon Method and Isohyetal Method)	1. Visit nearby rain gauge station and Prepare a report on rain gauge data. 2. Estimate quantity of rain water that can be harvested for a selected building for available rainfall data.
7	**3**	**1,2, 3,7**	**Hydrological cycles** 1. Simple problems on computation of average rainfall over a basin. 2. Brief description of types of precipitation, 3. Definition of Run-off and Estimation of runoff (Runoff co-efficient method only), Factors affecting the run-off.	Prepare a report on Collected rainfall data over a period of 5 years and interpolate the data.
8	**3**	**1,2,3 , 6,7**	**Irrigation** 1. Definition and necessity of irrigation, Methods of irrigation: Surface Irrigation (Flooding, Furrow Irrigation, Border Strip Irrigation and Basin Irrigation) – Brief description only. 2. Methods of irrigation: Micro Irrigation (Drip Irrigation and Sprinkler Irrigation) – Brief description only.	Prepare a report on water requirements of different crops grown in your region.

			3. Definition of lift irrigation. Advantages and disadvantages.	
9	**3**	**1,3,5, 6,7**	**Water Requirements of Crops** 1. Duty, delta, base period and relationship between them. 2. Factors affecting duty of water crops, Irrigation efficiency and frequency of irrigation. 3. Simple problems on duty, delta and base period	Field visit to nearby irrigation site/ regulatory works/ cross drainage works/ diversion head works and prepare a small report.
10	**4**	**1,3,5, 6,7**	**Irrigation structures** 1. Classification of head works - storage and diversion head works - their suitability under different conditions. **Storage Head works** 2. Dams and its classification: Earthen dams and Gravity dams (concrete). 3. Earthen Dam: Site selection for earthen dams, typical cross section of earthen dam, Causes of failures of earthen dams (structural failures only).	For the given data, Draw the cross section and sectional plan of Earthen bund with core wall using CAD.
11	**4**	**1,3,5, 6,7**	**Irrigation structures** 1. Gravity dams: Elementary profile of a gravity dam, list various forces acting on gravity dam, 2. Modes of failure of gravity dams, Spillways - Definition, function and location. 3. Diversion head works and sluice - Layout, components and their function.	For the given data, Draw the longitudinal section, half plan at top, half plan at foundation level ,half front elevation and half sectional elevation of Pipe sluice - Tower head using CAD**.**
12	**4**	**1,3,5, 6,7**	**Irrigation structures** 1. Weirs - Components, parts, types. Weirs - Discharge equation & Simple problems. 2. Barrages - components and their functions, 3. Difference between weir and Barrage.	For the given data, Draw the half longitudinal section, half front elevation, half plan at top, half plan at foundation level & cross section of Waste weir with water cushion type using CAD**.**
13	**4**	**1,3,5, 6,7**	**Canals** 1. Classification of canals according to alignment and position in the canal network. 2. Canal lining - Purpose, material used, its properties and advantages Simple problems on most economical canal section. 3. Cross drainage works- types and their function.	1. Sketch the cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth using CAD. 2. For the given data, half longitudinal section, half longitudinal elevation, half plan at top, half plan at foundation level, the Plan and sectional elevation of Two span slab culvert with return wing walls using CAD.

4. References:

a. Dr. R.K.Bansal : Fluid Mechanics & Hydraulic Machine ; Laxmi Publishers

b. R.S.Khurmi : Hydraulics, Fluid Mechanics & Hydraulic Machines; S. Chand & Co.

c. Modi & Seth : Hydraulics & Hydraulic Machines ; Standard Publishers
d. R.K.Rajput : Hydraulics ; S.Chand& Co.
e. Jagdish lal : Hydraulics ; Dhanpat Rai & Sons
f. C. Punmia : Irrigation Engineering ; Laxmi Publishing Co:
g. Modi &Seth : Irrigation Engineering ; Standard Publishing House
h. S.K.Garg : Irrigation Engineering ; Khanna Publishers.
i. B S Birdie : Irrigation Engineering & Water Power Engg ; Standard Publishing House
j. N.N. Basak : Irrigation Engineering ; McGraw Hill Publishing

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13	---	50	
				Total	**50 Marks**

6. SEE - Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	Civil Engineering			Semester - IV	
Course Name	Hydraulics & Water Resources Engineering			Test	I/III
Course Code	25CE43I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q. No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	(a) Define the following terms: Fluid, Fluid Mechanics, Hydrostatics, and Hydrodynamics. (b) A closed tank contains oil of density 850 kg/m^3 up to a height of 3m. Determine the pressure exerted by the oil at the bottom of the tank. (Take g = 9.81 m/s^2).	R/U An	**CO 1** **CO 1**	10 15
2	(a) Define pressure head. Mention the formula of pressure head along with its unit. (b) A U-tube differential manometer contains mercury and connects two points in a pipeline where the pressure difference is 5 kN/m^2. If the density of mercury is 13.600 kN/m^3, determine the difference in mercury levels.	R/U An	**CO 1**	10 15
	Section - 2			
3	a) List assumptions of Bernoulli's theorem. b) A pipe 300m long has a slope of 1 in 100 and tapers from 1.0m diameter at the higher end to 0.50m at the lower end. The quantity of water flowing is 900lit/sec. If the pressure at the higher end is 70KPa, find the pressure at the lower end.	R/U An	**CO 2**	10 15
4	a) What is an orifice? List its different types. b) During an experiment in a laboratory, 280lit of water flowing over a right-angled triangular notch was collected in one minute. If the head of water over the sill is 100mm, calculate the 'Cd' of the notch.	R/U An	**CO 2**	10 15
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	IV
Course Name	Hydraulics & Water Resources Engineering			Test	II
Course Code	25CE43I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
1.Determination of Coefficient of discharge for Rectangular Notch / Triangular Notch. 2.Determination of Coefficient of discharge for Venturimeter/ losses from Friction through pipes	CO 2	20 20
Scheme of assessment a) Writing procedure, tabular column, figure and equations – 10 M b) Conducting – 05 M c) Result and discussion – 05 M		
Viva		10
Total Marks		50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	IV
Course Name	Hydraulics & Water Resources Engineering			Test	IV
Course Code	25CE43I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
3. Plotting Earthen Bund/Sluice drawing a. For the given data, plot the Plan and cross section of earthen bund / Sluice drawing using CAD. **OR** **4. Plotting Weir/Canal/Culvert drawing** a. For the given data, plot the Plan and longitudinal section/ half section half elevation of waste weir / Canal / Culvert using CAD.	CO4	45
Scheme of assessment a) Plotting - 30 b) Dimensioning and detailing - 10 c) Plot to scale - 05		
Viva	CO3/ CO4	05
Total Marks		50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
1	Students collect different fluids (like water, oil, honey) and compare their viscosity, surface tension, and density.
2	Prepare a report on different valves (like Pressure Relief, Air Relief, Sluice Valve) in water supply line.
3	Prepare a report on ground water recharge techniques.
4	Prepare a report on desilting of reservoirs

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
	Average Marks=(30+40+20+30)/4=30						**30**

Note: Dimension and descript or shall be defined by the respective course coordinator as per the activities

10. SEE–Model Practice Question Paper

Program	**Civil Engineering**		**Semester**	**IV**
Course Name	**Hydraulics & Water Resources Engineering**	**Course Code: 25CE43I**	**Duration**	**180 min**

Sl. No	Questions	CO	Marks
1	Determination of Coefficient of discharge for **Rectangular Notch/ Triangular Notch/ Venturimeter/ losses from Friction through pipes** Scheme of assessment a) Writing procedure, tabular column, figure and equations – 10M b) Conducting – 05M c) Result and discussion – 05M	**CO2**	**20**
2	For the given data, plot the Plan and cross section/longitudinal section/half section half elevation of **earthen bund / Sluice / waste weir / Canal / Culvert** using CAD. Scheme of assessment a) Plotting -15M b) Dimensioning and detailing - 05M c) Plot to scale - 05M	**CO4**	**25**
3	Viva- voce	**CO1 & CO3**	**05**
		Total Marks	**50**

Signature of the Internal examiner **Signature of the External examiner**

11. Equipment/software list with Specification for a batch of 30 students

Sl. No.	Particulars	Specification	Quantity
01	Venturimeter with accessories.	As per standards	05
02	Flow through notches apparatus with all accessories (Rectangular Notch, triangular notch & trapezoidal notch).	As per standards	05
03	Flow through pipes (friction) apparatus with all accessories.	As per standards	05
04	Piezometer with scale and tube.	As per standards	
05	Differential manometer set	As per standards	05
06	Orifice apparatus.	As per standards	05
07	Computers with Latest Configuration (One Computer per student in practical session).	As per standards	30
08	Latest licensed Computer Aided Drafting Software. (For 30 Computers)	As per standards	01
09	Plotter of size A0	As per standards	01
10	UPS 5KVA	As per standards	01
11	Measuring jar, 10ml, 20ml, 50ml, 100 ml, 200ml, 500ml, 1000ml.	As per standards	10
12	Weighing balance with accuracy about 0.01 gm	As per standards	04

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	IV
Course Name	DESIGN AND DETAILING RCC STRUCTURES	Type of Course	Integrated
Course Code	25CE44I	Contact Hours	91 Hrs./Sem. 7 Hrs./Week
Teaching Scheme	L: P :: 3:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. **Rationale:** This course is an applied engineering subject, Diploma holders in Civil Engineering will be required to supervise Reinforced Cement Concrete Construction and fabrication. Students may also be required to design simple structural elements and can make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per IS: 456, SP-16 and SP34.

2. **Course Outcomes:** At the end of the Course, the student will be able to:

CO-01	Identify the various RC structural elements of a building for a given construction project. Explain the concept of Limit state design of Reinforced Cement Concrete (RCC).
CO-02	Analyse, Design, draft and detail singly and doubly reinforced beams subjected to dead and superimposed loads as per IS codes. Prepare bar bending schedule.
CO-03	Differentiate between one-way and two-way slabs. Design, draft and detail one-way and two-way slabs subjected dead and superimposed loads as per IS codes. Prepare bar bending schedule.
CO-04	Design, draft and detail column and footings economically subjected to dead and superimposed loads as per IS codes. Prepare bar bending schedule.
CO-05	Economically design, draft and detail Staircase and Lintel with chejja subjected dead and superimposed loads as per IS codes. Prepare bar bending schedule.

3.Course Content

WEEK	CO	PO	Theory 3 hours/week	Practice 4 hours/ week
1	1	1,2,5	1. Introduction: Concept of reinforced cement concrete structures, Different grades of concrete and steel used in RCC. Load and loading standards as per IS: 875. 2. Design Based on Limit State Method: - Fundamentals of Limit State Method, types of limit state. 3. Introduction to stress block parameters, Assumptions in the theory of simple bending for RCC beams, Neutral Axis, Moment of resistance.	1 & 2 Demonstrate concept of density, Load and Loading standards for materials.

2	**1**	**1,2,5**	1. Critical neutral axis, actual neutral axis. Concept of under reinforced, balanced and over-reinforced sections.	1. Study of codal provisions for Environmental Exposure Conditions. Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures.
			2. Concept of balanced, under reinforced and over-reinforced sections.	
			3. Partial safety factors, Flexural strength, Shear Strength, Concept of Deflection and cracking, Design requirements.	2. Study the Codal provisions for development Length of bars, Side face reinforcement. Nominal Cover and Effective covers to various RC structural elements.
3	**2**	**1,2,3, 4,5,7**	1. Beams: Design and Detailing Concept of Simply supported and Cantilever singly reinforced Beams as per IS 456.	1 & 2. Drafting and Prepare bar bending schedules of Singly Reinforced simply supported beam as per codal provisions.
			2. Analysis of Singly reinforced simply supported beam.	
			3. Design of Singly reinforced simply supported beam.	
4	**2**	**1,2,3, 4,5,7**	1.Problems.	1 & 2. Drafting and Prepare bar bending schedules of Singly Reinforced cantilever beam as per codal provisions.
			2. Design of singly reinforced cantilever beam	
			3.Problems	
5	**2**	**1,2,3, 4,5,7**	1. Design and Detailing Concept of Doubly reinforced Simply supported Beams as per IS 456.	1 & 2. Drafting and Prepare bar bending schedules of Doubly Reinforced Simply Supported Beam as per codal provisions.
			2. Analysis of Doubly reinforced Simply Supported Beam.	
			3. Design of Doubly reinforced Simply Supported Beam.	
6	**3**	**1,2,3, 4,5,7**	1 Design and Detailing Concept of RCC One--way slab..	1 & 2. Drafting and Prepare bar bending schedules of one-way slab as per codal provisions
			2. Design of one-way slab..	
			3. Design of one-way slab.	
7	**3**	**1,2,3, 4,5,7**	1. Design and Detailing concept of RCC two-way Slab.	1 & 2. Drafting and Prepare bar bending schedules of two-way slab as per codal provisions- Corners are not held down.
			2. Design of Two-way slab: Corners are not held down: All the Four edges discontinuous case only.	
			3. Problems	
8	**3**	**1,2,3, 4,5,7**	1. Problems on Two way slab.	1. Continued..
			2. Design and Detailing Concept of One-way continuous slab (Two span only) using moment coefficient as per IS: 456.	2. Drafting and Prepare bar bending schedules of one-way Continuous slab, as per codal provisions
			3. Problems.	
9	**4**	**1,2,3, 4,5,7**	1. Columns: Concept of long and short columns, Specifications for longitudinal and lateral reinforcement, interaction diagram	1 & 2. Drafting and Prepare bar bending schedules of Axially loaded

			in column design, Behaviour of RCC column under axial load. 2. Analysis and Design of Axially loaded column (Square, rectangular and Circular) 3. Design of column subjected to uniaxial bending for reinforcement distributed equally on TWO sides only using SP-16 chart (Square and Rectangular).	short columns and uniaxial bending (square and rectangular as per IS specifications).
10	**4**	**1,2,3, 4,5,7**	1. Design and Detailing of Column Footings: Concept of column footing, Design criteria for square & rectangular isolated column footings. 2. Design of square isolated column footing with uniform thickness. 3. Problems	1 & 2. Drafting and Prepare bar bending schedules of isolated column footing (square-uniform thickness) as per IS specification.
11	**5**	**1,2,3, 4,5,7**	1.Design and Detailing of Stairs: Introduction to stairs, Design of doglegged stairs as per codal provisions. 2. Problems on Waist slab type stair 3. Problems	1 & 2. Drafting and Prepare bar bending schedules of dog legged stair (waist slab type) as per codal provisions
12	**5**	**1,2,3, 4,5,7**	1 Introduction to lintel with chejja. Design and Detailing of Lintel with chejja: 2. Design of lintel and chejja 3. Problems on Lintel and chejja	1 & 2. Drafting and Prepare bar bending schedules of lintel with chejja as per codal provisions
13	**5**	**1,2,4, 7**	Field visit on bar bending fabrication for Beam, slab, column, footing, stair case and lintel with chejja.	1 & 2. (i)Fabrication of hook and 45^0 / 90^0 bend (ii) Fabrication of bent up bar (iii) Fabrication of stirrup / ties (iv) Arranging of reinforcement with spacing (v) Tying up of bars

Note:

(i) Students have to be taken to construction sites to provide the demonstrative examples of structural elements such as columns, beams, slab, staircase, footings etc.

(ii) IS 456-2000 & SP16 is permitted in the examination only original copy or hard bound photo copy attested by head of the institution.

4. References:

1. Ashok K. Jain," *Reinforced Concrete* by Limit State Design", by Nem Chand & Bros, Roorkee.
2. Unnikrishnan Pillai and Devadas Menon, "*Design of Reinforced Concrete Structures*", –Tata McGraw Hill Publications.
3. P.C. Varghese," Design of reinforced concrete structures".
4. S Ramamrutham & R Narayan." Design of Reinforced Concrete Structures"
5. B C Punmia." Reinforced Concrete Structures".
6. Plain and Reinforced Concrete-Code of Practice IS 456-2000.
7. SP-16 Design aids for Reinforced Concrete to IS:456-1978
8. IS 875 Code of practice for design loads.
9. SP-34 Hand book on Concrete Reinforcement and Detailing.

5.CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	**Civil Engineering**			**Semester -IV**	
Course Name	**Design and Detailing RCC Structures**			**Test**	**I**
Course Code	**25CE44I**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q. No	**Questions**		**Cognitive Level**	**Course Outcome**	**Marks**
Section - 1					
1	a) b) c)		R/U/An/Ap	1/2	25
2	a) b) c)		R/U/An/Ap	1/2	
Section - 2					
3	a) b) c)		U/An/Ap	2	25
4	a) b) c)		U/An/Ap	2	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

Signature
Course Coordinator

Signature
Programme Coordinator

Signature
IQAC Chairman

7. CIE Practice Test model question paper (CIE 2)

Program	Civil Engineering			Semester	IV
Course Name	Design and Detailing RCC Structures			Test	II
Course Code	25CE44I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl. No	Questions	CO	Marks
1	Simply supported/Cantilever -Singly/Doubly reinforced beam /One-way slab/ Two slab. a. Design of given structural element as per codal provision- 20 marks b. Detailing and drafting of designed structural Element-10 Marks c. Bar bending Schedule for given structural element using spreadsheet- 10	2 ,3	40
2	Viva- voce		10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper (CIE 4)

Program	Civil Engineering			Semester	IV
Course Name	Design and Detailing RCC Structures			Test	IV
Course Code	25CE44I	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl. No	Questions	CO	Marks
1	Column/Footing/Staircase/ lintel with chejja. a. Design of given structural element as per codal provision-20 marks b. Detailing and drafting of designed structural Element-10 Marks c. Bar bending Schedule for given structural element using spreadsheet- 10 Marks	4,5	40
2	Viva- voce		10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
01	Visit to nearby multistoried building/Apartment etc. and collect the structural details.
02	Collect the IS codes related to Design of RCC structures, make a report and present it.
03	Understand the concept of formwork for different types of buildings and collect information about stripping times for forms for different conditions.
04	Prepare a standard beam column layout using an existing drawing of a framed building as per SP-34.
05	Prepare a standard drawing conventions for concrete reinforcement as per SP-34.

Note: All Activity Reports Must be hand Written

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
	Average Marks=(40+50+20+30+40)/5= 36						**36**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE- Model Practice Question Paper

Program	**Civil Engineering**		**Semester**	**IV**
Course Name	**Design and Detailing RCC Structures**	**Course Code: 25CE44I**	**Duration**	**180 min**

Sl. No	**Questions**	**CO**	**Marks**
1	Simply supported/Cantilever -Singly/Doubly reinforced beam /One way slab/Two-way slab/Column with Footing/Staircase/Lintel with Chejja a. Detailing and drafting of structural Element as per the given design data and codal provision-**20 Marks** b. Bar bending Schedule for given structural element using spreadsheet – **15 Marks** c. Fabrication of steel as mentioned in 13th week- **5 Marks**	**2,3,4,5**	**40**
2	Viva- voce		**10**
		Total Marks	**50**

1) Signature of the Examiner **2) Signature of the Examiner**

11. Equipment/software list with Specification for a batch of 30 students

Sl. No.	Particulars	Specification	Quantity
01	Computer with AutoCAD software	8 GB RAM, 512GB HARD DRIVE, i5 and above 2.5GHz PROCESSOR	1/ student
02	Bar Bending table and tools	as per standards	2 set / batch
03	Bar Cutting and Bending Machine	as per standards	1 set / batch

V & VI Semester

Government of Karnataka

DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

V Semester Scheme of Studies - Civil Engineering

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	CE	**SP-1**	**Specialization Pathway-I**	4	0	4	8	6	50	20	50	20	-	-	100
2	CE	**SP-2**	**Specialization Pathway-II**	3	0	4	7	5	50	20	-	-	50	20	100
3	CE	**SP-3**	**Specialization Pathway-III**	3	0	4	7	5	50	20	-	-	50	20	100
4	CE	**25CE54I**	**Construction Management and Entrepreneurship**	4	0	4	8	6	50	20	50	20	-	-	100
Total				**14**	**0**	**16**	**30**	**22**	**200**		**100**	**-**	**100**	**-**	**400**

SP	Course code	Course Name
1	**25CE51IA**	**Transportation Engineering**
	25CE51IB	**Town Planning & Sustainability**
	25CE51IC	**Building Maintenance and Repairs**

SP	Course code	Course Name
2	**25CE52IA**	**Design and Detailing of Steel Structures**
	25CE52IB	**Analysis of Structures**
	25CE52IC	**Geotechnical Engineering**

SP	Course code	Course Name
3	**25CE53IA**	**Environmental Engineering**
	25CE53IB	**Mechanical Electrical and Plumbing (MEP)**
	25CE53IC	**3D Virtual Presentation Techniques**

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	TRANSPORTATION ENGINEERING	Type of Course	Integrated
Course Code	25CE51IA	Contact Hours	104/Sem 8 Hrs/Week
Teaching Scheme	L : P :: 4 : 4	Credits	06
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

Transportation Engineering is a vital discipline within civil engineering that focuses on the design, development, and maintenance of efficient, safe, and sustainable transportation systems. Transportation systems are crucial for economic development, facilitating the movement of goods and people. Well-designed infrastructure enhances productivity, reduces travel time, and promotes regional growth. Engineers must design roadways, railways, airports, and other transportation networks that maximize safety while ensuring the efficient movement of traffic.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Classify various types of roads and identify highway geometric design elements.
CO-02	Choose appropriate highway material and conduct relevant quality tests to ensure compliance with specifications.
CO-03	Supervise highway construction activities to ensure adherence to design specifications and standards.
CO-04	Demonstrate traffic data collection methods and identify traffic control devices.
CO-05	Understanding of the foundational components of railway engineering, from the permanent way to the functioning of railway stations.
CO-06	Understanding of the key terminologies and components of tunnels, airports, and harbors.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	**1,2**	**1, 2, 3, 4, 5, 7**	1.Importance of transportation Engineering, Role of Transportation in national development-Economic, Social, Spatial, Cultural and Political 2.Formation of Jayakar Committee and its recommendations and Implementations Importance of Indian Road Congress (IRC) Committees and Sub committees, Importance of IRC Codal Provisions 3.Classification of roads as per Nagpur Road plan, 4.Characteristics of Road Transport,	1. Conduct total station survey for a road stretch 300m. 2. Prepare LS/CS with FRL drawings using CAD. Estimate earthwork quantity extracting measurements from CAD

			Requirements of ideal alignment, Factors controlling alignment, Engineering Surveys, Drawings and Report.	
2	**1,2**	**1, 2, 3, 4, 5, 7**	**Highway Geometric Design:** 1. Importance and objectives of highway geometric design, Pavement Surface Characteristics-Friction, factors affecting friction, Pavement unevenness, Light reflecting characteristics. 2.Camber-Definition, objectives, types and recommended values for different types of road surface, simple problem Width of Carriageway - Significance, IRC standards for various classes of roads, functions of traffic separator(medians) 3. Kerbs-Definition, types of kerbs Road Margins-Shoulders, parking lane, frontage road, driveway, cycle track, footpath, guardrail and embankment slope (significance and functions only) Width of Roadway. 4.Right of way-Definition & significance **Cross section of roads** • Embankment and cutting • NH, SH, MDR, ODR & VR	**Tests on soil** **1.** Determination of Specific gravity of soil by Pycnometer method **2.** Determination of water content by oven drying method **3.** Determination of particle size distribution by dry sieve Analysis
3	**1,2**	**1, 2, 3, 4, 5, 7**	**Sight Distance** **1.**Significance, Types**, Stopping** sight distance-definition, Factors affecting SSD, PIEV theory 2.Overtaking Sight Distance-definition, factors affecting OSD Intermediate Sight Distance-definition 3 & 4. Simple Problems.	**1.** Determination of Liquid limit by Casagrande's apparatus **2.** Determination of plastic limit by method of rolling. **3.** Determination of field density by core cutter method.
4	**1,2**	**1, 2, 3, 4, 5, 7**	**Horizontal & Vertical Alignment Elements** 1. Design Speed-significance, factors affecting design speed, IRC standards for different classes of roads in different terrains (ruling &minimum) 2. Horizontal Curves -Objective and significance, types. Widening of pavement on horizontal curves-objectives and significance 3.Super Elevation - Objectives & Significance, advantages and disadvantages, Gradient-Definition, Function, types, IRC standards for maximum gradient in different terrains 4.Vertical Curves-objects, types-Summit Curve, Valley curve (Definition and its application only)	1. Determination of Optimum moisture content and maximum dry density by Modified Proctor Compaction Test

5	**2**	**1, 2, 3, 4, 5, 7**	**HIGHWAY MATERIALS & PAVEMENT** 1.Subgrade Soil- Significance, characteristics, desirable properties, Index Properties-Grain size analysis, Consistency limits & Indices 2.HRB classification of soil, California Bearing Ratio (CBR) Test, 3. Stone Aggregates-Desirable properties, Bitumen-origin, grades, requirements, tests on stone aggregates with IRC recommendation. 4.Functions of binder as Pavement Material, desirable properties, Tests on bitumen with IRC recommendation	**1.** Determination of strength of soil by California Bearing Ratio Test **Tests on Road Aggregates** **1.** Determination of Specific Gravity and Water absorption of aggregates **Note:** Study MORTH Specifications on the results of each tests for inference of its application in road construction
6	**2,3**	**1, 2, 3, 4, 5, 7**	1.Cutback Bitumen, Bituminous Emulsion and Tar- Significance and applications, Importance of modified forms of bitumen-PMB, NRMB, CRMB 2.Types of Pavements-Flexible & Rigid, cross section and function of each layer, Comparison 3 & 4. Pavement Construction Material Specifications, Construction Methodology and Quality Control checks for the following Components of flexible pavement i. Granular sub base drainage layer ii. Granular Base course a) Wet Mix Macadam (WMM) b) Water Bound Macadam (WBM)	**1.** Determination of shape of aggregates by Flakiness and Elongation test **2.** Determination of resistance to crushing by Aggregate Crushing Test **Note:** Study MORTH Specifications on the results of each tests for inference of its application in road construction
7	**2,4**	**1, 2, 3, 4, 5, 7**	**Traffic Engineering** 1.Scope, Traffic characteristics- Factors affecting road user characteristics, listing vehicular characteristics, 2. Concept of PCU, factors affecting PCU, PCU values recommended by IRC 3. Traffic Volume Study-Definition, objects, variations in traffic flow, Methods-mechanical counters, manual counts 4. Concept of AADT, LOS (Level of service) – Definition , Importance , parameters as per IRC	**1.** Determination of toughness/ resistance to Impact by Aggregate Impact Test **2.** Determination of Hardness / Resistance to Abrasion by Los Angeles Abrasion test **Note:** Study MORTH Specifications on the results of each test for inference of its application in road construction.
8	**2,4**	**1, 2, 3, 4, 5, 7**	1. Speed studies-objects, definition of spot speed, average speed, Running speed and overall speed 2.Types of speed Studies-Spot speed studies-uses, Develop cumulative frequency speed, distribution curve and calculation of various statistical measures. 3.Traffic Control Devices-Definition, Traffic Signs-	**Tests on Bitumen** **1.** Determination of consistency of bituminous material by Penetration test **2.** Determination of Ductility of bituminous material by Ductility test **Note:** Study IRC and MORTH

			Regulatory sign, Warning sign, Informatory signs 4.Traffic signals -advantages & disadvantages	Specifications on the results of each test for inference of its application in road construction.
9	**2,5**	**1, 2, 3, 4, 5, 7**	**Introduction to Railway Engineering** 1.Role and Features of Indian Railways Advantages of Railways- Political, Social and Economical, Comparison of railway and highway transport 2.Permanent way-definition, requirements of an ideal permanent way, Components of a Railway track, Gauge, Various gauges in Indian Railways, Choice of Gauge 3.Rails- Definition, Functions of Rails, Requirements of an ideal Rail section, Types of Rails, Length of rail, 4.Rail Joints-Definition, Effects of Rail joints, Requirements of an ideal rail joint, Types of Rail Joint, Welding of Rails-Purpose, advantages	**1.** Determination of temperature at which bituminous material softens by Softening point test **2.** Determination of Specific Gravity of bituminous material by Pycnometer Method **Note:** Study IRC and MORTH Specifications on the results of each test for inference of its application in road construction
10	**2,5**	**1, 2, 3, 4, 5, 7**	1.Sleepers- definition, function, Requirements of good sleeper, Pre-stressed sleeper advantages & disadvantages, Ballast- Definition, function, Requirements of good ballast, recycled ballast. 2.Fixtures & Fastenings- Definition, function, Points and Crossing- Turnout and its necessity, Level Crossings- objects of providing level crossings 3 & 4. Railway stations and yards - Purpose of a Railway Station, Selection of Site for a Railway Station, Facilities Required at Railway Stations Classification of railway stations on operational and functional considerations (explain only A- class block station for double line) wayside station on a single line section	1. Determination of rate of flow of bituminous material by viscosity test using Orifice Viscometer 2. Determination of temperature of flash and fire by Flash & Fire Point Test Note: Study IRC and MORTH Specifications on the results of each test for inference of its application in road construction
11	**2,4,5**	**1, 2, 3, 4, 5, 7**	1. Yards – definition, types, Explain Marshalling yard. 2.Signaling and interlocking - Objectives, signals required at stations, types of signals 3.Interlocking and its essential regulations. 4.Sub-urban railways in metro cities Tube railways and elevated railways.	**Traffic Survey** **1.** Conduct Classified traffic Volume survey by Manual counting method and collect data in a given area on selected stretch of major road as per IRC standards **2.** Convert the data collected by Classified traffic Volume survey into PCU values using tables
12	**4,6**	**1, 2,**	**Tunnels:** Terminology, advantages of tunnels,	1. Represent the traffic

		3, 4, 5, 7	Size and shapes of tunnels- horse shoe, egg shape, segmental roof section Transferring alignment inside the tunnel, mucking, concept of shafts Objects of tunnel lining Ventilation and Drainage in tunnels.	composition using tables and charts (Pie charts, Bar charts)
13	**4,6**	**1, 2, 3, 4, 5, 7**	**Airport** – Terminology, Aerodrome, Apron, Hanger, Runway, Taxiway, Terminal area, Wind rose., Factors influence site selection of an airport **Harbour-** Terminology, Dock, Port, Breakwater, Jetties, Quays, Dredging, Light house, Buoys and Beacons, Types of harbour , Factors influence site selection of a harbour	1. Visit nearby railway station/airport ,prepare report .

4. References:

1. Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., "Highway Engineering", Nem Chandand Bros , Roorkee
2. Kadiyali, L.R. "Traffic Engineering and Transport Planning", Khanna Publishers
3. S K Khanna- C.E.G. Justo, and Veeraraghavan "Highway Material Testing" Nemchand Bros- Rookee, 2010
4. S.C.Saxena and S.P.Arora "A text book of Railway Engineering", Dhanpat Rai publications
5. N. L. Arora, "A Textbook of Transportation Engineering", Publisher, New India Pub., 1977.
6. Relevant IRC Codes and Practices.
7. MORT&H specifications for roads and bridge works 5th revision

E-learning resources:

1. Determination of Specific Gravity of soil https://youtu.be/hNNilk-OKaw
2. Determination of water content of soil by oven drying method https://youtu.be/N2J-tvEeI4c
3. Determination of particle size distribution of soil by sieve analysis https://youtu.be/CAezS3mPzOc
4. Determination of consistency limit of soil by Casagrande's apparatus https://youtu.be/pM-w_cvk1nA
5. Determination of field density of soil by core cutter method https://youtu.be/5rDHjZ_RJq0
6. Determination of field density of soil by sand replacement method https://youtu.be/C10dklH12W0
7. Determination of Optimum moisture content and maximum dry density by Modified Proctor Compaction Test https://youtu.be/pRz_hAHeoBo
8. Determination of strength of soil by California Bearing Ratio Test https://youtu.be/fCmMW73rP64
9. Determination of Specific Gravity and Water absorption of aggregates https://youtu.be/hqXFPq676iM?si=oL3iW3c3Qh4WdtoE
10. Determination of shape of aggregates by Flakiness and Elongation test https://youtu.be/acfJIG9o8iw
11. Determination of shape of aggregates by angularity number https://youtu.be/n-RmtrNdY0c
12. Determination of resistance to crushing by Aggregate Crushing Test https://youtu.be/lE7LFOuGKyI
13. Determination of toughness/ resistance to Impact by Aggregate Impact Test https://www.youtube.com/watch?v=Mn7aeorMpTs
14. Determination of Hardness / Resistance to Abrasion by Los Angeles Abrasion test https://youtu.be/k6wXH50Kwkw
15. Determination of consistency of bituminous material by Penetration test https://youtu.be/9HZE6DNfF5U
16. Determination of Ductility of bituminous material by Ductility test https://youtu.be/TE8zYxUJHt0
17. Determinination of temperature at which bituminous material softens by Softening point test https://youtu.be/-yBXl4z70mI

18. Determination of Specific Gravity of bituminous material by Pycnometer Method
    https://youtu.be/7ReVXB6VPto
19. Determination of rate of flow of bituminous material by viscosity test using Orifice Viscometer
    https://youtu.be/HWoiDepU3eM
20. Determination of temperature of flash and fire by Flash & Fire Point Test
    https://youtu.be/oZh-V2F0oDI

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE - Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	**Civil Engineering**			**Semester - V**	
Course Name	**Transportation Engineering**			**Test**	**I/III**
Course Code	**25CE51IA**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q. No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) List the characteristics of Road transport. b) Define camber. List are the objectives of providing camber. c) What are the factors affecting highway alignment	R	1	05 05 10
2	a) List the objectives of highway geometric design. b) What are the factors controlling highway alignment c)Define Kerb. List the types of kerb	R	1	
	Section - 2			

3	a) Numerical problem on sight distance b) Draw cross section road in embankment. c)Define Gradient. List the functions of gradient	An U R	1	10 05 10
4	a) Numerical problem on sight distance b) Draw cross section of road in Cutting. c)Define super elevation. List the advantages of super elevation.	An U R	1	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

7. CIE Practice Test model question paper

Program	**Civil Engineering**			**Semester**	**V**
Course Name	**Transportation Engineering**			**Test**	**II/IV**
Course Code	**25CE51IA**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					

Questions	**CO**	**Marks**
1. Any one experiment on Tests on subgrade soil/Total station experiment. 2. Any one experiment on Tests on Road Aggregates.	**CO 1, 2**	**25** **25**
Scheme of assessment (For Question no.1 and 2) a) Writing Procedure-10 b) Conduction-10 c) Result& Conclusion-5 Total -25		**50**
	Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	**Suggestive Activities**
01	For 12 hour classified volume count survey data, present traffic volume using Bar chart, Pie chart, Trend chart and show the hourly variation of traffic

Hour	**Motorcycles (M)**	**Cars (C)**	**Light Trucks (L)**	**Heavy Trucks (H)**	**Buses (B)**
6:00-7:00	25	120	45	30	10
7:00-8:00	30	150	55	40	12
8:00-9:00	28	140	60	35	8
9:00-10:00	22	115	50	25	5
10:00-11:00	20	130	40	28	7

<table>
<tr><td></td><td></td><td>11:00-12:00</td><td>24</td><td>125</td><td>48</td><td>30</td><td>6</td><td></td></tr>
<tr><td></td><td></td><td>12:00-1:00</td><td>30</td><td>160</td><td>55</td><td>40</td><td>9</td><td></td></tr>
<tr><td></td><td></td><td>1:00-2:00</td><td>27</td><td>145</td><td>50</td><td>33</td><td>10</td><td></td></tr>
<tr><td></td><td></td><td>2:00-3:00</td><td>23</td><td>135</td><td>53</td><td>32</td><td>8</td><td></td></tr>
<tr><td></td><td></td><td>3:00-4:00</td><td>26</td><td>155</td><td>52</td><td>36</td><td>12</td><td></td></tr>
<tr><td></td><td></td><td>4:00-5:00</td><td>29</td><td>165</td><td>60</td><td>45</td><td>14</td><td></td></tr>
<tr><td></td><td></td><td>5:00-6:00</td><td>32</td><td>170</td><td>62</td><td>50</td><td>15</td><td></td></tr>
<tr><td>02</td><td colspan="8">Spot speed studies were carried out at a certain stretch of a highway, and the consolidated data collected are given below. Determine (i) the upper and lower values or speed limits for regulation of mixed traffic flow and (ii) the design speed for checking the geometric design elements of the highway.
<table>
<tr><th>Speed Range (kmph)</th><th>No. of Vehicles Observed</th><th>Speed Range (kmph)</th><th>No. of Vehicles Observed</th></tr>
<tr><td>0 to 10</td><td>12</td><td>50 to 60</td><td>255</td></tr>
<tr><td>10 to 20</td><td>18</td><td>60 to 70</td><td>119</td></tr>
<tr><td>20 to 30</td><td>68</td><td>70 to 80</td><td>43</td></tr>
<tr><td>30 to 40</td><td>89</td><td>80 to 90</td><td>33</td></tr>
<tr><td>40 to 50</td><td>204</td><td>90 to 100</td><td>9</td></tr>
</table></td></tr>
<tr><td>03</td><td colspan="8">The table below gives the consolidated data of spot speed studies on a section of a road. Determine the most preferred speed at which the maximum proportion of vehicles travel.
<table>
<tr><td>Speed range (kmph)</td><td>No. of speed observations</td></tr>
<tr><td>0 – 10</td><td>0</td></tr>
<tr><td>10 – 20</td><td>11</td></tr>
<tr><td>20 – 30</td><td>30</td></tr>
<tr><td>30 – 40</td><td>105</td></tr>
<tr><td>40 – 50</td><td>233</td></tr>
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<tr><td>70 – 80</td><td>24</td></tr>
<tr><td>80 – 90</td><td>0</td></tr>
</table></td></tr>
<tr><td>04</td><td colspan="8">Prepare a report on Tunnels and bridges in Konkan Railway</td></tr>
</table>

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	StudentsScore
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
	Average Marks=(10+30+20+40)/4=25						**25**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10.Equipment/software list with specification for a batch of 30 students

Sl.No.	Particulars	Quantity
1	Mechanical Sieve Shaker	2
2	Set of IS sieves for soil	3 set
3	Set of IS sieves for coarse aggregates	2 sets
4	Set of IS sieves for fine aggregates	2 sets
5	Casagrande's apparatus	2
6	Hot air Oven	1
7	Standard Proctor test apparatus	1
8	Modified Proctor test apparatus	1
9	Impact testing machine	2
10	Los Angeles abrasion testing Machine	1
11	Compression Testing Machine	1
12	Water Bath	1
13	Electric Heater for bitumen	1
14	Length gauge and Thickness gauge	2
15	Set of Pycnometers and Beaker– Different sizes	2 sets
16	Crushing test apparatus- Moulds	2 sets
17	Penetrometer and mould	1
18	Briquette Moulds and Ductility Machine	1 set
19	Ring and Ball Apparatus	2 sets
20	Cannon Fenske Opaque Viscometer /	2
21	Penskey Martens Closed cup apparatus	2
22	Flash & Fire point apparatus	2

* Specifications of equipments as per standards

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	TOWN PLANNING & SUSTAINABLITY	Type of Course	Integrated
Course Code	25CE51IB	Contact Hours	104/Sem 8 Hrs/Week
Teaching Scheme	L : P :: 4 : 4	Credits	06
CIE Marks	50	SEE Marks	50 (Theory)

1. **Rationale:**

This town planning course systematically builds students' understanding and skills, progressing from fundamental principles and surveying techniques to contemporary challenges and sustainable solutions. It establishes a foundation in town planning theory, surveying, and plan development. It delves into the regulatory and infrastructural aspects of urban development, including building codes, and zoning. It also focuses on green building practices and sustainable urban development, emphasizing the importance of environmentally conscious design and planning for a sustainable future. The integration of theory and practice throughout the course ensures students develop both a strong conceptual understanding and the practical skills necessary for a successful career in town planning.

2. **Course Outcomes:** At the end of the course, the student will be able to:

CO-01	Understand the principles and socio-economic aspects of town planning and perform boundary and topographical surveys using modern surveying equipment.
CO-02	Apply building bye-laws and zoning regulations in layout planning and design infrastructure plans considering utilities and services for a typical town.
CO-03	Analyze the challenges of re-planning existing towns, understand base map preparation, and evaluate the features and importance of smart cities.
CO-04	Evaluate the principles of green buildings, their materials, energy efficiency, and certification systems, and analyze the principles of sustainable urban development.

3. **Course Content:**

WEEK	CO	PO	Theory	Practice
1	1	1,2,4	**Introduction** a. Objectives of town planning. b. Principles of town planning. c. Benefits of town planning. d. Socio – Economic aspects of town planning.	Conduct boundary location survey and calculate area of the boundary using total station/DGPS/Handheld GPS Navigator.
2	1	2,4,7	**Topographical Surveying** a. Maps - Types of maps. b. Relief - Methods of representing relief. c. Procedure for topographic surveying.	Prepare a topographical map using total station/DGPS in the field, prepare contour

			d. Applications of topographical maps.	map using open source software like SWDTM.
3	**1**	**1,2,4,7**	**Surveys & Planning** a. Various types of surveys to be conducted for town planning project. b. Data to be collected for town planning survey. **Types of plans** c. Brief description of development plans. d. Master plan - Objectives and necessities.	Prepare a layout plan/master plan for the above topographic map as per zoning regulations using CAD.
4	**2**	**2,4,7**	**Building Bye- Laws** a. Objectives of building bye-laws. b. Important aspects of building bye-laws for a typical town. **Zoning** c. Definition - Objectives and aspects of zoning. d. Advantages of zoning.	Prepare a plan for (Minimum Area = 9m X 12m) as per building bye laws in CAD
5	**2**	**1,2,3,7**	**Infrastructure Planning** a. Role of physical planner in infrastructure planning. b. Various utilities and services required for a Town. c. Location criteria for water supply and sewage treatment plants (SPTs). d. Location criteria for recreation centers.	Prepare a 3D model of 1BHK Residential building using Revit/AutoCAD.
6	**2**	**1,2,3,7**	**Aerial survey** a. Limitations of traditional survey over modern survey in town planning. b. Definition and objectives of aerial survey. c. Merits & demerits of UAV (drones) survey. d. Application of UAV (drones) in civil engineering.	Prepare a report on uses and applications of GIS in Urban Planning Spatial data handling tools: DISHANK, BHOOMI , KGIS
7	**3**	**1,3**	**Re-planning Existing Towns** a. Objectives of re-planning. b. Analyzing the defects of existing towns. c. Difficulties in master Planning of existing towns / cities. d. Goals of urban renewal projects.	Use Google Earth to locate and capture an image of your institute. Then, identify and record the latitude and longitude coordinates of the institute's location.
8	**3**	**2,3,7**	**Base Maps** a. Definition and objectives of base maps. b. Contents of base maps. c. Techniques for conducting surveys for land use. (Field Survey, Remote Sensing & Other Surveys) d. Definition and benefits of town planning schemes (TPS).	Prepare key plan of existing building using CAD software. And verify with the local prevailing bye-laws
9	**3**	**1,2,5,7**	**Planning for the Future** a. Definition and features of smart city. b. Importance of smart city.	

			c. IOT models used in smart city. d. Challenges faced by smart city.	QGIS – Introduction to QGIS, Applications, Installation & Demonstration.
10	**3**	**1,2,4,7**	**Planning for the Future** a. Elements of smart city infrastructure. b. Sensors Monitoring in smart city. c. Green Transportation. d. Smart waste management (3R Concept).	Create map of IITs in India/NITs in India /etc using any open source software like QGIS
11	**4**	**1,2,5,7**	**Green Building in Town Planning** a. Definition and principles of Green Buildings. b. Need for green buildings in town planning. c. Criteria for site selection of green building. d. Types and properties of eco-friendly green building materials. (Any 5)	Introduction to KGIS, Create a map of hospitals/libraries/any buildings etc in your district in any open source software like QGIS after extraction of cadastral data from KGIS.
12	**4**	**1,2,5,7**	**Green Building in Town Planning** a. Strategies for achieving energy efficiency in green buildings. b. Types of Water efficient plumbing systems. c. Definition and benefits of green building certification. d. Assessment and rating system of GRIHA & IGBC.	Conduct a local survey to identify an ecofriendly home in a nearby locality and prepare a report.
13	**4**	**2,3,5,7**	**Sustainable Urban Development** a. Definition and principles of sustainability in urban development. b. Types of Green Spaces in Urban Areas. c. Importance of rainwater harvesting in sustainability. d. Examples of Renewable Energy Sources and their Contribution to Sustainability.	Prepare a BOQ for construction of green building Green building using spreadsheet.

4. References:

a. Rangwala, S. C. (Year). Town Planning. Charotar Publishing House.
b. Bandyopadhyay, A. (2011). Textbook of Town Planning. Books & Allied Ltd.
c. Biswas, H. (2019). Principles of Town Planning and Architecture (2nd ed.). Vayu Education of India.
d. Savla, Harshul. Green Building: Principles & Practices. Notion Press, 2021.
e. http://www.moud.in/
f. http://www.uddkar.gov.in
g. https://www.karnatakahousing.com/
h. http://www.hudco.org
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j. http://www.urbantransport.kar.gov.in/

5. CIE Assessment Methodologies:

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	5	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics for theory assessment and Lab record for Practice.	1-13		50	
				Total	**50 Marks**

6. SEE - Theory Assessment Methodologies:

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper:

Program	**Civil Engineering**			**Semester - V**	
Course Name	**TOWN PLANNING & SUSTAINABLITY**			**Test**	**I**
Course Code	**25CE51IB**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q. No	Questions	Cognitive Level	Course Outcome	Marks
Section - 1				
1		R/U/An/Ap	**CO 1**	25
2		R/U/An/Ap	**CO 1**	
Section - 2				
3		R/U/An/Ap	**CO 1,CO 2**	25
4		R/U/An/Ap	**CO 1,CO 2**	

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC chairman**

7.CIE Practice Test model question paper:

Program	**Civil Engineering**			**Semester**	**V**
Course Name	**TOWN PLANNING & SUSTAINABLITY**			**Test**	**II**
Course Code	**25CE51IB**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
Note : Any one exercise Prepare a topographical map using total station/DGPS in the field, prepare contour map using open source software like SWDTM .,/ Prepare a layout plan/master plan for the above topographic map as per zoning regulations using CAD./ Prepare a 3D model of 1BHK Residential building using Revit/AutoCAD.Use Google Earth to locate and capture an image of your institute.				**1,2**	**45**
Scheme of assessment Procedure – 05 Conduction – 30 Result-10					
Viva - voce					**05**
				Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl.No.	Suggestive Activities
01	Prepare a presentation on stages in the evolution of your city. Identify what has made the city unique and understand how social & economic forces (Port/Tourism/Industries etc.) have shaped the city.
02	Collect data from local government body & prepare a presentation on organization structure of Town Planning Authority and the activities performed by it.
03	Collect/obtain the master plan of your city /village map /town and outline the features.
04	Collect the town planning map of the nearby layout and study the land distribution as per zoning regulations.

9. Rubrics for Assessment of Activity (Qualitative Assessment):

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30

3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
	Average Marks=(40+30+50+10)/4 = 32.5						**32.5**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. Equipment/software list with Specification for a batch of 30 students:

Sl No	Particulars	Specification	Quantity
1	Total Station	Accuracy: ±2", Range: 500m–1000m, Internal memory, USB data transfer	02 No
2	Differential GPS (DGPS)	Accuracy: ±1cm, Dual Frequency GNSS Receiver, Real-Time Kinematic (RTK) capability	02 No
3	UAV Drone (for Aerial Surveying)	Camera resolution: 20MP, GPS-supported auto-navigation, Flight time: 30-45 mins	01 No
4	Digital Planimeter	Accuracy: ±0.2%, Measures areas from drawn maps	01 No
5	Computers	Intel i7/i9 or AMD Ryzen 7/9, 16GB RAM, 512GB SSD, Dedicated GPU (4GB)	30 No
6	Printers & Plotters	Inkjet/Laser Printer, Large Format Plotter for Maps (42-inch width)	1 A3 Printer, 1 Plotter
7	CAD Software	Essential for preparing layout plans, master plans, building plans, contour maps, and 3D models.	30 licenses
8	QGIS (Quantum GIS)	For spatial analysis, base map creation, and working with geographic data. QGIS is a good open-source option.	30 licenses
9	3D Modeling Software	For creating 3D models of buildings and urban environments. Blender is a good open-source option.	30 licenses

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	BUILDING MAINTENANCE AND REPAIRS	Type of Course	Integrated
Course Code	25CE51IC	Contact Hours	104/Sem 8 Hrs/Week
Teaching Scheme	L: P : : 4: 4	Credits	06
CIE Marks	50	SEE Marks	50 (Theory)

1. **Rationale:** Maintenance and repair of structures lies in the prevention of catastrophic failures, extension of useful life, cost-effectiveness, compliance with regulations, and the safety and well-being of users. A well-maintained structure not only preserves its functional and aesthetic value but also contributes to a sustainable built environment by reducing the need for extensive new construction and minimizing waste.

2. **Course Outcomes:** At the end of the Course, the student will be able to:

CO-01	Acquire skills in damage detection, maintenance strategies, and the effective application of modern technologies, while emphasizing sustainable and economically feasible repair solutions.
CO-02	Performing NDT tests regularly to maintenance and repair strategies can be planned effectively to improving the lifespan and safety of the structure.
CO-03	Select and apply a wide range of materials effectively for maintaining, repairing, and enhancing the durability of structures.
CO-04	Evaluate, Select, and Apply appropriate repair techniques based on the type of damage, the nature of the structure, and environmental factors.

3. **Course Content**

WEEK	CO	PO	Theory	Practice
1	CO1	1,2, 3,5,7	**Maintenance and Repair Strategies** - Introduction - Classification of Maintenance - Necessity, objective, Importance of maintenance and repairs. - Factors Influencing the maintenance and repairs. - Causes that affect the service and durability of the structure. - Advantages of maintenance and repair.	- Prepare the table for maintenance norms, Frequency of Application of finishing items. - Prepare maintenance Manual of Existing Building/Apartment/Commercial Building/College Building.

			- Periodical Maintenance, pre and post monsoon maintenance.	
2	**CO1**	**1,2, 3,5,7**	**Deterioration Causes, Inspection and Assessment of structures.** - Deterioration/ Distress. - Factors, causing causes of deterioration of structures. - Types of failures with its causes of deterioration in structures. **Types of Damage in Concrete Structures** - Defects in concrete, Mechanical, Physical & Chemical attack. - Reinforcement Corrosion.	- Prepare the presentation on Mechanism, Symptoms and prevention Measures of cause of damage of concrete due to - i) Chemical reactions. - ii) Corrosion of embedded metals.
3	**CO1**	**1,2, 3,5,7**	- Common mode of Deterioration of concrete and its typical Appearances. - Methods of prevent deterioration in Building, Diagnosis of defect, Remedial Measures.	- Prepare the Presentation on Deterioration of concrete and its typical appearance.
4	**CO1**	**1,2, 3,5,7**	**Systematic Approach of Damages Detection.** - Scope, Objectives of Investigation. **Inspection Types.** - Planned Inspection - Detailed Inspection - Physical Inspection - Visual Observation of Detection of damages.	- Visit nearby existing Building and Prepare Report on Visual observation for detection of damages.
5	**CO2**	**1,2, 3,4, 5,7**	**Test for assessment of in-situ quality of reinforced concrete and embedded steel.** Importance and need of NDT. - Typical situations where non-destructive Testing Useful. - Classification of NDT tests on properties of concrete and steel such as strength, durability, chemical attacks and Performance and Integrity. **Non-Destructive testing for concrete structures Principal, Procedure, Precautions, Correction and Interpretation of results.** - Rebound hammer test, Ultra sonic Pulse Velocity.	- Conduct Rebound Hammer test to assess the quality and Strength of site concrete.
6	**CO2**	**1,2, 3,4, 5,7**	- Pull out and Pull of test, Break-off, Core Test, Windsor Probe Pulse Eco Technique.	- Conduct Ultrasonic Pulse Velocity to assess the quality and strength of site concrete.
7	**CO2**	**1,2, 3,4, 5,7**	- Cover meter or Magnetic rebar locator. - Half-cell potentiometer for Measuring Reinforcement Corrosion in concrete and	- Conduct Pull-out or Pull-off Test on concrete. - Conduct the test to locate or

			reinforcement.	direction or bar size of embedded reinforcement.
8	**CO2**	**1,2, 3,4, 5,7**	**Chemical Analysis of Corrosion of Concrete.** - Chloride Test - Sulphate Attack - pH Measurement - Carbonation Test	- Conduct the test for measuring reinforcement corrosion in concrete by using half-cell potentiometer. - Field test for pH Measurement of concrete surface.
9	**CO3**	**1,3, 5,7**	**Materials for Maintenance and Repair.** - Factor influencing the material selection for maintenance and repair. - Anti-corrosion coating materials. - Adhesive materials. - Mortar repair materials.	- Prepare detailed Market survey report on Anti-Corrosive coating and Adhesive materials.
10	**CO3**	**1,3, 5,7**	- Joint sealants materials - Grout materials - Waterproofing roof materials - Surface coating materials for concrete protection. - Additional repairing materials.	- Prepare detailed Market survey report on Joint sealant, water proofing and Surface coating for concrete protection.
11	**CO4**	**1,2,3, 4,5,7**	**Maintenance and repair methods for Masonry.** - Causes of wall cracks due to bulging of wall, shrinkage, bonding, shear and tension, differential settlement of foundation, thermal movement and vegetation. - Repair techniques Grouting, patch spalling replacement or delaminating and epoxy bonded mortar. - Repairing methods for minor and medium cracks include epoxy injection, grooving and sealing. shotcrete, stitching, grouting and guniting. - Effects of dampness in wall, damping repair techniques.	- Study of crack location such as junction of main and cross wall, junction of RCC column and wall, junction of slab and wall, cracks in masonry joints.
12	**CO4**	**1,2,3 ,4,5,7**	**Maintenance and repair methods for RCC Construction.** - Probable location of cracks in RCC elements. - Causes of Dampness in roof slab and its repair techniques. - Repair of RC old and new slab bottom. - Repair of RCC beam and column. - Repair of Sun shade/chejja.	- Visit nearby Building prepare report on masonry cracks and propose repair techniques. -
13	**CO4**	**1,2,3, 4,5,7**	- Repair of leakage of Bathing area of Toilet, Sunken floor of toilet and kitchen. - Control, treatment and constant vigil after treatment of Termites in building. - Fung's decay in wood works in building.	- Visit the frame building, identify the location of cracks, problems in RC slab, beam, column, joint. Prepare the report on it and propose repair techniques.

4. References:

i. Dr. G. N. Nandini Devi., "Maintenance, *Repair, Rehabilitation and Retrofitting of Structures*", Wiley Edition: 2021

ii. J Bhattacharjee., "Concrete *Structures Repair, Rehabilitation and Retrofitting*", CBS Publishers & Distributors Pvt Ltd

iii. P.C. Varghese., "Maintenance Repair and Rehabilitation and Minor Works 0f Buildings", PHI Learning Pvt Ltd.

iv. Sail P. Deshpande and Akshay P. Joshi., "Maintenance *and Repairs of Structures*", Nirali Prakashan.

v. J.H.Bungey and S.G. Millard., "Testing of Concrete in Structures", Blackie Academic & Professional

vi. NON-DESTRUCTIVE TESTING OF CONCRETE - METHODS OF TEST IS: 13311 part 1,2

vii. https://law.resource.org/pub/in/bis/S03/is.13311.2.1992.pdf

viii. https://law.resource.org/pub/in/bis/S03/is.13311.1.1992.pdf

ix. https://cs-iitd.vlabs.ac.in/exp/rebound-hammer-test/

x. https://cs-iitd.vlabs.ac.in/exp/pulse-velocity-test/

xi. https://www.youtube.com/watch?v=kxZJHa-PALM

xii. https://www.youtube.com/watch?v=Ltx5TLxNjGY

xiii. https://www.youtube.com/watch?v=pEYnt9PAmH8

xiv. https://www.youtube.com/watch?v=hZibCTFTl38

xv. https://www.youtube.com/watch?v=md_M12ZKOuM

xvi. https://nptel.ac.in/courses/105104030 Lecture-34 Basic non-destructive testing for concrete structures, Lecture-37,38 Considerations in repair of concrete structures (Part 1 & 2)

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities throughRubrics	1-13		50	
				Total	**50 Marks**

6.SEE - Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7.CIE Theory Test model question paper

Program	Civil Engineering			Semester - V	
Course Name	BUILDING MAINTENANCE AND REPAIRS			Test	I/III
Course Code	25CE51IC	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answeranyonefullquestionfromeachsection.Eachfullquestioncarriesequal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) What are the objective of maintenance and repairs? b) List the causes that affect the service and durability of the structure. c) Name the Factors, causing causes of deterioration of structures. Explain any two.	R/U	CO1	7 8 10
2	a) What are the Importance of maintenance and repairs? b) List the Necessity & Importance of maintenance and repairs c) List the types of failures with its causes of deterioration in structures. Explain any two	R/U	CO1	7 8 10
	Section - 2			
3	a) What are the defects normally observed in concrete structures? discuss briefly their remedies. b) List the Objectives of Investigation c) List he different types of Inspection? Explain any two	R/U	CO1	7 8 10
4	a) What are common mode of Deterioration of concrete? b) List the Scope of Investigation. c) Explain Planned Inspection, Detailed Inspection and Physical Inspection.	R/U	CO1	7 8 10

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

7. CIE Practice Test 1 model question paper

Program	Civil Engineering			Semester	V
Course Name	BUILDING MAINTENANCE AND REPAIRS			Test	II
Course Code	25CE51IC	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
Q1. Prepare the table for maintenance norms, Frequency of Application of finishing items. /Prepare maintenance Manual of Existing Building/Apartment/Commercial Building/College Building.	CO1	10
Q2. Conduct Rebound Hammer/ Ultrasonic Pulse Velocity/ Conduct Pull-out or Pull-off test to assess the quality and Strength of site concrete.	CO2	35
Scheme of assessment Q1. Prepare Table or Maintenance manual- 10 marks Q2. Write procedure and Dig – 10 marks, Observations & Table – 5 marks, Conduction – 10 marks, Calculation, Result and Conclusion – 10 marks **Viva-5 marks**		
	Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test 2 model question paper

Program	Civil Engineering			Semester	V
Course Name	BUILDING MAINTENANCE AND REPAIRS			Test	IV
Course Code	25CE51IC	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
Q1. Conduct test to locate or direction or bar size of embedded reinforcement. / reinforcement corrosion in concrete by using half-cell potentiometer / pH Measurement of concrete surface.	CO2	25
Q2. Identify any four repair materials , write its properties and its applications	CO3 & CO4	20
Scheme of assessment Q1. Write procedure and Dig – 5 marks, Observations & Table – 5 marks, Conduction – 10 marks, Calculation, Result and Conclusion – 5 marks. Q2. Identify – 4 marks, Properties- 8 marks, Application- 8 marks **Viva-5 marks**		
	Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
01	Prepare maintenance Manual of your College Building.
02	Conducting NDT, students will **analyze test results** and create a **detailed report** that identifies potential weaknesses in the structure. Students will suggest appropriate maintenance actions or repairs based on the findings.
03	Given a **damaged structure scenario** (e.g., cracked concrete, corroded steel reinforcement), students will **identify the problem** and choose materials (e.g., adhesives, sealants, grouts) that are most suitable for the repair.
04	Given a **case study of a building** with different types of failure (e.g., cracks in masonry, corrosion in steel, dampness), students will evaluate the **nature of the damage** and **structural factors** to select the most appropriate repair techniques (e.g., epoxy injection, crack stitching, shotcrete).

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
	Average Marks=(10+30+40+20)/4=25						**25**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. Equipment/software list with Specification for a batch of 30 students

Sl. No.	Particulars	Specification	Quantity
01	Digital Schmidt Rebound Hammer	Silver Schmidt ST/PC Type N Concrete Compressive Strength Range 70 - 100 MPa	2
02	Ultra-sonic Pulse Velocity apparatus	Frequency 24 to 150 kHz Pulse 1, 2, 5, 10 per second Resolution 0.1 ms Transmitter output 1200V Power rechargeable battery, Battery life 14 working hours Interface RS232 output Dimensions 240 x 120 x 75 mm Weight 0.5 kg Accessories Two 54 kHz transducer heads, transmitter & receiver, 3m cable, calibration rod, Rs232 cable	2
03	Mild Steel Digital Pull Out Tester for Concrete	Capacity 50 kN, Usage/Application Industrial, Material Mild Steel. Display Type Digital, Operating Mode Manual.	1
04	Concrete Cover Meter Rebar Detector	Designed in accordance to EN 12504-4, ASTM C597-02, ISO 1920-7:2004, IS13311, CECS 21 standards	1
05	Half Cell Potentiometer	Frequency 50 Hz, Power Source Electric	02

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	DESIGN AND DETAILING OF STEEL STRUCTURES	Type of Course	Integrated
Course Code	25CE52IA	Contact Hours	91 Hrs./Sem. 7 Hrs/Week
Teaching Scheme	L: P : : 3: 4	Credits	05
CIE Marks	50	SEE Marks	50 (Practice)

1. **Rationale:** The design and detailing of steel structures is a critical aspect of Civil and Structural Engineering that ensures the safety, functionality, and durability of buildings, bridges, and other infrastructural systems. Course provides students with the technical foundation and practical skills necessary to design safe, efficient, and cost-effective steel structures. It prepares them to meet both current and future challenges in the construction industry.

2. **Course Outcomes:** At the end of the course, the student will be able to:

CO-01	Design, draft and detail bolted and welded joints in steel structural elements as per codal provisions.
CO-02	Design, draft and detail Flexural members as per the codal provisions.
CO-03	Design, draft and detail Tension members as per the codal provisions.
CO-04	Design, draft and detail Compression members and column bases as per the codal provisions.

3. **Course Content**

WEEK	CO	PO	Theory	Practice
1	CO1	1,2,5,7	**Introduction to Limit state design of steel structures:** Advantages and disadvantages of Steel structures, structural steel sections, loads and load combinations, Limit state design- Design considerations, Failure criteria for steel, codal specifications and section classifications as per IS 800-2007.	1 & 2 Listing of Sectional Properties of different steel sections like i) I section, ii) Channel section, iii) Angle Section, iv) T section v) Square/ Rectangular Tubes Prepare 2D and 3D drawings in CAD.
2	CO1	1,2,3,4,5,7	**Bolted Connections:** Introduction, advantages and	1 & 2 Drawing the layout of different types of bolted connections for the given data (lap joint/ single cover

			disadvantages of bolted connections, Difference between unfinished bolts and High strength friction grip bolts (HSFG). Behavior of bolted joints, failure of bolted joints,	butt joint/ double cover butt joints) as per given data using CAD.
3	**CO1**	**1,2,3,4,5,7**	Simple problems on finding shear strength, bearing strength, tensile strength of bolts (bearing type only). Tensile strength of plate, Efficiency of the joint. Simple Lap Joint Design problems. ***Note:*** *Excluding problems on HSFG Bolts and Long joints conditions*	1 & 2 Draw the neat sketch of staggered joints (zig-zag bolting) and show pitch gauge, edge distance & end distance as per the given data using CAD.
4	**CO1**	**1,2,3,4,5,7**	**Welded Connections:** Introduction, advantages of welding, types of welding, types of joints, weld symbols, specifications, Effective area of weld	1. Drafting and Detailing of lap joint by Fillet weld for the given data using CAD. 2. Drafting and Detailing of Tee joint by Fillet weld for the given data using CAD.
5	**CO1**	**1,2,3,4,5,7**	Design strength of fillet weld, Simple problems on welded joints (fillet weld only).	1. Drafting and Detailing of Corner Fillet weld for the given data using CAD. 2. Drafting and Detailing of Butt weld for the given data using CAD.
6	**CO2**	**1,2,3,4,5,7**	**Flexural Members**: Section Classification as per IS 800, Lateral buckling, Web buckling and crippling, Difference between laterally restrained and unrestrained beams, Determination of the moment capacity of laterally restrained beams.	1. Beam to beam Bolted connection using CAD as per the given data. 2. Beam to beam Welded connection using CAD as per the given data.
7	**CO2**	**1,2,3,4,5,7**	Design of laterally restrained simple beams using standard rolled steel sections only.	1. Main Beam to Secondary beam connection: Bolted connection using CAD as per the given data. 2. Main Beam to Secondary beam connection: Welded connection using CAD as per the given data.
8	**CO3**	**1,2,3,4,5,7**	**Tension Members**: Introduction, types of tension members, slenderness ratio, net area, behavior of tension members, modes of failure, factors affecting the strength of tension member, design strength of tension member due to yielding of gross section, due to rupture of critical sections and block shear.	1. Drawing and detailing of Apex Joint of Steel truss with bolted connection as per the given data using CAD. 2. Drawing and detailing of End Joint at support of Steel truss with bolted connection as per the given data using CAD.
9	**CO3**	**1,2,3,4,5,7**	Problems on design of tension members	1 & 2 Drawing and detailing of Steel truss with Bolted connection as per the given data using CAD.

10	**CO3**	**1,2,3,4,5,7**	Problems on design of tension members	1 & 2 Drawing and detailing of Steel truss with Welded connection as per the given data using CAD.
11	**CO4**	**1,2,3,4,5,7**	**Compression Members and Column Bases:** Columns –Classification, Boundary conditions, effective length, slenderness ratio. Analysis and design of axially loaded Columns (Excluding Built-up sections) Concept of lacing and battens	1. Drafting and detailing of Column Splices details using CAD software for the given data. 2. Drafting and Detailing of Built–up Columns with Lacings & Battens as per the given data using CAD.
12	**CO4**	**1,2,3,4,5,7**	Column Bases, Introduction, Types of Column Bases, Slab base, Gusseted Base,	1 & 2 Drafting and detailing of Column with slab base using CAD for the given data.
13	**CO4**	**1,2,3,4,5,7**	Design of Slab base for axial Load.	1 & 2 Drafting and detailing of Column with gusseted base using CAD for the given data.
TOTAL			**39**	**52**

4. References:

1. M.L. Gambhir "Fundamentals of Structural Steel Design" Tata Mcgraw Hill, New Delhi
2. N. Subramanian, Design of Steel Structures Limit State Method, Oxford University Press, New Delhi
3. K.S. Duggal, "Limit State Design of Steel Structures", Tata Mcgraw Hill, New Delhi
4. Design and Drawing of Steel Structures, S S Bhavikatti
5. S. S. Bhavikatti, Design of Steel Structures (By Limit State Method as Per IS: 800 2007)
6. L.S. Negi, Design of Steel Structures Second Edition, Mcgraw Hill Education.
7. https://www.youtube.com/watch?v=VphHC3OejKA
8. https://www.youtube.com/watch?v=SJ943xd1kpA
9. https://www.youtube.com/watch?v=wfcwFIM2ovg
10. https://www.youtube.com/watch?v=SJ943xd1kpA&t=145s
11. https://www.youtube.com/watch?v=Kqm7MLL8i78
12. https://archive.nptel.ac.in/courses/105/105/105105162/
13. SP 6-1 (1964): ISI Handbook for Structural Engineers -Part- 1 Structural Steel Sections

5.CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6.SEE - Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7.CIE Theory Test model question paper

Program	Civil Engineering			Semester -V	
Course Name	Design and Detailing of Steel Structures			Test	I/III
Course Code	25CE52IA	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a. What are the advantages and disadvantages of steel as a structural material?	R/U	CO1	10
	b. Calculate the strength of 20 mm diameter bolt of grade 4.6 if connected by a Lap joint. The main plates to be joined are 12 mm thick.	Ap	CO1	15
2	a. What are the different types of loads acting on steel structures? Explain.	R/U	CO1	10
	b. Design a lap joint between two plates of 20 mm and 12 mm thickness, so as to transmit a factored load of 70 kN using M16 bolts of grade 4.6 and grade 410 plates.	Ap	CO1	15
	Section - 2			
3	a. What are the different types of welds. Explain with a neat sketch.	R/U	CO1	10
	b. A tie member in a truss is 200 x 10 mm in size it is welded to a 10 mm thick gusset plate by fillet weld. The overlap of the member is 300 mm and the weld size is 6 mm determine the design strength of the joint. If the welding is done on all the three sides.	Ap	CO1	15
4	a. Discuss the advantages and disadvantages of welded joints?	R/U	CO1	10
	b. An 150 x 100 x 10 mm angle section is to be connected to a 10 mm thick gusset plate at site. Design the fillet weld to carry a load equal to the strength of the member.	Ap	CO1	15

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	V
Course Name	Design and Detailing of Steel Structures			Test	II
Course Code	25CE52IA	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl.No	Questions	CO	Marks
1	a. Drafting and Detailing of the layout of different types of bolted connections/staggered joints and show pitch, gauge, edge and end distance as per the given design data. OR b. Drafting and Detailing of Lap Fillet weld/ Tee Fillet weld/ Corner Fillet weld/ Butt weld for the given design data using CAD. **Scheme of assessment** Drafting of given structural element with connections. - 10 Marks Detailing of Given Structural element with connections -10 marks	CO1	20
2	a. Drafting and Detailing of Beam to Beam Bolted connection/ Beam to Beam Welded connection using CAD as per the given design data. OR b. Drafting and Detailing of Main Beam to Secondary Beam Bolted connection / Main Beam to Secondary Beam Welded connection using CAD as per the given design data. **Scheme of assessment** Drafting of given structural element with connections. - 10 Marks Detailing of Given Structural element with connections -10 marks	CO2	20
3	Viva-Voce		10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	V
Course Name	Design and Detailing of Steel Structures			Test	IV
Course Code	25CE52IA	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Sl.No	Questions	CO	Marks
1	a. Drafting and detailing of Apex Joint/ End Joint at support of Steel truss with bolted connection as per the given design data using CAD. OR b. Drafting and detailing of Steel truss with Bolted connection/Welded Connection as per the given design data using CAD. **Scheme of assessment** Drafting of given structural element with connections. - 10 Marks Detailing of Given Structural element with connections -10 marks	CO3	20

2	a. Drafting and detailing of Column Splices details/ Built–up Columns with Lacings & Battens using CAD software for the given design data. OR b. Drafting and detailing of Column with slab base/ Gusseted base using CAD for the given design data. **Scheme of assessment** Drafting of given structural element with connections. **-** 10 Marks Detailing of Given Structural element with connections -10 marks	**CO4**	**20**
3	**Viva-Voce**		**10**
	Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl.No.	Suggestive Activities
01	Identify the different types of steel sections used in construction in nearby localities (e.g., I-beams, channels, angles, etc.). Draw these sections and label key dimensions.
02	For the given design data students have to draw and detail simple beam to beam splicing (web splice and flange splice) using CAD.
03	Analyze and design a simple Steel roof truss for a building. They will need to calculate member forces, design suitable member sizes. Afterward, they will draft the truss and its connection details using CAD.
04	For the given design data students have to draw and detail a column bracket connection using CAD.
05	Prepare a Report on Modes of failure of Steel Structure using case studies and stages involved in the Erection of Steel Structures.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
	Average Marks=(10+30+40+20+20)/5=24						**24**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE–Model Practice Question Paper

Program	Civil Engineering	Semester	V
Course Name	Design and Detailing of Steel Structures	Marks	50
Course Code	25CE52IA	Duration	180 min
Note:			

Sl.No	Questions	CO	Marks
1	Drafting and Detailing of Bolted Connections/Welded Connections /Beam to Beam connections for the given design data. **Scheme of assessment** Drafting of given structural element with connections. - 10 Marks Detailing of Given Structural element with connections -10 marks	CO1/CO2	20
2	Drafting and Detailing of Roof Truss Joints/ Roof Truss/Built up columns with lacing and battens/column splices/ slab base/gusseted base for the given design data. (20 Marks) **Scheme of assessment** Drafting of given structural element with connections. - 10 Marks Detailing of Given Structural element with connections -10 marks	CO3/CO4	20
3	Viva Voce		10
		Total Marks	50

Signature of the Examiner **2) Signature of the Examiner**

11.Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	01 Computer with Drafting software	8 GB RAM, 512GB HARD DRIVE, i5 and above 2.5GHz PROCESSOR	1/ student
02	Any latest licensed Computer Aided Drafting Software	Ver.2024	1/ Computer
03	LCD Projector	1800 Lumen, Large 120-Inch Display Projection with HDMI+ VGA+AUX+USB Connectivity	1
04	Power Backup	Battery + Inverter	1

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	ANALYSIS OF STRUCTURES	Type of Course	Integrated
Course Code	25CE52IB	Contact Hours	91 Hrs./Sem. 7 Hrs/Week
Teaching Scheme	L: P:: 3:4	Credits	05
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

The study of "Analysis of Structures" is a fundamental subject in civil and structural engineering that focuses on analysing and understanding the behaviour of structures under different loads. It provides the essential principles and mathematical tools required for designing safe, efficient, and economical structures.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Identify statically determinate and indeterminate structures and practice any analysis software.
CO-02	Analyse beams by Slope Deflection method and validate using relevant analysis software.
CO-03	Analyse Continuous beams and Portal frames by Moment Distribution method and validate using relevant analysis software.
CO-04	Analyse the Plane determinate Trusses and validate using relevant analysis software.

3. Course Content

WEEK	CO	PO	Theory 3 hours/week (per batch)	Practice 4 hours/ week (2 hours/ batch twice in week)
1	CO 1	1, 2, 3, 4, 5, 7	**INTRODUCTION TO DETERMINATE AND INDETERMINATE STRUCTURES** 1. Introduction to Types of structures, Structural Systems, Classification of structures and Structural forms. 2. Types of Loads, Types of Support, conditions of equilibrium, compatibility equations. Comparison between Determinate and Indeterminate structures. 3. Free body diagram, Different methods to analyse the structures, Degrees of freedom, Portal Frames, Types, Bays, and Storey	1 & 2. Introduction to Analysis Software.
2	CO 1	1, 2, 3, 4,	1. Concept of Static and Kinematic indeterminacy	1 & 2. Introduction to Analysis Software.

		5, 7	2. Simple problems on determination of degree of static and kinematic indeterminacy for the structures. 3. Simple problems on determination of degree of static and kinematic indeterminacy for the structures.	
3	**CO 2**	**1, 2, 3, 4, 5, 7**	**ANALYSIS OF BEAMS BY SLOPE DEFLECTION METHOD** 1. Introduction, Sign conventions, Development of slope deflection equations. Analysis of fixed beams, Propped Cantilever beams and Continuous beams. 2. Problems on analysis of fixed beams, Propped Cantilever beams and Continuous beams. 3. Problems on analysis of Continuous Beams by Slope Deflection Method **(Problems are Restricted to Two spans with UDL and concentrated load only)*	1 & 2. Analysis of Continuous Beams using any relevant analysis software. **(Problems are Restricted to Two spans with UDL and concentrated load only)*
4	**CO 2**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Problems on analysis of Continuous Beams by Slope Deflection Method.	1 & 2. Analysis of Continuous Beams using any relevant analysis software.
5	**CO 2**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Problems on analysis of Continuous Beams by Slope Deflection Method.	1 & 2. Analysis of Continuous Beams using any relevant analysis software.
6	**CO 3**	**1, 2, 3, 4, 5, 7**	**ANALYSIS OF CONTINUOUS BEAMS BY MOMENT DISTRIBUTION METHOD** 1. Introduction, Definition of terms, Carry over factor, Stiffness factor and Distribution factor and Relative Stiffness. Analysis of Continuous Beams by Moment Distribution Method **(Restricted to Two spans with UDL / concentrated load only)(03 iterations only)* 2 & 3. Problems on Analysis of Continuous Beams by Moment Distribution Method. **(Problems are Restricted to Two spans with UDL / concentrated load only) (03 iterations only)*	1 & 2. Analysis of Continuous Beams using any relevant analysis software. **(Problems are Restricted to Two spans with UDL / concentrated load only)*
7	**CO 3**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Problems on Analysis of Continuous Beams by Moment Distribution Method	1 & 2. Analysis of Continuous Beams using any relevant analysis software.

8	**CO 3**	**1, 2, 3, 4, 5, 7**	**ANALYSIS OF 2D NON-SWAY PORTAL FRAMES BY MOMENT DISTRIBUTION METHOD** 1. Introduction to Sway and Non-Sway Frames. Analysis of 2D Non-Sway Portal Frames by Moment Distribution Method **(Restricted to single Bay and single Storey with UDL / concentrated load only) (03 iterations only)* 2. & 3. Problems on Analysis of 2D Non-Sway Portal Frames by Moment Distribution Method. **(Problems are Restricted to single Bay and single Storey with UDL / concentrated load only) (03 iterations only)*	1 & 2. Analysis of 2D Non-Sway Portal Frames using any relevant analysis software. **(Problems are Restricted to single Bay and single Storey with UDL / concentrated load only)*
9	**CO 3**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Problems on Analysis of 2D Non-Sway Portal Frames by Moment Distribution Method.	1 & 2. Analysis of 2D Non-Sway Portal Frames
10	**CO 3**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Problems on Analysis of 2D Non-Sway Portal Frames by Moment Distribution Method.	1 & 2. Analysis of 2D Non-Sway Portal Frames
11	**CO 4**	**1, 2, 3, 4, 5, 7**	**ANALYSIS OF PIN JOINTED FRAMES (TRUSS)** 1. Introduction and types of Trusses, Assumptions in analysis of 2D truss. Concept of indeterminacy. 2. Determination of degree of indeterminacy for 2D truss. 3. Analysis of 2D Determinate Trusses Simple Problems on Analysis of determinate Truss by Method of joints	1 & 2. Analysis of 2D determinate Truss using any relevant analysis software.
12	**CO 4**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Simple Problems on Analysis of determinate Truss by Method of joints	1 & 2. Analysis of 2D determinate Truss using any relevant analysis software.
13	**CO 4**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Simple Problems on Analysis of determinate Truss by Method of Sections	1 & 2. Analysis of 2D determinate Truss using any relevant analysis software.

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The Activity criteria shall be conducted / executed by the student and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. References:

i. Ramamurtham. S & R. Narayan., *"Theory of Structures,"* Dhanpat Rai Publications

ii. S.S. Bhavikatti, "*Structural Analysis-I & II",* New Age International (P) Limited, Publishers.

iii. B.C. Punmia, Ashok Kumar Jain, Arun Jain., "Theory of Structures," Thirteenth edition, Laxmi Publications.

iv. R.S Khurmi, & N. Khurmi," *Theory of Structure* ", Twelfth edition, S Chand Publications.

v. V.N.Vazirani, M.M.Ratwani & S.K. Duggal," Analysis of Structures Vol-I & II ", Khanna Publishers

vi. G.S.Pandit, S.P.Gupta & R.Gupta, "Theory of Structures Vol-I&II", TATA McGraw Hill Education.

vii. C.S.Reddy, "Basic Structural Analysis", TATA McGraw Hill education.

NPTEL videos on Statically determinate and Indeterminate structures.

viii. https://archive.nptel.ac.in/courses/105/105/105105166/

NPTEL videos on Slope deflection method and Moment Distribution method

ix. https://archive.nptel.ac.in/courses/105/105/105105109/

NPTEL videos on Analysis of Truss by method of joints and method of section.

x. https://archive.nptel.ac.in/courses/105/105/105105166/

xi. https://www.thestructuralengineer.info/software/linpro-275

xii. https://skyciv.com/free-frame-calculator/

xiii. https://calcforge.com/1/free-structural-analysis-calculator

xiv. https://app.clearcalcs.com/freetools/free-moment-of-inertia-calculator/au

xv. https://app.clearcalcs.com/freetools/beam-analysis/au

xvi. https://optimalbeam.com/beam-calculator.php#

5.CIE Assessment Methodologies

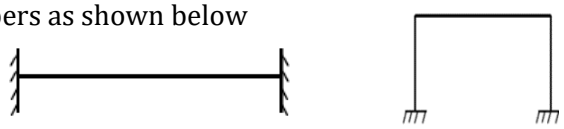
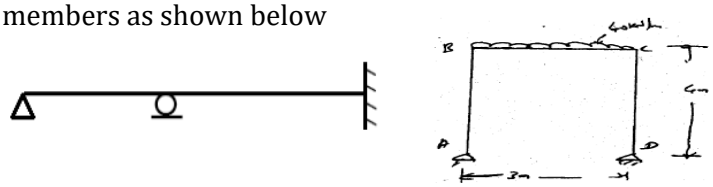
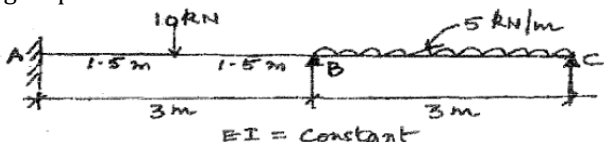
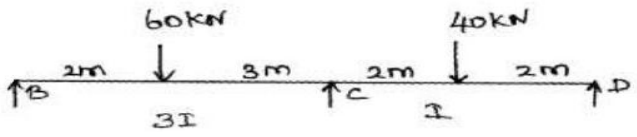
Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1 Theory Test	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					**50 Marks**

6.SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper (CIE 1)

Program	Civil Engineering			Semester -V	
Course Name	Analysis of Structures			Theory Test	01
Course Code	25CE52IB	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) State Conditions of equilibrium b) Differentiate between determinate and indeterminate structure c) Explain the concept of degrees of freedom in structures. d) Determine Static Indeterminacy for the given structural members as shown below 	R/ U /An	**CO 1**	**25**
2	a) What are the different types of supports? Give one example for each. b) Comparison of static and kinematic indeterminacy. c) What are the different types of loads acting on a structure d) Determine Static Indeterminacy for the given structural members as shown below 	R/ U /An	**CO 1**	
	Section - 2			
3	Analyze the given beam as shown in figure and draw SFD and BMD using Slope Deflection Method. 	R/ U /An	**CO 2**	**25**
4	Analyze the given beam as shown in figure and draw SFD and BMD using Slope Deflection Method. 	R/ U /An	**CO 2**	
			Total	**50**

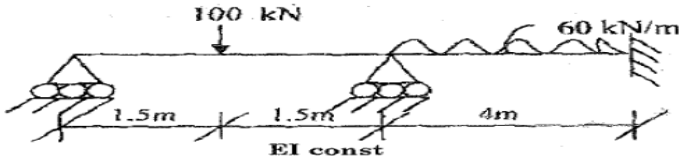
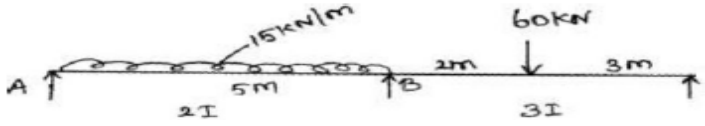
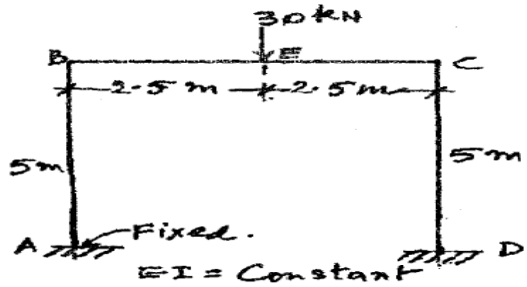
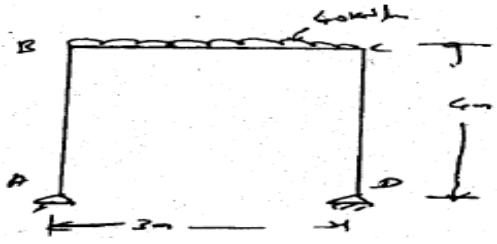
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature	Signature	Signature
Course Coordinator	Programme Coordinator	IQAC Chairman

7. CIE Theory Test model question paper (CIE 3)

Program	Civil Engineering			Semester -V	
Course Name	Analysis of Structures			Theory Test	02
Course Code	25CE52IB	Duration	90 min	Marks	50
Name of the Course Coordinator:					

Note: Answer any one full question from each section. Each full question carries equal marks.

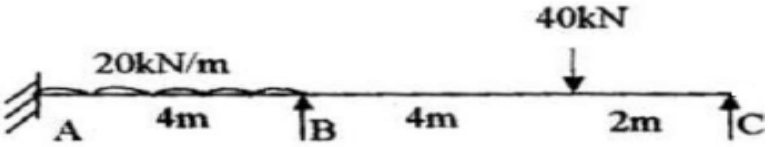
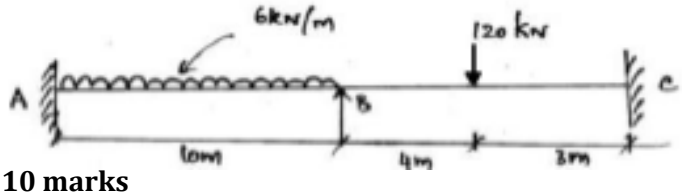
Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	Analyze the given beam as shown in figure and draw SFD and BMD using Moment Distribution Method. 	R/ U /An	CO 3	25
2	Analyze the given beam as shown in figure and draw SFD and BMD using Moment Distribution Method. 	R/ U /An	CO 3	
	Section - 2			
3	Analyze the given Portal frame as shown in figure and draw SFD and BMD using Moment Distribution Method. 	R/ U /An	CO 3	25
4	Analyze the given Portal frame as shown in figure and draw SFD and BMD using Moment Distribution Method. 	R/ U /An	CO 3	
			Total	50

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature	Signature	Signature
Course Coordinator	Programme Coordinator	IQAC Chairman

7. CIE Practice Test model question paper (CIE 2)

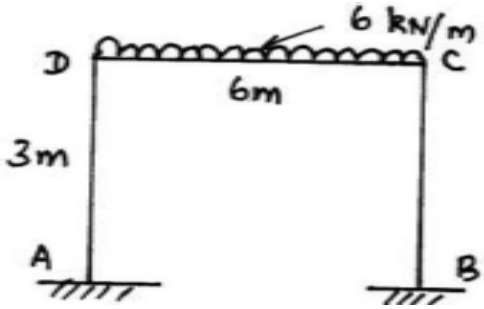
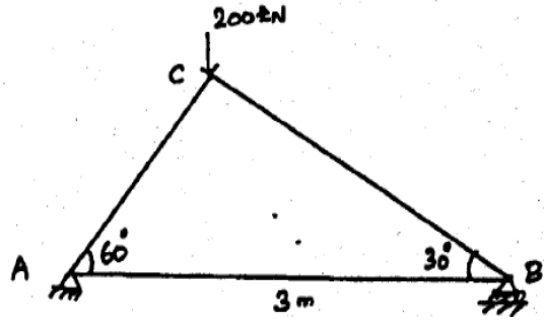
Program	Civil Engineering			Semester	V
Course Name	Analysis of Structures			Practice Test	01
Course Code	25CE52IB	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Note for the Examiner: Student has to answer one question from each section.					

Sl. No	Questions	CO	Marks
1	**Section – 1 (Experiment from Week 1 to Week 5)** Analyse the given beam as shown in figure and draw SFD and BMD using Slope Deflection Method and validate the results using any relevant analysis soft  **Manual Analysis -10 marks** **Validate the results using software -10 marks**	CO- 2	20
2	**Section – 2 (Experiment from Week 6 and Week 7)** Analyse the given beam as shown in figure and draw SFD and BMD using Moment Distribution Method and validate the results using any relevant analysis software.  **Manual Analysis -10 marks** **Validate the results using software -10 marks**	CO- 3	20
3	**Viva- voce**	CO 1, 2 & 3	10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper (CIE 4)

Program	Civil Engineering			Semester	V
Course Name	Analysis of Structures			Practice Test	02
Course Code	25CE52IB	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Note for the Examiner: Student has to answer one question from each section.					

Sl. No	Questions	CO	Marks
1	**Section – 1 (Experiment from Week 8 to Week 10)** Analyse the given portal frame as shown in figure and draw SFD and BMD using Moment Distribution Method and validate the results using any relevant analysis software.  **Manual Analysis -10 marks** **Validate the results using software -10 marks**	CO- 3	20
2	**Section – 2 (Experiment from Week 11 to Week 13)** Analyse the given Truss as shown in figure and tabulate the axial forces using Method of joints or Method of sections and validate the results using any relevant analysis software.  **Manual Analysis -10 marks** **Validate the results using software -10 marks**	CO- 4	20
3	**Viva- voce**	CO 1, 3 & 4	10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
1	Students could work in groups to research different types of structures (e.g., arches, bridges, buildings) and classify them into structural forms (e.g., trusses, frames, shells). Each group would present their findings.
2	Have students use different analysis software to solve continuous beam problems. They should compare results from manual calculations using the slope-deflection.
3	Use different analysis software to compare the results from manual calculations using Moment Distribution method for continuous beams. Students can do multiple iterations to match software results.
4	Ask students to research real-life 2D non-sway portal frames (e.g., buildings) under various loads. Students can use both manual methods (by Moment Distribution method with multiple iterations to match software results.) and software to analyze the frames and discuss the differences in approaches.
5	Present a scenario in which a truss is failing due to overload or improper design. Students can analyze why the truss fails and propose design modifications to prevent failure.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

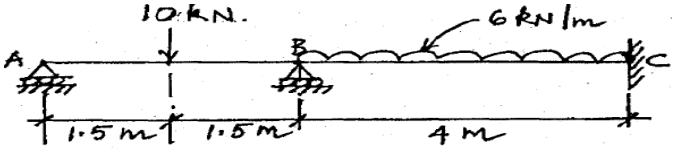
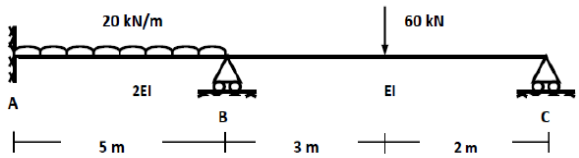
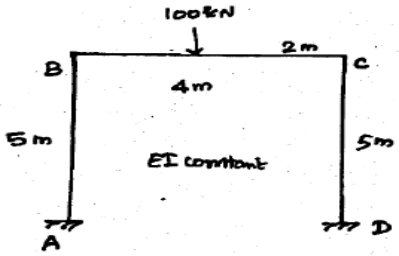
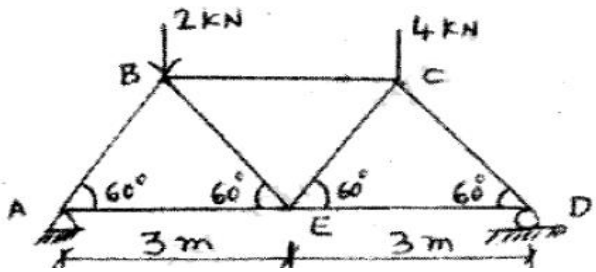
Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
	Average Marks=(20+40+30+50+40)/5						**36**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE- Model Practice Question Paper

Program	Civil Engineering		Semester	V
Course Name	Analysis of Structures	Course Code:25CE52IB	Duration	180 min

Note for the External Examiner:
- **Answer any one question from each section**
- **The Choice between the questions 1(a) or 1(b) and 2(a) or 2(b) shall be done by the external examiner**

Sl.no	Questions	CO	Marks
1	**Section – 1 (Experiment from Week 1 to Week 7)** **a)** Analyse the given beam as shown in figure and draw SFD and BMD using Slope Deflection Method and validate the results using any relevant analysis software.  EI = Constant **OR** **b)** Analyse the given beam as shown in figure and draw SFD and BMD using Moment Distribution Method and validate the results using any relevant analysis software.  **Manual Analysis -10 marks** **Validate the results using software -10 marks**	**CO 2 & 3**	**20**
2	**Section – 2 (Experiment from Week 8 to Week 13)** **a)** Analyse the given portal frame as shown in figure and draw SFD and BMD using Moment Distribution Method and validate the results using any relevant analysis software.  **OR** **b)** Analyse the given Truss as shown in figure and tabulate the axial forces using Method of joints or Method of sections and validate the results using any relevant analysis software.  **Manual Analysis -10 marks** **Validate the results using software -10 marks**	**CO 3 & 4**	**20**

3	**Viva- voce**	**CO 1, 2, 3 & 4**	**10**
		Total Marks	**50**

1) Signature of the Examiner **2) Signature of the Examiner**

11. Equipment/software list with Specification for a batch of 30students

Sl. No.	Particulars	Specification	Quantity
01	Desktop Computers / Laptops	8 GB RAM, 512GB HARD DRIVE, i5 2.5 GHz PROCESSOR, and above	30
02	Any Structural Analysis software	Any Open source/licensed	01 / computer

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	**CIVIL ENGINEERING**	**Semester**	**V**
Course Name	**GEOTECHNICAL ENGINEERING**	**Type of Course**	**Integrated**
Course Code	**25CE52IC**	**Contact Hours**	**91 Hrs./Sem. 7 Hrs/Week**
Teaching Scheme	**L: P:: 3:4**	**Credits**	**05**
CIE Marks	**50**	**SEE Marks**	**50 (Practice)**

1. Rationale:

Geotechnical Engineering is a fundamental branch of Civil engineering that deals with the behavior of soil and rock in relation to construction. Understanding geotechnical principles is essential for designing safe and stable foundations, retaining structures, slopes, tunnels, and other earth-related projects ensuring long-term performance, stability, safety, and sustainability and preventing failures of Civil engineering projects.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Classify different types of soil, based on their gradation and describe properties of soil and their significance in foundation design.
CO-02	Understand the Significance of Rankine's Earth pressure, Permeability, Compaction and Consolidation of Soil.
CO-03	Know the Importance of Shear Strength and shear parameters of soil in substructure design.
CO-04	Recognize the need of Ground Improvement Techniques and Soil stabilization for different types of soil and to determine Bearing capacity for given data.

3. Course Content

WEEK	CO	PO	Theory 3 hours/week (per batch)	Practice 4 hours/ week (2 hours/ batch twice in week)
1	**CO 1**	**1, 2, 3, 4, 5, 7**	**INTRODUCTION AND PROPERTIES OF SOIL** 1. Introduction –application of Geotechnical Engineering – 2. & 3. Soil properties – Phase Diagram, Definitions of Voids ratio, Porosity, Percentage Air voids, Air content, Degree of saturation, Moisture content, Simple Problems on interrelationships.	1. Determine Specific gravity of soil sample using Pycnometer. 2. Determine the grain size distribution of soil sample by dry sieving.

2	**CO 1**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Bulk density, Dry density, Saturated density, Submerged density and Density Index / Relative density. Interrelationships among the terms. Simple Problems on interrelationships.	1. Determine the particle size distribution of fine-grained soil sample using Hydrometer 2. Determine Consistency limits for soil sample. [Liquid limit (by Casagrande's method), Plastic limit]
3	**CO 1**	**1, 2, 3, 4, 5, 7**	**INDEX PROPERTIES OF SOIL** 1. 2. & 3. Index Properties of soils – Water content, Specific Gravity, Particle size distribution, Atterberg's limits / Consistency limits (shrinkage limit, plastic limit, and liquid limit), in-situ density. Importance of index properties in foundation design. Simple Problems on index properties.	1. Determine liquid limit of soil sample by Cone Penetration method. 2. Determine moisture/ water content of soil sample by oven dried method
4	**CO 1**	**1, 2, 3, 4, 5, 7**	**CLASSIFICATION OF SOIL** 1. 2. & 3. Classification: Purpose of soil classification, Particle size classification, Indian Standard Classification of Soil (ISCS) System, field identification of soils.	1. Determine in-situ density for of soil sample by core cutter method. 2. Determine dry density of soil sample by Sand replacement method.
5	**CO 2**	**1, 2, 3, 4, 5, 7**	**EARTH PRESSURE AND PERMEABILITY** 1. 2. & 3. Rankine's Earth pressure (Active, passive, earth pressure at rest) Simple problems on Rankine's Earth pressure. Introduction to slope stability and advantages of slope stabilization. Introduction to Permeability, coefficient of permeability, factors affecting permeability.	1. & 2. Determine / Demonstration of constant head and variable head test, to determine co-efficient of permeability of soil sample. **(If relevant Equipment not available, Conduct experiment through virtual labs)*
6	**CO 2**	**1, 2, 3, 4, 5, 7**	**COMPACTION AND CONSOLIDATION** 1. 2. & 3. Definition, Principle of compaction, Standard and Modified proctor compaction test, factors affecting compaction, effect of compaction on soil properties, Types of field compaction.	1. & 2. Determine Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) of soil sample by Standard Proctor method.
7	**CO 2**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Field compaction control, Zero Air Voids (ZAV). Consolidation: Normally consolidated, under consolidated and over consolidated soils. Difference between Compaction and Consolidation. List the tests conducted for Consolidation of soil.	1. Determine Uniaxial Compression Strength of soil by unconfined compression test. 2. Determine / Demonstration of Consolidation test, to determine compression index and coefficient of consolidation. **(If relevant Equipment not available, Conduct experiment through virtual labs)*

			Importance of Compaction and Consolidation of soil in Civil Engineering Construction.	
8	**CO 3**	**1, 2, 3, 4, 5, 7**	**SHEAR STRENGTH** 1. 2. & 3. Concept of shear strength, Modes of shear failure, Total and effective shear strength parameters. List the tests conducted for shear strength of soil Demonstration of Triaxial test, to determine shear strength parameters of soil sample.	1. Determine shear strength parameters using Direct shear test. 2. Determine shear strength parameters using Vane shear test. **(If relevant Equipment not available, Conduct experiment through virtual labs)*
9	**CO 3**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Factors affecting shear strength of soils, Concept of pore pressure (Definition and necessity). Importance of Shear strength of soil in Civil Engineering Construction.	1. & 2. Visit any nearby Civil Engg. construction projects, collect soil samples from the site and prepare report on classification of soil.
10	**CO 4**	**1, 2, 3, 4, 5, 7**	**GROUND IMPROVEMENT TECHNIQUES AND STABILIZATION OF SOIL** 1. 2. & 3. Introduction, objectives, Factors affecting ground improvement techniques, commonly used methods - Soil nailing, vibro-compaction, Sand drains, Stone columns, Compaction piles, soil reinforcement- Geogrids and Geosynthetics.	1. & 2. Visit any nearby Highway project construction and prepare a report on reinforced soil wall, Geogrids and Geosynthetics usage.
11	**CO 4**	**1, 2, 3, 4, 5, 7**	1. 2. & 3. Introduction- Objects of stabilization- Methods of stabilization- grouting methods (Compaction grouting and slurry injection grouting only), stabilization of soil using chemicals. Demonstration of Standard Penetration Test (SPT) and Plate Load Test.	1. & 2. Visit any nearby Civil Engg. construction projects and prepare a report on Ground improvements techniques implemented.
12	**CO 4**	**1, 2, 3, 4, 5, 7**	**BEARING CAPACITY OF SOIL** 1. 2. & 3. Introduction, Factors affecting Bearing capacity of soil, Determination of bearing capacity by Terzaghi's equations / BIS methods. Demonstration on effect of water table on bearing capacity of soil.	1. Extraction / Field collection / sampling of soil samples (Disturbed and undisturbed) from site. 2. Determine Safe Bearing Capacity (SBC) for soil sample (sandy/ coarse grained) using Direct shear test values and by Terzaghi's equations for given data.
13	**CO 4**	**1, 2, 3, 4, 5, 7**	**SETTLEMENT OF SOIL** 1. 2. & 3. Settlement: Types of settlements and its importance, permissible, differential and total settlements. Importance of Bearing capacity and Settlement of soil in sub-structure design.	1. & 2. Determine Safe Bearing Capacity (SBC) for soil sample (sandy/ coarse grained) using Direct shear test values and by Terzaghi's equations for given data.

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The Activity criteria shall be conducted / executed by the student and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. References:

i. Punmia B.C. (2005), "Soil Mechanics and Foundation Engg.", 16th Edition, Laxmi Publications Co., New Delhi.
ii. Gopal Ranjan and Rao A.S.R. (2000), "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi. R.S Khurmi, & N. Khurmi," *Theory of Structure* ", Twelfth edition, S Chand Publications.
iii. Alam Singh and Chowdhary G.R., "Soil Engineering in Theory and Practice" CBS Publishers and Distributors Ltd., New Delhi
iv. Bowles J.E. (1996), „Foundation Analysis and Design" 5th Edition, McGraw Hill Pub. Co. New York.
v. T.G. Sitharam and T.N. Ramamurthy, "Geotechnical Engineeing", 3rd Edition, S. Chand & Co., New-Delhi
vi. Dr. P. Purushotham Raju, "Ground Improvement techniques", University Science Press, 1999.
vii. VNS Murthy "Text book of Soil Mechanics & Foundation Engineering", Dhanpat Rai & Sons 1682, Nai sark, Delhi.
viii. BIS Codes of Practice: IS 2720, IS 8009 Part 1, IS: 6403
NPTEL courses on Geotechnical Engineering web links
ix. https://nptel.ac.in/courses/105103097
x. https://archive.nptel.ac.in/courses/105/105/105105168/
Ground Improvement Techniques and soil stabilization web links
xi. https://archive.nptel.ac.in/courses/105/108/105108075/
xii. https://archive.nptel.ac.in/courses/105/105/105105210/
Virtual Lab web links
xiii. https://www.vlab.co.in/broad-area-civil-engineering
xiv. https://smfe-iiith.vlabs.ac.in/List%20of%20experiments.html

5.CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6.SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper (CIE 1)

Program	Civil Engineering			Semester -V	
Course Name	Geotechnical Engineering			Theory Test	01
Course Code	25CE52IC	Duration	90 min	Marks	50
Name of the Course Coordinator:					

Note: Answer any one full question from each section. Each full question carries equal marks.

Q. No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) Define Voids ratio and Porosity b) Explain three phase system of soil with a neat sketch. c) What is the purpose of soil classification d) Simple Problems on index properties and their interrelationships	R/ U /An	CO 1	25
2	a) Define Bulk density and Dry density b) Explain the application of Geotechnical Engineering in civil engineering projects. c) How does soil classification impact the design of foundations? d) Simple Problems on index properties and their interrelationships	R/ U /An	CO 1	
	Section - 2			
3	a) Define Percentage air voids and Degree of saturation b) Discuss the significance of the shrinkage limit, plastic limit, and liquid limit in soil behavior. c) Define specific gravity in the context of soil. what is its significance in soil classification? d) Simple Problems on index properties and their interrelationships	R/ U /An	CO 1	25
4	a) Define Submerged density and Saturated density. b) What are the index properties of soils, and why are they important in foundation design? c) Explain the different categories in the Indian Standard Soil Classification System (ISCS). d) Simple Problems on index properties and their interrelationships	R/ U /An	CO 1	
			Total	50

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature	Signature	Signature
Course Coordinator	Programme Coordinator	IQAC Chairman

7. CIE Theory Test model question paper (CIE 3)

Program	Civil Engineering			Semester -V	
Course Name	Geotechnical Engineering			Theory Test	02
Course Code	25CE52IC	Duration	90 min	Marks	50
Name of the Course Coordinator:					

Note: Answer any one full question from each section. Each sub-question carries equal marks.

Q. No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) List and explain the factors that affect the permeability of soil. b) Differentiate between normally consolidated, under-consolidated, and over-consolidated soils. c) What is the difference between compaction and consolidation. d) Problems on Earth pressure **OR** a) List the factors that affect the compaction of soil. b) List and describe the common tests conducted to determine the permeability of soil. c) Why is compaction and consolidation important in civil engineering construction projects d) Problems on Earth pressure	R/ U /An	**CO 2**	**20**
	Section - 2			
2	a) Why is shear strength important in the design and stability of structures. b) Describe the different modes of shear failure in soils. **OR** c) What are the main factors affecting the shear strength of soils d) List the tests commonly used to determine the shear strength of soil.	R/ U /An	**CO 3**	**10**
	Section - 3			
3	a) What is the objective of ground improvement techniques? b) List any five commonly used ground improvement techniques and their applications. c) What are the key considerations when selecting a ground improvement method for a specific site or project? d) Discuss the advantages and limitations of using stone columns for ground improvement. **OR** a) List any five different types of geosynthetics available and their applications. b) List the factors that affect the choice and effectiveness of ground improvement techniques c) How does vibro-compaction improve the properties of loose granular soils d) Explain the concept of soil nailing	R/ U /An	**CO 4**	**20**
			Total	**50**

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature
Course Coordinator

Signature
Programme Coordinator

Signature
IQAC Chairman

7. CIE Practice Test model question paper (CIE 2)

Program	Civil Engineering			Semester	V
Course Name	Geotechnical Engineering			Practice Test	01
Course Code	25CE52IC	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Note for the Examiner : Student has to answer one question from each section.					

Sl. No	Questions	CO	Marks
1	**Section – 1 (Experiment from Week 1 to Week 4)** 1) Determine Specific gravity of soil sample using Pycnometer. 2) Determine the grain size distribution of soil sample by dry sieving. 3) Conduct Hydrometer analysis to determine the particle size distribution of fine-grained soil sample. 4) Determine Consistency limits / Atterberg's limits for soil sample. 5) Determine liquid limit of soil sample by Cone Penetration method. 6) Determine moisture/ water content of soil sample by oven dried method 7) Determine in-situ density for of soil sample by core cutter method. 8) Determine dry density of soil sample by Sand replacement method	CO- 1	20
2	**Section – 2 (Experiment from Week 5 to Week 7)** 1) Determine co-efficient of permeability by constant head or variable head method for given soil sample. 2) Determine Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) of soil sample by Standard Proctor method 3) Determine Uniaxial Compression Strength of soil by unconfined compression test. 4) Determine compression index and coefficient of consolidation by Consolidation test for given soil sample. **Scheme of evaluation** Procedure -05 marks Conduction-05 marks Observation and Calculations- 05 marks Results -05 marks	CO- 2	20
3	**Viva- voce**	CO 1 & 2	10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper (CIE 4)

Program	Civil Engineering			Semester	V
Course Name	Geotechnical Engineering			Practice Test	02
Course Code	25CE52IC	Duration	180 min	Marks	50

Note for the Examiner : Student has to answer one question from each section.

Sl. No	Questions	CO	Marks
1	**Section – 1 (Experiment from Week 8 and Week 9)** a) Determine shear strength parameters using Direct shear test. b) Determine shear strength parameters using Vane shear test. **Scheme of evaluation** Procedure -05 marks Conduction-05 marks Observation and Calculations- 05 marks Results -05 marks	CO- 3	20
2	**Section – 2 (Experiment from Week 10 to Week 13)** Determine Safe Bearing Capacity (SBC) for soil sample (sandy/ coarse grained) using Direct shear test values and by Terzaghi's equations for given data. **Scheme of evaluation** Tabulation and Calculations- 15 marks Results - 05 marks	CO- 4	20
3	**Viva- voce**	CO 3 & 4	10
		Total Marks	50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl. No.	Suggestive Activities
1	Collect soil samples from different locations and conduct classification exercises as per Indian standards.
2	List out the various equipments / machineries used for compaction and consolidation of different types of soil.
3	Analyze how shear parameters influence the soil behavior and choice of foundation or foundation design.
4	Discuss how bearing capacity value influences /affects choice of foundation or foundation design.
5	Prepare a case study on advanced ground improvement techniques.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
	Average Marks=(20+40+30+50+40)/5						**36**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE- Model Practice Question Paper

Program	**Civil Engineering**		**Semester**	**V**
Course Name	**Geotechnical Engineering**	**Course Code:25CE52IC**	**Duration**	**180 min**

Note for the External Examiner:
- **Conduct any one experiment from each section**
- **The Choice of experiments shall be done by the external examiner**

Sl.no	**Questions**	**CO**	**Marks**
1	**Section – 1 (Experiment from Week 1 to Week 4)** 1) Determine Specific gravity of soil sample using Pycnometer. 2) Determine the grain size distribution of soil sample by dry sieving. 3) Determine the particle size distribution of fine-grained soil sample using Hydrometer 4) Determine Consistency limits / Atterberg's limits for soil sample. 5) Determine liquid limit of soil sample by Cone Penetration method. 6) Determine moisture/ water content of soil sample by oven dried method 7) Determine in-situ density for of soil sample by core cutter method. 8) Determine dry density of soil sample by Sand replacement method	**CO 1**	**20**
2	**Section – 2 (Experiment from Week 5 to Week 13)** 1) Determine Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) of soil sample by Standard Proctor method. 2) Determine Uniaxial Compression Strength of soil by unconfined compression test. 3) Determine shear strength parameters using Direct shear test. 4) Determine shear strength parameters using Vane shear test. **Procedure -05 marks** **Conduction-05 marks** **Observation and Calculations- 05 marks** **Results -05 marks**	**CO 2, 3 & 4**	**20**
3	**Viva- voce**		**10**
		Total Marks	**50**

1) Signature of the Examiner **2) Signature of the Examiner**

11. Equipment/software list with Specification for a batch of 30students

Sl. No.	Particulars	Specification	Quantity
1	Pycnometer Bottle	1-liter capacity, with airtight cap	05
2	Weighing Balance	50 kg capacity with 1 g accuracy 1 kg capacity with 0.1 g accuracy	01 01
3	Desiccator	As per standards	01
4	Sieve Set	IS Standard Sieves (4.75mm, 2mm, 1mm, 600µm, 425µm, 212µm, 150µm, 75µm)	03 set
5	Mechanical Sieve Shaker	Timer-controlled, capacity for 8 sieves	01
6	Hydrometer analysis Apparatus Hydrometer	151H (ASTM), 152H (ISO) standard hydrometers	01
	Graduated Cylinders	1000 ml capacity	
	Dispersing Agent	(Sodium Hexa metaphosphate) **– 40 g/l solution**	
	Thermometer	Range 0°C to 50°C	
07	Casagrande's Apparatus	Adjustable base, mechanical crank	02
08	Cone Penetrometer	30° Cone Angle, Weight: 80g	01
09	Shrinkage Limit Apparatus	Evaporating Dish, Mercury, Shrinkage Mold	02
10	Hot Air Oven	Temperature range 10°C to 1000°C, digital display	02
11	Moisture Cans	Aluminum, airtight	02
12	Core Cutter	Steel, 100mm diameter, 127.5mm height	03
13	Rammer	2.6 kg weight, 310mm drop height	03
14	Sand Replacement Apparatus	200mm dia cone, metal base plate, glass jar	02
15	Permeability apparatus set Constant Head Permeability Test	Permeameter Mould – Diameter: 100mm, Height: 127mm Constant Water Head Tank – Graduated, adjustable outlet Stopwatch – Digital, accuracy 0.01s	01
16	Permeability apparatus set Variable Head Permeability Test	Glass Standpipes – Diameter 5mm, 10mm, 20mm Flexible Rubber Tubing – For water flow adjustments	01
17	Stopwatch	Digital, accuracy 0.01s	05
18	Standard Proctor apparatus set	As per standards	03
19	Consolidation (Oedometer) Test apparatus	As per standards	01
20	Direct Shear Test apparatus	As per standards	01
21	Triaxial Test apparatus	As per standards	01
22	Vane Shear Test apparatus	As per standards	01
23	Compression testing Machine	Load capacity 100kN	01
24	Standard Penetration Test (SPT) apparatus	As per standards	01
25	Geosynthetics Samples	Geogrids, Geotextiles	02

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	ENVIRONMENTAL ENGINEERING	Type of Course	Integrated
Course Code	25CE53IA	Contact Hours	91 Hrs./Sem. 7 Hrs/Week
Teaching Scheme	L: P :: 3: 4	Credits	05
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

The Environmental Engineering is to equip students with the knowledge, skills, and critical thinking abilities necessary to design and implement engineering solutions that protect and promote public health. Aspects such as water and wastewater management, pollution control, waste disposal, and sustainable solutions for future generations.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Estimate the future water requirement using forecasting methods and identify the suitable sources of water.
CO-02	Analyze the water quality as per standards, suggest suitable treatment methods and distribution systems.
CO-03	Determine the quantity and of sewage and analyze the sewage as per standards.
CO-04	Understand the sewerage systems, Compare various methods of Sewage treatment and sewage/sludge disposal methods.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	CO1	1,2,5,7	WATER REQUIREMENT: Necessity of water supply. Water Requirements for a) Domestic Purpose b) Industrial Use c) Fire Fighting d) Public Purpose e) Losses.	1. List the different Indian codes and standards for requirements of water supply, drainage and sanitation. 2. List the different water quality standards as per Indian standards.
2	CO1	1,2,5,7	Methods of population forecasting (Arithmetical, Geometrical and Incremental Increase method). Per Capita Demand and Factors affecting Per Capita Demand, Total Quantity of Water Required for a Town/Village/locality/City.	1 & 2. For a given population of a city/town calculate the total water requirement using Arithmetical, geometrical and Incremental Increase method and compare the values.
3	CO1	1,2,5,7	Sources of Water: Surface Sources - Lakes, Streams, Rivers. Impounded Reservoirs. Underground Sources: Infiltration Galleries,	1. Demonstrate Collection of Water Samples: Surface, Running and Ground water samples. 2. Video demonstration on

			Infiltration Wells and Springs. Intake Works: Types of intakes i)Reservoir intake ii) River intake iii) Canal intake.	determination of Colour of Water.
4	**CO2**	**1,2,4,5,7**	**Physical, Chemical and biological Parameters of water.** Physical Parameters: Colour, Taste and Odour, pH, Turbidity, Total Dissolved solids. Compare the result with BIS and interpret the result.	1. Determination of Turbidity of Water by Nephelo Turbidity meter. 2. Determination of pH Value (pH meter method & pH paper) of water sample.
5	**CO2**	**1,2,4,5,7**	**Chemical Parameters:** Total Hardness, Chlorides, Nitrates, Fluoride, Sulphates, Iron, Residual chlorine, Calcium, Acidity, Alkalinity and other relevant chemical parameters. BIS for potable water. **Biological Parameters:** E-coli, Most Probable Number (MPN), Quality Standards for Domestic purpose as per BIS.	1. Determination of Total solids, Suspended Solids and Dissolved solids of water. 2. Determination of Dissolved solids of water by TDS meter.
6	**CO2**	**1,2,4,5,7**	**TREATMENT OF WATER:** Flow diagram of different units of treatment, construction details, working and operation of the following units. Plain sedimentation. Sedimentation with coagulation, flocculation. Design problems of treatment units	1. Determination of Alkalinity & acidity of water sample. 2. Determination of hardness- total hardness, Calcium and Magnesium Hardness, Permanent Hardness.
7	**CO2**	**1,2,4,5,7**	Filtration-Slow sand filters. Rapid sand filter. Pressure Filters Back washing of filter Disinfection of water- Chlorination.	1. Determination of Chlorides of water sample. 2. Determination of Nitrates of water sample.
8	**CO2**	**1,2,4,5,7**	**DISTRIBUTION SYSTEM**: General requirements, Systems of Distribution - Gravity System, Combined System, Direct Pumping. Methods of Supply - Intermittent and Continuous. Storage - Ground Level and overhead Service Types of lay-out: Dead end, Grid iron, Radial and Ring systems, their merits and demerits and their suitability.	1. Determination of Residual chlorine in water 2. Determination of fluorides by using (Spectrophotometer/ Colorimeter) *(If relevant Equipment not available, Conduct experiment through virtual labs)
9	**CO3**	**1,2,4,5,7**	**INTRODUCTION:** Definition of sullage, sewage, sewerage, sewer, refuge, garbage. Water carriage system. **QUANTITY OF SEWAGE:** Domestic and industrial sewage, volume of domestic sewage, variability of flow, limiting velocities, Self-cleansing and Maximum velocities of sewer.	1. Simple problems on design of sewers. 2. Video demonstration on sewage treatment plants.
10	**CO3**	**1,2,4,5,7**	**CHARACTERISTICS AND ANALYSIS OF SEWAGE:** Strength of Sewage, Sampling of Sewage to analyze for Physical, Chemical and Biological Parameters, Decomposition of sewage. **Analysis of Sewage** - Significance of the following Tests Turbidity, Solids, Dissolved Oxygen, BOD, COD, pH value, Chlorides, & Nitrate.	1. Determination of Turbidity by using Jackson Turbidity meter 2. Determination of Dissolved oxygen (DO)
11	**CO4**	**1,2,4,5,7**	**Sewerage Systems:** Types of sewerage systems and their suitability- Separate, Combined & partially separate systems **Sewerage Appurtenances**: Brief description, Location, Function and Construction of Manholes, Drop Manholes, Inlets Catch Basin,	1&2. Determination of Biochemical oxygen demand (BOD)

			Flushing Tanks, Regulators. Surface Drains - Requirements, Shapes, Laying and Construction.	
12	**CO4**	**1,2,4,5,7**	**Sewage Treatment:** Preliminary Treatment– Description and Functions of – Screens, Skimming Tanks, Grit Chambers. Primary Treatment - Description and Function of the Sedimentation and Septic Tanks. Secondary Treatment - Description of Trickling Filters, Activated Sludge Process.	1 & 2. Determination of chemical oxygen demand (COD)
13	**CO4**	**1,2,4,5,7**	**Sewage Disposal:** Sewage Disposal- Dilution, Disposal in Sea water, Disposal on Lands, Self-purification of streams, factors affecting self-purification. Recycle of waste water (Grey water technology)	1 & 2. Visit nearby solid waste management plant and Prepare a report.

4. References:

1.Water Supply & Sanitary Engineering- by Rangwala.
2. Water Supply Engineering Vol-I - by S.K.Garg.
3. Water Supply & Sanitary Engineering- by Birde.
4. Water Supply Engineering Vol-I - by Gurucharan Singh.
5. Environmental Engg.-Vol-I –by P.N. Modi.
6. Water Supply Engg.-Vol-I – by Fair & Geir.
7. Water Supply, Waste Disposal and Environmental Pollution Engineering-(Khanna publication) A.K.chatterjee .
8. Water Supply Engineering by Dr B.C.Punmia, Jain & Jain.
9. Waste water Engineering by Dr B.C. Punmia, Jain & Jain
10. Sanitary Engineering Vol-II - by Gurucharan Singh

5.CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE - Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

<table>
<tr><td>Program</td><td colspan="3">Civil Engineering</td><td colspan="2">Semester - V</td></tr>
<tr><td>Course Name</td><td colspan="3">ENVIRONMENTAL ENGINEERING</td><td>Test</td><td>I/III</td></tr>
<tr><td>Course Code</td><td>25CE53IA</td><td>Duration</td><td>90 min</td><td>Marks</td><td>50</td></tr>
<tr><td colspan="6">Name of the Course Coordinator:</td></tr>
<tr><td colspan="6">Note:Answer any one full question from each section. Each full question carries equal marks.</td></tr>
<tr><td>Q.No</td><td colspan="2">Questions</td><td>Cognitive Level</td><td>Course Outcome</td><td>Marks</td></tr>
<tr><td colspan="6">Section - 1</td></tr>
<tr><td>1</td><td colspan="2">a) List the and explain different types of water requirements.
b) The following data have been observed from the census department.
<table><tr><th>Sl.No</th><th>Year</th><th>Population</th></tr><tr><td>1</td><td>1955</td><td>8000</td></tr><tr><td>2</td><td>1965</td><td>10000</td></tr><tr><td>3</td><td>1975</td><td>12000</td></tr><tr><td>4</td><td>1985</td><td>25000</td></tr><tr><td>5</td><td>1995</td><td>30000</td></tr><tr><td>6</td><td>2005</td><td>45000</td></tr><tr><td>7</td><td>2015</td><td>55000</td></tr><tr><td>8</td><td>2025</td><td>60000</td></tr></table>Estimate the population for the year 2035 and 2045 by Arithmetical Increase method.
c) Explain are the factors affecting the per capita demand.</td><td>R/U</td><td>CO1</td><td>05

10

10</td></tr>
<tr><td>2</td><td colspan="2">d) Explain with sketch Infiltration Galleries and Infiltration Wells.
e) Explain with neat sketches, reservoir intake, river intake and canal intake.</td><td>R/U</td><td>CO1</td><td>10

15</td></tr>
<tr><td colspan="6">Section - 2</td></tr>
<tr><td>3</td><td colspan="2">a) Explain the various surface sources of water with neat sketches.
b) Explain Colour, Taste and Odour tests conducted on water and their significances.</td><td>R/U</td><td>CO1/ CO2</td><td>16

09</td></tr>
<tr><td>4</td><td colspan="2">a) Explain the various Sub surface sources of water with neat sketches.
b) Explain pH, Turbidity, Total Dissolved solids tests conducted on water and their significances.</td><td>R/U</td><td>CO1/CO2</td><td>12

13</td></tr>
<tr><td colspan="6">Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.</td></tr>
</table>

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	V
Course Name	ENVIRONMENTAL ENGINEERING			Test	II
Course Code	25CE53IA	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
Section-1		
a. For a given population of a city/town calculate the total water requirement using Arithmetical/ geometrical/ Incremental Increase method and compare the values. OR Write the procedure for Collection of Water Samples: Surface, Running and Ground water samples.	CO1	**10**
Section-2		
b. Determination of Turbidity/pH Value/Solids/Dissolved Solids of Water **Scheme of Evaluation:** Procedure: 5marks Conduction: 5marks Calculation & Results: 5marks	CO2	**15**
Section-3		
c. Determination of Alkalinity & Acidity/Hardness/Chlorides/Nitrates of water sample. **Scheme of Evaluation:** Procedure: 5marks Conduction: 5marks Calculation & Results: 5marks	CO2	**15**
d. Viva-Voce		**10**
Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	V
Course Name	ENVIRONMENTAL ENGINEERING			Test	IV
Course Code	25CE53IA	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
Section-1		
a.) Simple problems on design of sewers.	CO3	**10**
Section-2		
b) Determination of Turbidity /Dissolved oxygen (DO) for the given sample of water. **Scheme of Evaluation:** Procedure: 5marks Conduction: 5marks Calculation & Results: 5marks	CO3	**15**
Section-3		
c) Determination of Biochemical oxygen demand (BOD)/ chemical oxygen demand (COD) **Scheme of Evaluation:** Procedure: 5marks Conduction: 5marks Calculation & Results: 5marks	CO4	**15**
d. **Viva-Voce**		**10**
Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose any 5 activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl.No.	Suggestive Activities
01	Visit water Treatment plant and Prepare a report on unit operations involved in treatment process .
02	Visit Sewage Treatment plant (STP)and Prepare a report on unit operations involved in treatment process .
03	Design a complete water supply system for a small town (say 10,000-20,000 people). Include population forecasting, per capita demand calculation, and determination of total water requirement. Calculate total water demand based on different forecasting methods. Choose an appropriate source of water (surface or underground). Design the distribution system (gravity or pumping). Design the storage system (overhead or ground-level tank). Prepare a complete layout of the water supply system.
04	Design a basic sewage system for a small community or neighborhood and analyze its functionality. Calculate the domestic and industrial sewage flow. Design sewer sizes, slopes, and materials based on flow and population. Study the different types of sewage systems (separate, combined) and recommend the most suitable one. Prepare a detailed design report of the sewage system with flow calculations and layouts.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
	Average Marks=(10+30+40+20)/4=25						**25**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE–Model Practice Question Paper

Program	**Civil Engineering**	**Semester**	**V**
Course Name	**ENVIRONMENTAL ENGINEERING**	**Marks**	**50**
Course Code	**25CE53IA**	**Duration**	**180 Min**
Note: Answer any one full question from each section. Each full question carries equal marks.			
Q No	**Questions**	**Course Outcomes**	**Marks**
	Section -1		
1	For a given population data of a city/town calculate the total water requirement/Write the procedure for Collection of Water Samples: Surface, Running and Ground water samples.	**CO1**	**05**

2	Determination of Turbidity/pH Value/Solids/Dissolved Solids of Water. OR Determination of Alkalinity & Acidity/Hardness/Chlorides/Nitrates of water sample.	**CO2**	**20**
Section -2			
3	Determination of Turbidity /Dissolved oxygen (DO)/ Biochemical oxygen demand (BOD)/ chemical oxygen demand (COD) for the given sample of Sewage.	**CO3/ CO4**	**20**
	Scheme of Evaluation: Q.No-1: 05 Marks Q.No-2&3: Procedure: 5marks Conduction: 10marks Calculation & Results: 5marks		
4	**Viva Voce**		**05**
Total		50 Marks	

11. Equipment/software list with Specification for a batch of 30students

Sl.No.	Particulars	Specification	Quantity
01	Water Sampling Bottles	Capacity: 500 mL – 1L; Material: Glass or plastic with airtight seal.	20
02	Nephelometer (Turbidity Meter)	Range: 0-1000 NTU; Accuracy: ±2% or ±0.1 NTU.	2
03	pH Meter	Range: 0-14 pH; Accuracy: ±0.01 pH.	2
04	TDS Meter/Conductivity meter	Range: 0-1000 ppm; Accuracy: ±2%.	2
05	Coagulation/Flocculation Unit(Model)	Adjustable stirring speed; Capacity: 1 10 liters.	1
06	Filtration Unit (Model)	Slow sand, Rapid sand filter types; Capacity: 10-20L.	1 Each
07	Chlorination Unit(Model)	Flow rate: Adjustable; Capacity: 1-10 chlorine solution.	1
08	Spectrophotometer/Colorimeter	Wavelength: 400–700 nm; Accuracy: ±1% full scale.	1
09	Jackson Turbidity Meter	Range: 0-1000 NTU; Accuracy: ±0.1 NTU.	2
10	DO Meter	Range: 0-20 mg/L; Accuracy: ±0.1 mg/L.	2
11	BOD Incubator	Temperature: 20-40°C; Capacity: 24 samples.	1
12	COD Reflux Test Apparatus	Range: 0-1500 mg/L; Method: Closed Reflux, Titrimetric.	1
13	Portable Water Analysis Kit	As per IS standards	1
14	Kjeldal Assembly Kit	As per IS standards	1
15	Water Bath (Hot)	As per IS standards	1
16	Dessicator	As per IS standards	1
17	Hot Air Oven	As per IS standards	
18	Glassware and chemicals (Consumables as per the requirements)	Borosilicate Grade	

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	MECHANICAL ELECTRICAL AND PLUMBING (MEP)	Type of Course	Integrated
Course Code	25CE53IB	Contact Hours	91 Hrs./Sem. 7 Hrs/Week
Teaching Scheme	L: P: :3: 4	Credits	05
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale:

The need for including MEP (Mechanical Electrical and Plumbing) as a course lies in its fundamental role in shaping safe, efficient, and sustainable building services. It equips professionals with the knowledge and skills to design, implement, and manage the essential systems that make modern infrastructure functional and comfortable. Understanding MEP principles is key to meeting the demands of evolving building technologies and contributing to a sustainable future.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Understanding and Applying MEP Systems Design Fundamentals and software.
CO-02	Understanding and create Mechanical Systems drawing for Building Infrastructure.
CO-03	Understanding and create Plumbing Systems for Building Infrastructure.
CO-04	Proficiency in Electrical Systems Integration in Building Infrastructure and create the drawings.
CO-05	Create Lighting, Communication and Security Systems for modern buildings.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	CO1	1,2	**Classification of buildings** Building efficiency factors, Net-to-gross ratio (NGR), Floor- Efficiency ratio (FER). Geometric factors, volume-to-surface ratio (VSR), area - to - perimeter ratio (APR) Design for correct climate zone, building orientation, functions, walls and roof, insulation, glazing in façades, day lighting and ventilation, shading devices, color. Building costs, design factors affecting the cost of buildings.	1. Exploring basic of MEP Software. 2. Calculation of Net-to-gross ratio (NGR) and Floor Efficiency Ratio (FER), volume to surface ratio (VSR), area to perimeter ratio (APR) for a given building plan.

2	**CO2**	**1,3,4,5,7**	**HVAC systems** Comfort air conditioning system, Mechanical cooling systems, Refrigerants, cooling system options, Systems with air based cooling, Systems with water based cooling. Combined systems (cooling is supply using both air and water) types of air conditioning systems, window air conditioners, split air conditioners, vertical air conditioning, centralized air conditioning, ductless mini-split, portable air conditioner, floor mounted air conditioner, smart air conditioner, geothermal air conditioning system, hybrid / dual fuel air conditioner. heat pumps, water chillers,	1 & 2. Draw the HVAC layout for a Single storey building using MEP Software.
3	**CO2**	**1,3,4,5,7**	**Air distribution system** Air Handling Units, Air distribution system design, All-air systems, Air-and-water systems, All-water systems, Constant Air Volume (CAV) Systems, CAV Reheat System Variable Air Volume (VAV) Systems, Applications of All Air Systems, Chilled Water System (CWS), Applications of All Water Systems, Air and Water Systems Air distribution ductwork, Heating systems, Indoor air quality.	1 & 2. Draw the HVAC layout for a Two-storied building using MEP Software.
4	**CO2**	**1,3,4,5,7**	**Firefighting systems** Difference between codes and standards, code, standard firewater demand, fire water storage tanks, fire pumps, the distribution system, general firefighting equipment, fire hydrants, standpipe systems, types of sprinkler systems, Fire extinguishers **Fire alarm systems** Determining fire alarm requirements Design features- control panels, fire alarm signals, normal alarm, supervisory, trouble, fire command centers, system power, commissioning and testing.	1. Draw the firefighting layout for a multi-story building using MEP Software. 2. Draw the fire alarm layout for a multi-story building using MEP Software.
5	**CO2**	**1,3,4,5,7**	**Vertical transportation** Elevators, Hydraulic elevator, Electric (traction) elevator, Elevator speed Typical elevator capacities Requirements of regulatory agencies, ADA requirements for elevators, Escalators, Types of Escalator configurations	1 & 2. Draw the plan and sectional elevation of hydraulic elevator for a multi-storey building using MEP Software.
6	**CO3**	**1,3,4,5,7**	**Plumbing systems** Gravity tank system, Hydro-pneumatic tank system, Booster pump system, Piping arrangement- Up feed and Down feed system, Water pumps, Plumbing fixtures	1 & 2. Draw the single line diagram of up feed and down feed system of plumbing for a multi-storey building showing different plumbing fixtures using MEP

				Software.
7	**CO3**	**1,3,4,5,7**	**Hot water system** Water heaters, Storage water heaters (tank), Tank less water heaters, Circulating water heater, Drainage systems, Sanitary drainage, Storm water drainage	1 & 2. Draw the Hot water system of plumbing for a multi-storey building showing different plumbing fixtures using MEP Software.
8	**CO3**	**1,3,4,5,7**	**Drainage system** Considerations Sewerage system, Storm water system, Typical plumbing system components, piping, checklists , Building layout considerations, Plumbing fixture location and roof drain location checklist, Structural constraints	1. Draw the single line diagram of drainage layout showing all the fixtures for a multi-storey building using MEP Software. 2. Draw the single line diagram of storm water drainage layout showing all the fixtures for a multi-storey building using MEP Software.
9	**CO4**	**1,3,4,5,7**	**Electrical systems** Electric power system, Single phase power, Three phase power, Advantages of 3-phase power, Power distribution in small buildings, Power distribution in large buildings	1. Draw the single line diagram of Electrical layout showing all the fixtures for a multi-storey building using MEP Software. 2. Continued.
10	**CO4**	**1,3,4,5,7**	**Electrical terms and components** Circuits – types & uses, Electrical load Conductors Feeder, American Wire Gauge System, Wire Types, Raceways, Conduits Capacitors, Transformer, Circuit Connections, Switchgear, Distribution boards, Switchboard, Branch Circuit, Circuit Protection, Grounding, Ground Fault Interrupter (GFI/GFCI) Fuses Circuit Breakers, Contactors, Receptacles (aka Outlets) Emergency Power Supply circuit protection, ground fault interrupter (GFI/GFCI) uninterruptible power supply (UPS)	1. Draw the single line diagram of Electrical layout showing all the fixtures for a multi-storey building using MEP Software. 2. Continued.
11	**CO5**	**1,3,4,5,7**	**Lighting in buildings** Recommended light levels by space, Characteristics of light sources, Selection factors, Types of lighting	1. Draw the single line diagram of Electrical layout showing all the fixtures for a multi-storey building using MEP Software. 2. Continued.
12	**CO5**	**1,3,4,5,7**	**Specialties, Communications & Security** Types of communication systems, intercom, paging devices, phone, data, local area networks (LAN), fire alarm, security systems, access control, CCTV, intercom, sound systems	1. Draw the single line diagram of CCTV layout showing all the fixtures for a given building using MEP Software. 2. Continued.
13	**CO5**	**1,3,4,5,7**	Access control MEP interface and relationship	1. Draw the single line

			with other disciplines, Coordination with civil structure works, safety, functionality, constructability, economy, efficiency, expandability, maintainability	diagram of LAN layout showing all the fixtures for a given Computer Lab using MEP Software. 2. Prepare a report on the existing communication and security system in nearby buildings.

4. References:

i. "HVAC: Principles and Applications" by C.P. Arora
ii. "Fire Safety in Buildings" by R. N. Lakhani
iii. "Fire Protection Systems" by A.K. Gupta
iv. "Building Services Engineering" by M. L. Jaiswal
v. "Design of Plumbing Systems" by S. G. Ghosh
vi. "Building Services and Systems: Plumbing" by Ramesh S. Maji
vii. "Electrical Power Systems" by C.L. Wadhwa
viii. "Building Lighting Design" by A. L. Rice
ix. "Design and Integration of Building Security Systems" by Mohammad Ali Hamade
x. AutoCAD MEP 2020 for Engineers & Designers
xi. https://www.planningengineer.net/wp-content/uploads/2015/12/MEP-Guide-for-Planning-Engineers.pdf
xii. https://electricalconnects.com/design/58-%20MEP%20Planning%20Manual%20Part%202.pdf.pdf
xiii. https://landscape.com.pk/wp-content/uploads/2020/06/MEP-Drawings.pdf
xiv. https://www.skillcatapp.com/post/a-complete-guide-to-hvac-drawings-and-blueprints

5.CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE - Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	Civil Engineering			Semester - V	
Course Name	MECHANICAL ELECTRICAL AND PLUMBING (MEP)			Test	I/III
Course Code	25CE53IB	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) Define Net-to-gross ratio (NGR), Floor- Efficiency ratio (FER), volume-to-surface ratio, area - to - perimeter ratio (APR) b) List and explain the different types of cooling systems. c) What are the different types of air conditioning systems?	R/U	CO1/CO2	08 10 07
2	a) List the design factors affecting the cost of buildings. b) List the different types of air distribution systems and explain any one. c) What is the necessity of providing a ducted conditioning system in a building.	R/U	CO1/CO2	08 10 07
	Section - 2			
3	a) Explain Fire Water Demand. b) Explain the necessity of fire pumps in firefighting system. c) What are the types of distribution system in firefighting? explain.	R/U	CO2	10 10 05
4	a) Explain fire hydrants, standpipe systems and sprinkler systems, b) List the different types of sprinkler systems. c) What are the requirements of a fire alarm systems.	R/U	CO2	10 05 10

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	V
Course Name	MECHANICAL ELECTRICAL AND PLUMBING (MEP)			Test	II
Course Code	25CE53IB	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
a) Develop HVAC/Firefighting / Fire Alarm layout for a given line diagram of a building. **Scheme of assessment** i) 2D Drawing 05 ii) Drawing fixtures and components 15	CO2	**20**
b) Draw the plan and sectional elevation of hydraulic elevator for a multi storey building/ Draw Plan of Upfeed and downfeed plumbing system/Hot water plumbing system using MEP Software. **Scheme of assessment** iii) 2D Drawing 05 iv) Drawing fixtures and components 15	CO3	**20**
c) Viva-Voce		**10**
Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

7. CIE Practice Test model question paper

Program	Civil Engineering			Semester	V
Course Name	MECHANICAL ELECTRICAL AND PLUMBING (MEP)			Test	IV
Course Code	25CE53IB	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
a) Draw the single line diagram of drainage layout/ storm water drainage layout showing all the fixtures for a multi-storey building using MEP Software. **Scheme of assessment** 2D Drawing 15 Drawing fixtures and components 05	CO3	**20**
b) Draw the single line diagram of Electrical layout/CCTV layout/ LAN layout showing all the fixtures for a multi- c) storey building using MEP Software. **Scheme of assessment** 2D Drawing 15 Drawing fixtures and components 05	CO4/CO5	**20**
c) Viva-Voce		**10**
Total Marks		**50**

Signature of the Course Coordinator **Signature of the HOD**

8. **Suggestive Activities**:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl.No.	Suggestive Activities
01	Using MEP software, students design an air distribution system for a multistory building, including ductwork and air handling units.
02	Present different types of escalator configurations and their applications in real-world buildings.
03	Analyze the placement of plumbing fixtures in a given building layout and suggest improvements for efficiency and accessibility.
04	Design a simple electrical circuit for a building, including wiring, conduits, and protection devices.
05	Compare different lighting systems (e.g., LED, fluorescent) and their applications in various building spaces.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
5		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	10
	Average Marks=(10+30+30+20+10)/5=20						**20**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE–Model Practice Question Paper

Program	Civil Engineering			Semester	V
Course Name	MECHANICAL ELECTRICAL AND PLUMBING				
Course Code	25CE53IB	Duration	180 min	Marks	50
Note: Answer any one question from each section.					
Questions				CO	Marks
SECTION - I a) Develop HVAC/Firefighting / Fire Alarm layout for a given line diagram of a building. OR b) Draw the single line diagram of Upfeed and downfeed plumbing system/Hot water plumbing system/ drainage layout/ storm water drainage layout showing all the fixtures for a multi-storey building using MEP Software. **Scheme of assessment** 2D Drawing 10 Drawing fixtures and components 10				CO2 CO3	20
SECTION - II c) Draw the single line diagram of Electrical layout showing all the fixtures for a multi-storey building using MEP Software. OR d) Draw the single line diagram of CCTV layout/ LAN layout showing all the fixtures for a multi-storey building using MEP Software. **Scheme of assessment** 2D Drawing 10 Drawing fixtures and components 10				CO4 CO5	20
e) Viva-Voce					10
				Total Marks	50

1. **Signature of the Examiner** **2. Signature of the Examiner**

11. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Computers	Core i5/8GB RAM/512SSD/4GB Graphics / 21.5" LED Monitor/KBD/Mouse	30
02	Software	Sketch Up/Reviet/3D studio	30 user
03	Printer/Plotter	A2/A3 size Plotter	1
04	Projector	LED Projector	1
05	UPS	5KVA with 3 hr backup	1

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	**CIVIL ENGINEERING**	**Semester**	**V**
Course Name	**3D VIRTUAL PRESENTATION TECHNIQUES**	**Type of Course**	**Integrated**
Course Code	**25CE53IC**	**Contact Hours**	**91 Hrs./Sem. 7 Hrs/Week**
Teaching Scheme	**L:P ::3 : 4**	**Credits**	**05**
CIE Marks	**50**	**SEE Marks**	**50 (Practice)**

1. Rationale:

Creating Virtual 3D Presentation with specialized software gives the actual and clear idea of the building with its real dimensions. This helps Construction team to analyze the design and make corrections prior to the construction. This tool provides the professionals to present the design, its form and appearance.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO- 1	Develop geometrical objects and forms using basic draw tools.
CO- 2	Develop 3D components of furniture, cabinets and apply materials.
CO- 3	Prepare various building components with accuracy and detail.
CO- 4	Develop Interior and Exterior realistic views of a residential building.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	**1**	**1,3, 4,7**	• Introduction to 3D modeling and Spatial concepts • Advantages & applications of 3D software • Selecting a template. Exploring the interface: Title bar, Menu bar, Getting Started with toolbars, drawing area, Status bar & Window resize handle in 3D software. • Introduction to Entities: Line, Face, Circle, Group, Component, Guideline, Dimension, Surface, Section plane.	• Practice basic tools using 3D software. • Creating 3D model. Saving and reopening a model. Back-up a file or restoring an Auto-save file. • Prepare geometrical 3D objects.
2	**1**	**1,3, 4,7**	• coordinate system • Dividing and Healing Geometry, push and pull • Camera adjustment, Camera tools • Perspective projection	Prepare simple objects using follow-me tool like handles, pots, cups, plates etc.,
3	**2**	**1,3, 4,7**	• Materials, Application and creating materials	Prepare 3D model of Chair, table, Tea pot, Study table, Bed,

			• Group and Components • Styles and types of styles • Shadows: Ground shadow, Face shadow.	Wardrobe etc.,
4	**2**	**1,3, 4,7**	• Sharing files • Export and import model • Warehouse • Rotate Moving and Coping, creating multiple copies.	Prepare 3D model of Dining table, TV unit, Kitchen unit etc.,
5	**3**	**1,3, 4,7**	• Scaling components • Measuring distance • Creating text and Text-types • Zoom tool, changing focal length	Develop a dog-legged and spiral staircase with railing and apply materials, add necessary details
6	**3**	**1,3, 4,7**	• Animation and walk through, scene tabs • Exporting animation • Scaling an object • Dynamic components	Develop 3D of Windows with suitable texture/material
7	**3**	**1,3, 4,7**	• Dividing lines of arc into equal parts • Flipping or mirroring geometry • Edit Menu and its elements	Develop any two types of doors with all necessary fittings like handle, lock etc.,
8	**3**	**1,3, 4,7**	• Camera menu and its elements • View menu and its elements	Develop interior model of a living unit and bedroom unit.
9	**4**	**1,3, 4,7**	• Interior Tools menu and its elements • Interior Window menu and its elements • Interior Draw menu and its elements	Develop interior model of a Kitchen and Dining unit.
10	**4**	**1,3, 4,7**	Exterior Toolbars: Getting started, large toolset, camera tool bar, guide toolbar, Drawing tool bar, face style tool bar	Develop 3D Exterior model of a residential building (2 floors)
11	**4**	**1,3, 4,7**	Exterior Toolbars: Google toolbar, measurement toolbar, principal toolbar, sand box toolbar	Develop 3D Exterior model of a School building (2 floors)
12	**4**	**1,3, 4,7**	• Standard views • Match new photo	Develop 3D Exterior model of a commercial building (2 floors)
13	**4**	**1,3, 4,7**	• Sketching over image • Raster file formats • Exporting images	Render the model and create scenes to develop animation/walkthrough of the residential model

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5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1 Theory Test	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE – Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	**Civil Engineering**			**Semester - V**	
Course Name	**3D Virtual Presentation Techniques**			**Test**	**I**
Course Code	**25CE53IC**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) What is Computer Aided Presentation Technique? Explain its advantages b) Sketch and Explain functions of following entities: Line, Face, Circle, Group, Component, Guideline.	L1 L3	1	3+10=**13** 6 x 2=**12**
2	a) What is 3D software? Explain its applications. b) Sketch and Explain functions of following entities: Dimension, Surface, Section plane, Push/pull, Camera, Perspective projection.	L1 L3	1	3+10=**13** 6 x 2=**12**
	Section - 2			
3	a) What is Material Pallet? Explain its application of creating materials b) Write a note on following: • Styles and types of styles • Shadows, ground shadow and face shadow.	L1 L1	2	3+10=**13** 6 x 2=**12**

4	a) What is Warehouse? Explain its benefits in 3D modeling. b) Write a note on following: • Export and import model • Moving and Coping, creating multiple copies.	L1 L1	2	3+10=**13** 6 x 2=**12**
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC**

7. CIE Practice Test model question paper

Program	**Civil Engineering**			**Semester**	**V**
Course Name	**3D Virtual Presentation Techniques**			**Test**	**II/IV**
Course Code	**25CE53IC**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
Develop 3D Model for an **Interior/Exterior** of any given space and line diagram. a. 3D view with all necessary components b. Furniture and fixtures c. Material application and presentation				**CO 1,2,3 / CO 1,2,4**	25 15 10
Scheme of assessment a) 3D Modeling 25 b) Drawing furniture and fixtures 15 c) Material Application and presentation 10					
				Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl.No.	Suggestive Activities
01	Graded Exercises/Sheets with 3D views of given practice sessions
02	Study materials used for interior and exterior, their appearance, color, texture.
03	Collect data on standard sizes of furniture and building components.
04	create the model and scenes to develop animation/walkthrough of the School building model

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	**20**	**30**	**40**	**50**	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
	Average Marks=(30+40+30+30)/4=32.5						**32.5**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. SEE- Model Practice Question Paper

Program	**Civil Engineering**		**Semester**	**V**
Course Name	**3D Virtual Presentation Techniques**	**Course Code 25CE53IC**	**Duration**	**180 min**
Questions			**CO**	**Marks**
Develop 3D Model, Exterior View of a residential building for a given line sketch a. 3D view with all necessary components b. Fixtures and components c. Material application and presentation			**CO 1,2,3 & 4**	25 15 10
Scheme of assessment a) 3D Modeling 25 b) Drawing furniture and fixtures 15 c) Material Application and presentation 10				
Total Marks				**50**

1. Signature of the Examiner **2. Signature of the Examiner**

11. Equipment/Software list with Specification for a batch of 30 Students

Sl.No.	**Particulars**	**Specification**	**Quantity**
01	Computers	Core i5/8GB RAM/512SSD/4GB Graphics / 21.5" LED Monitor/KBD/Mouse	30
02	Software	SketchUp/Reviet/3D studio/Blender/Free CAD	30 user
03	Printer/Plotter	A2/A3 size Plotter	1
04	Projector	LED Projector	1
05	UPS	5KVA with 3 hr backup	1

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	CIVIL ENGINEERING	Semester	V
Course Name	CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP	Type of Course	Integrated
Course Code	25CE54I	Contact Hours	104 Hrs./Sem. 8 Hrs/Week
Teaching Scheme	L:P : : 4:4	Credits	06
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

Construction management is a critical discipline that involves overseeing the planning, design, and construction of a project from start to finish, ensuring that it is completed on time, within budget, and to the desired quality standards. It encompasses a wide range of responsibilities, from managing resources and finances to ensuring safety and compliance.

Entrepreneurship provides individuals with the knowledge, and mindset needed to identify opportunities, take risks, and create meaningful impact through business ventures. It fosters innovation, personal growth, and critical business skills, while also contributing to economic development and job creation.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Understanding of the project life cycle, including initiation, planning, execution, monitoring, and closure.
CO-02	Use project tools such as Gantt charts, CPM, and PERT to manage project timelines and budgets , Quality assurance control measures to ensure project deliverables meet the required standards and expectations.
CO-03	Concepts of safety management, including the identification, assessment, and control of hazards in the workplace , Interpret and apply contractual terms, payment schedules, retention clauses, and penalties, in the preparation of bills to ensure compliance with contract requirements.
CO-04	Understand what drives entrepreneurs to succeed, both internally - passion, values and externally - profit, success and Recognize opportunities , develop the ability to validate a business idea to assess its market potential and feasibility.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,4, 6,7	**Introduction to Project management** 1. Definition, types of construction projects, objectives of construction management, unique features of construction projects, functions of project management. 2. & 3. Construction project team – Client, owner, Builder, Consultants – Project management consultancy (PMC), architectural, Structural,	1. Provide students with case studies of successful and failed projects. Ask them to analyze what worked, what didn't, and suggest improvements.

			Services, Contractor – Sub-contractor, labour contractor, Material supplier. **4.** Organization chart for private & Government bodies.	
2	**1**	**1,6, 7**	**Introduction to project resources** **1.** Resources for executing construction projects - Men, Machine, Materials, Money & Time. **2.** Construction workers - types, Machinery used in construction projects **3.** Requirements, Roles and responsibilities - Site engineer, Quality control/Quality assurance engineer, Billing engineer, Planning engineer, Project manager. **4.** Budget allocation for project , time management.	**2.** Visit any construction company prepare report on organization chart, roles & responsibilities of all employees.
3	**2**	**1,6, 7**	**Key phases of construction project** **1.** Work breakdown structure (WBS) – definition, benefits, Stages in construction project – Initiation to close out. **2.** Types of contract, Tendering process - invitation for tenders, instructions to tenderers, conditions of contract. **3.** EMD, security deposit, Award of Contract, as built drawings. **4.** e-Governance initiative Karnataka Public Procurement Portal – Advantages, overview.	**3.** Prepare job layout for any construction residential project using Auto Cad/Revit/Sketch up. **4.** Create work breakdown structure (WBS)/ activities involved in completion of construction project from project initiation to closeout, assign duration , mention predecessors.
4	**2**	**1,2, 6,7**	**Project Planning & Scheduling** **1.** Forms of projects, projects classified on patterns of Ownership and financing. **2.** Construction project planning – Objective, Stages. **3.** Construction project scheduling – Necessity, types of scheduling. **4.** Methods for scheduling - Bar chart, Gant chart, milestone chart network analysis.	**5.** Create work breakdown structure (WBS) / activities involved in construction of 2BHK residential building, assign duration, mention predecessors.
5	**2**	**1,2, 6,7**	**Project Planning & Scheduling** Network analysis – Activities in construction project , interrelationship , Development of a network using Critical Path method (CPM) with simple numerical problems , Program Evaluation and Review Technique (PERT)	**6.** Schedule & plan construction of 2BHK residential building in MS project/primavera software.

6	**2**	**1,4, 6,7**	**Quality Management Plan** 1. Construction method statements for civil works, Request for Inspection (RFI) - benefits. 2. Material quality plan – standards and procedures to ensure the quality of materials used in construction 3. Inspection – civil works - pre-delivery inspection of materials, On-Site inspection of construction activities, Non-Conformance Handling. **4**. Quality control requirements as per IS – materials used in construction such as cement, steel, aggregates, building blocks ,tiles .	**7.** Schedule & plan construction of (G+1) school building in MS project/primavera software.
7	**2**	**1,4, 6,7**	**Quality Management Plan** **1 & 2.** Quality Checklists for construction activities – Block/brick masonry, plastering, Column, footing, slab concreting. **3 & 4.** Quality audit report – Benefits , Quality audit report of a project (during construction) – faults & remedies.	**8.** Plan & Allocate resources for construction of commercial building project in MS project / primavera software.
8	**3**	**1,2, 5,6, 7**	**Safety management** **1.** Hazard's condition at construction site, safe method, Accident- Causes, precaution & prevention in each construction activity. **2.** Safety checklists for key construction activities – scaffolding, slab concreting, deep excavation, external plastering. **3.** PPE in construction industry, safety drills, safety trainings. **4.** Safety audit report - benefits, necessity, safety audit report of a project (during construction)- faults & remedies	**9.** Prepare a safety audit report of Hazard's condition in site for a construction project.
9	**3**	**1,6, 7**	**Bills & Payments** **1.** Labour report, Measurement Book, Pre measurements, overview on The Indian Standard (IS: 1200) code. **2.** Mobilization advance, Progress (RA) bills, Retention clauses, penalties, termination of contract. **3.** Project clearance procedure: Term Snagging, stages of snagging. Tools used for snagging **4.** Drawing register - types of drawings in construction projects, Hindrance register – benefits, Project risks – definition, types, risk register - benefits	**10.** Prepare construction method statement for activity a. Casting RCC concrete for raft footing to commercial building. b. Waterproofing for terrace slab. **11.** Prepare construction method statement for activity a. Internal wall plastering in 3rd floor of school building. b. Glazing façade work for commercial building. Note : Any construction activities may be selected.
10	**4**	**1,2, 3,5, 6,7**	**Entrepreneurship** **1.** & 2. Terminologies - entrepreneurship, entrepreneur, Business Plan, Innovation & creativity, employees, start up, customers,	**13.** Think of an innovative product/service and conduct a survey in your locality and analyze

			dealers, suppliers, investors, equity, Incubator, Intellectual Property. 3. Evolution of entrepreneurship in India, characteristics of successful entrepreneurs. 4. . Need for entrepreneurship, managerial, entrepreneurial qualities & technical skills.	whether it will be accepted in your neighborhood.
11	**4**	**1,2, 3,6 ,7**	**Entrepreneur** **1.** Types of entrepreneurs, types of Business- based on nature, size, type. **2.** Entrepreneurial Values, Attitudes and Motivation, essential attitudes of an Entrepreneur. **3.** Motivation Theories - McClelland's Theory of Needs, Maslow's Hierarchy of Needs Theory. **4.** Functions of entrepreneur, SWOT Analysis framework.	**14.** Prepare a detailed SWOT (strengths, weaknesses, opportunities and threats) analysis of your enterprise like construct houses/render professional services/produce concrete products etc., and device a strategy that gives you an edge over your competitors.
12	**4**	**1,6 ,7**	**Forms of Entrepreneurship** **1. & 2.** Small business entrepreneurship – importance in Indian economy, Advantages, limitations. **3 & 4.** Types of ownership – forms of enterprises/ownership in private sector, public sector & joint sector.	**15.** Prepare a report on legal formalities expected to be complied by the entrepreneur for starting any venture/firm/enterprises
13	**4**	**1,2, 3,6 ,7**	**Business Plan** **1.** Business Ideas - structured approaches/ ways to Generate Ideas **2.** Feasibility Study – features, types, Preparation of a Business Plan – purpose, elements. **3.** Exploring opportunities in the environment - environment scanning, Business environment levels, **4.** Government grants & schemes.	**16.** Prepare a business plan for becoming an entrepreneur in construction industry – Service-Based Business Model (Construction Services) / Product-Based Business Model (Construction Products)

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5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					**50 Marks**

6. SEE – Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test 1 model question paper

Program	**Civil Engineering**			**Semester - V**	
Course Name	**Construction management & Entrepreneurship.**			**Test**	**I**
Course Code	**25CE54I**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section – 1			
1	a) Explain different types of construction projects b) Explain the key elements of budget allocation for a construction project: c)Write the functions of project management	R/U	1	10 marks 10 marks 5marks
2	a) List different types of consultants in construction industry and write their scope of work. b) List the important machinery used in construction projects with their uses. c) Write the organization chart for medium construction firm.	R/U	1	10 marks 10 marks 5marks

SECTION - 2				
3	a) Briefly explain projects classified on patterns of Ownership and financing. b) What are the benefits of KPPP portal in tendering. c) What is Construction planning? What are its Objectives?	R/U	2	10 marks 10 marks 5marks
4	a) Explain steps involved in tendering process and awarding of contract. b) What are the features of network planning. List the key components of Gantt chart. c) Write the necessity of preparing material schedule.	R/U	2	10 marks 10 marks 5marks
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Theory Test 2 model question paper

Program	**Civil Engineering**			**Semester - V**	
Course Name	**Construction Management & Entrepreneurship.**			**Test**	**III**
Course Code	**25CE54I**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q.No	**Questions**		**CL**	**CO**	**Marks**
Section – 1					
1	a) Draw a network diagram for the following logic B follows A, C follows A, D and E follows B, F follows C and D, G follows E and F Determine the critical path for the network diagram if the duration of activities A, B, C, D, E, F and G are 2,6,3,1,6,3 and 6 days respectively b) List the different tests and results as per IS code for cement. c) List any five hazardous conditions and precautions to be taken in construction site		U/Ap R/U R/U	2 2 3	10 marks 10marks 5marks
2	a) List any five construction activities in construction of single storeyed building, assign duration, predecessors. b) Prepare quality checklist for i) Internal wall Plastering ii) Block masonry wall construction c) List any five PPE with their use.		U/Ap	2 2 3	10 marks 10 marks 5marks
SECTION - 2					
3	a) Prepare safety check list for (i) scaffolding (ii) Slab shuttering b) List the necessities of providing mobilization advance c) What is the need for entrepreneurship? List any five characteristics of successful entrepreneurs		R/U	3.4	10marks 5marks 10marks

4	a) List the benefits of risk register and any five types of risks in project. b) Write any five managerial functions of an entrepreneur c) Explain any two types of snagging in construction projects. List the necessity of taking pre measurements.	R/U	3,4	10 marks 5 marks 10 marks
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator Signature of the HOD Signature of the IQAC Chairman

7. CIE Practice Test 1 model question paper

Program	**Civil Engineering**			**Semester**	**V**
Course Name	**Construction management & Entrepreneurship.**			**Test**	**II**
Course Code	**25CE54I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
1. Prepare job layout for any construction residential project using Auto Cad/Revit/Sketch up.				1	20
2. Schedule & plan construction of 2BHK residential building in MS project/primavera software. Or 3. Schedule & plan construction of G + 1 school building in MS project/primavera software.				2	30
Scheme of assessment **1.** • Different elements of job layout=5marks • Arrangement of elements = 5marks • Drafting skills = 5marks • Print = 5marks		**2. Or 3** • Listing out activities = 5marks • Assigning duration = 5marks • Creating network, find time of completion, critical path = 15marks • Print /presentation = 5marks			
Total Marks					**50**

7. CIE Practice Test 2 model question paper

Program	**Civil Engineering**			**Semester**	**V**
Course Name	**Construction management & Entrepreneurship.**			**Test**	**IV**
Course Code	**25CE54I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					
Questions				**CO**	**Marks**
1. Prepare construction method statement for any two activities. OR 2. Prepare a safety audit report of Hazard's condition at construction site in word document with images for a construction project.				3	20
2. Prepare a detailed SWOT (strengths, weaknesses, opportunities and threats) analysis of your enterprise and device a strategy that gives you an edge over your competitors. OR 4. Prepare a business plan for becoming an entrepreneur in construction industry .				4	30
Scheme of assessment	**3**	**4.**			

1. & 2. **a.** Procedure- 10 marks b. Report – 10marks	**a.** Prepare a report on Strengths, Weakness, Opportunities, threats = 4 x 6 = 24 marks b. Presentation skills = 6marks	a. Business Venture, Organized plan, Operational plan = 8 x 3 = 24 b. Presentation skills = 6marks	
			50

Signature of the Course Coordinator **Signature of the HOD**

8. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic (Atleast one activity for each Course Outcome)

Sl.No.	Suggestive Activities
01	Visit an ongoing construction site ,list out the activities ,plan and schedule using project management software.
02	Present a detailed report on stages – applying tender till getting work order in KPPP.
03	Visit an ongoing construction site , prepare quality audit report and safety audit report for a construction project - report poor quality procedures , recommend rectifications/correct measures, instruct correct procedures.
04	A young entrepreneur who wanted to start a new business with an initial investment of 25 lakhs. He was not sure of what business he has to undertake. His friend suggested seeking the help of professionals who would spot the latest trends in the market and give him an idea, but he decided to do it by himself. Suggest the various ways by which he can do it.

9. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
	Average Marks=(20+30+40+50)/4=35						**35**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. . Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
1	MS project/PRIMAVERA	Ver.2010 & above/PRIMAVERA P7 & above	1 license/institute
2	AUTOCAD	Ver.2016 and above	1 license/institute
3	Sketch up/3D MAX	Ver.2018 & above	1 license/institute
4	Computer/Laptop	Intel Core Ultra 7 258V processor or 16GB DDR5 RAM , 1TB SSD , MD's Ryzen 7000 processors	30 per batch
5	Printer	LaserJet printer	1 no /batch

VI SEM

Government of Karnataka

DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

VI Semester Scheme of Studies - Civil Engineering

Sl. No.	Department	Course Code	Course Name	Hours per week	No. of Weeks	Credits	CIE Marks		Practice SEE Marks		Total Marks
							Max	Min	Max	Min	
1	CE	25CE61I	Internship/Capstone Project	40	13	13	50	20	50	20	100
			Total	**40**	**13**	**13**	**50**	**20**	**50**	**20**	**100**

Government of Karnataka
Department of Technical Education

C-25 Diploma Curriculum

INTERNSHIP

AND

CAPSTONE PROJECT

GUIDELINES

FOR

FACULTY, STUDENTS AND EXAMINERS

INTERNSHIP

Introduction

The students of Polytechnic Programs will have an opportunity to be part of one of the most challenging educational experiences in the year-3, The students will be trained in the specialization pathways of their interest in fifth semester, followed by 13-week internship or a Capstone Project work in sixth semester.

An internship is a professional learning experience which offers meaningful, practical work relevant to a student's field of study or career interest. It gives the students an opportunity for exploring the various career choices and acquire varied skills. It also offers an opportunity to bring out the innovative, creative ideas and energy into the workplace. This effectively aims at developing talent and potentially builds a pipeline for future Job prospects that may be ready for challenging roles in future. Internship has become very crucial for students to gain on-field experience which acts as an advantage for the students who do not have corporate experience.

Internships allow students to examine new situations, work techniques, problem-solving tactics, interpersonal skills, understanding of timelines and targets which would otherwise not be possible unless they were on board. Companies which plan to offer job placements to students also prefer hiring the interns for a short period as a trial wherein they have an opportunity to assess their ability and select them based on their observations over a considerable amount of time. This alternative gives the recruiter a better understanding of the candidate's worth in comparison to the assessment made in couple of interview sessions. Even for the interns it is a win-win situation as they get an opportunity to learn the corporate work culture in advance and later demonstrate their skills at their workplace

Outcomes

After completing Internship, Interns will be able to,

- Apply the theoretical knowledge and skill during performance of the tasks assigned in internship
- Demonstrate soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship
- Document the Use case on the assigned Task

Facilitating the Interns by an Internship Provider

- Orient intern in the new workplace. Give interns an overview of the organization, Explain the intern's duties and introduce him or her to co-workers
- Develop an internship job description with clear deliverables and timeline
- Allow the interns in meetings and provide information, resources, and opportunities for professional development
- The interns have never done this kind of work before, they want to know that their work is measuring up to organizational expectations, hence provide professional guidance and mentoring to the intern

- Daily progress report of Intern is to be evaluated by industry supervisor. examine what the intern has produced and make suggestions. Weekly supervision meetings can help to monitor the intern's work.

Duties & Responsibilities of the Faculty (Cohort Owner):

- To facilitate the placement of students for the internship
- To liaison between the college and the internship provider
- To assist the Industrial Training Supervisor during assessment

Instructions to the Interns(Students):

- Students shall report to the internship provider on the 1st day as per the internship schedule
- Intern is expected to learn about the organization, its structure, product range, market performance, working philosophy etc
- The interns shall work on live (On Job) projects assigned by the internship provider.
- The Intern shall record all the activities in the daily log book and get the signature of the concerned training supervisor
- Intern shall have 100% attendance during internship programme. In case of un-avoidable circumstances students may avail leave with prior permission from the concerned training supervisor of the respective internship provider. However, the maximum leave permitted during internship shall be as per company norms where they are working and intern shall report the leave sanctioned details to their college cohort owner
- The interns shall abide all the Rules and Regulations of internship provider
- Intern shall follow all the safety Regulations of internship provider.
- On completion of the internship, intern shall report to the college and submit the internship certificate mentioning duration of internship, evaluation of interns by internship provider, Student's Diary, report to the cohort owner.

Assessment

The Internship will be assessed for 100 marks through formative and summative assessment tools, in formative assessment the internship will be evaluated for 50 marks and in summative assessment internship will be evaluated for 50 marks

The Formative Assessment- (Continuous Internal Evaluation- CIE)

The Formative Assessment is conducted for 50 marks throughout the course in three developmental phases as CIE-I, CIE II and CIE-III. Students shall complete CIE-I before taking CIE-II and complete CIE-II before taking CIE-III, otherwise will not be eligible to take Semester End Examination.

Continuous Internal Evaluation- CIE - I conducted at the end of 4th week		
Sl No	**Assessment parameter**	**Marks**
1	Submit a report to the training supervisor and copy to the cohort owner focusing on: • Overview of the organization • Vision and mission of the organization • Organization structure • Roles and Responsibilities of personnel in the organization • Products and market performance	30
2	Give a presentation on the above	20
	Total	**50**

Note: CIE-1 shall be assessed by the Faculty (Cohort owner) for 50 marks using appropriate Rubrics.

Continuous Internal Evaluation- CIE - II conducted at the end of 8th week		
Sl No	**Assessment of On Job Training (OJT)**	**Marks**
1	On select job role of his/her interest in an organization or role assigned by the training supervisor for next Four weeks and submit a report to the training supervisor and copy to cohort owner focusing on: 1. Intern's ability to apply the skill and technical knowledge on OJT 2. Intern's performance on assigned tasks and project 3. Extent of Intern's ability to add value to the organization through internship	30
2	Document a Use case on a task where he is working as intern	20
	Total	**50**

Note:

1. CIE-II shall be assessed by the Industrial Training Supervisor using companies' assessment Tools/Rubrics.

2. Faculty (Cohort owner) shall assist the Industrial Training Supervisor during assessment of CIE-II.

Continuous Internal Evaluation- CIE -III conducted at the end of 13th week		
Sl No	**Assessment of On Job Training (OJT)**	**Marks**
1	On select job role of his/her interest in an organization or role assigned by the training supervisor for next Five weeks and submit a report to the training supervisor and copy to cohort owner focusing on: 1. Intern's ability to apply the skill and technical knowledge on OJT 2. Intern's performance on assigned tasks and project 3. Extent of Intern's ability to add value to the organization through internship	30
2	Documenting of another Use case on a task where he is working as intern	20
	Total	**50**

Note:

1. CIE-III shall be assessed by the Industrial Training Supervisor using companies' assessment Tools/Rubrics
2. Faculty (Cohort owner) shall assist the Industrial Training Supervisor during assessment of CIE-III
3. **Average Marks obtained in the above Three CIE's (CIE-I,CIE-II & CIE-III) shall be recorded as Formative assessment for 50 Marks.**

The Summative assessment- Semester End Examination (SEE)

During the semester end examination, students shall demonstrate the outcomes of their Internship to the Panel of Examiners comprises of a Cohort owner and an external Subject expert The evaluation criteria are as follows

Sl No	SEE Evaluation Criteria	Marks
1	**Presentation shall include**: 1. Overview of the organization, vision, mission, structure, roles and responsibilities of personnel's, products, market Performance etc. - (10marks) 2. The role performed in the organization during OJT and Intern's ability to apply the skill and technical knowledge – (20 marks)	30
2	Evaluation of comprehensive Internship Report with special focus on organization profile, OJT and contribution made to the organization	20
	Total	**50**

Note: Cohort owner and External subject expert shall assess the intern separately using an appropriate rubrics and average marks to be tabulated

FORMATS

Department of Technical Education

FORMAT - 1

Student Internship Application

(Complete and submit to the Training and Placement Officer)

Student Name			
Student e-mail Id			
Mobile			
Name of the Institute			
Name of the Program			
Specify the Specialization Pathway			
Overall CGPA			
Internship Preferences	Location	Core area	Organization
Preferance-1			
Preferance-2			
Preferance-3			
Cohort owner Signature: Date			
Student Signature: Date			

Department of Technical Education

FORMAT - 2

Request Letter from Institute to Internship Provider

(To be forwarded by the Training and Placement Officer/Student)

Date:

To,

.....

.....

Subject: Request for 13 weeks Semester long internship training of Diploma in ---------- engineering Program

Dear Sir/ Madam,

This is to certify your good office to allow Mr/ Ms---------- student of our polytechnic perusing sixth semester diploma in ---------- engineering and trained in ---------- specialization pathway in boot camp mode to render on-the-job internship training in your prestigious company

As per the requirement of Diploma in ---------- engineering program, he/she is required to complete 520 hours of internship related to his/her specialization

Your support in this regard is highly appreciated

With warm regards,

Signature of Training and Placement Officer

Department of Technical Education

FORMAT - 3

Agreement

This Agreement is between the student, cohort owner and internship provider. It shall serve to clarify the educational purpose of the internship and to ensure an understanding of the total learning experience among the student, cohort owner and Industrial training supervisor

Part I: Contact Information

Student

Name: _____ Student ID_____Class Year: _____

College Address: _____City, State: _____

Phone: _____ Email: _____

Industrial Supervisor

Name: _____ Designation: _____

Company/Organization: _____

Address: _____City, State ----------Pin: _____

Phone: _____ Email: _____

Cohort owner

Name: _____ Designation: _____

Phone: _____ Email: _____

College Address: _____

Academic Credit Information

Program: _____

Pathway: ---------- Credits: 16

Beginning Date: _____ Ending Date: _____

Hours per Week: 40

Part II: The Internship

Internship Objectives:
Describe What do the interns intend to learn, acquire skill through this internship? Try to use concrete, measurable terms in listing the learning objectives under each of the following categories:

- Knowledge
- Skills

Job Description:
Describe in as much detail as possible intern's role and responsibilities while on internship. List duties, project to be completed, deadlines, etc. Describe How interns' technical knowledge can be applied at the site of the internship and how they can create value to the organization through internship

Supervision: Describe in as much detail as possible the supervision to be provided/needed at the work site. List what kind of instruction, assistance, consultation interns will receive from whom, etc

Evaluation: Describe How will interns work performance be evaluated? By whom? When?

Part III: Agreement

This Agreement may be terminated or amended by student, cohort owner or industry training supervisor at any time upon 7days written notice, which is received and agreed to by the other parties.

Student _____ Date _____

Cohort owner _____ Date _____

Industry Training Supervisor _____ Date _____

Department of Technical Education

FORMAT 4

Student's Daily Log Book

Day-1	Date:
Time of Arrival	Time of Departure
Dept/Division	Nature of work
Name of the Supervisor With designation and email ID	
Remarks of the Training supervisor:	
Record Main actives of the day (including observation, sketches, discussions, etc) **Signature of Industry Supervisor**	

Note: Prepare a A4 size hard bound Intern work book using this format with college and student details

Department of Technical Education

FORMAT 4

Internship Report template

The student, after the completion of internship should submit a comprehensive Internship report, the contents of the report shall be arranged in the following order:

1. Cover Page
2. Inside Title Page
3. Internship Certificate issued by the organization
4. Acknowledgements
5. Executive Summary
6. Table of Contents
7. List of Figures
8. List of Tables
9. Abbreviations/ Notations/ Nomenclature
10. Text of the Report
    - **Chapter 1:** Company Profile
    - **Chapter 2**: Describe in as much detail as possible intern's role and responsibilities while on OJT. List duties, project completed, etc. Describe How interns' technical knowledge can be applied at the site of the internship and how they can create value to the organization through internship
11. Student Profile/Resume
12. Photo Gallery
13. Appendices

General Guidelines

Report Size - Report may contain maximum of about 50 pages including Proto gallery and appendices.

Paper Size - Use A4 size paper

Paper Quality - White bond paper weighing 85 g/m2 or more should be used. Photographs or images with dense colors may be printed in single side on glossy paper.

Margins - A margin of 40 mm is to be provided on left and 30 mm on right sides, whereas top and bottom margins should be 30 mm. No print matter should appear in the margin except the page numbers. All page numbers should be centered inside the bottom margin, 20mm from the bottom edge of the paper.

Font - Times New Roman (TNR) 12-point font has to be used throughout the running text. The captions for tables and figures should have font size of 11 and foot notes should be set at font size 10. Font sizes for various levels of headings are given in the table below

CHAPTER 3

TITLE PAGE-CENTERED TNR 17-POINT BOLD ALL CAPS

3.1. Section Heading
Left aligned with number, TNR 17 points, bold and leading caps

3.1.1. Second level section heading
Left aligned with number, TNR 14 points, bold and sentence case**.**

3.1.1.1 Third level section heading
Left aligned with number, TNR 12 points, bold and sentence case.

Fourth-level section heading
Numbered subsections beyond third level are not recommended. However, fourth-level subsection headings may be included without numbering, TNR 12-point font, left aligned and italicized
Running text should be set in 12-point TNR and fully justified. First line of paragraph should have indentation of 15 mm**.**

Line Spacing - The line spacing in the main text should be 1.5, for quotations, figure captions, table captions, figure legends, footnotes, equations, tables, figures, and quotations Single line spacing should be given.

Table / Figure/equation Format-

Tables and figures shall be numbered chapter-wise. For example, second figure in Chapter 3 will be numbered Figure 3.2. The figure can be cited in the text as Figure 3.2, Tables shall be numbered similarly (Table 2 in Chapter 3 will be numbered Table 3.2) and shall be cited in the text as Table 3.2. Figure caption shall be located below the figure. Table number and caption shall be located above the table.

Appendices

Include data tables, drawings, background calculations, specification lists for equipment used, details of experimental configuration, and other information needed for completeness,

Page Numbering

Page numbers for the prefacing materials (Inside title page, certificate, acknowledgements, executive summary, table of contents, etc.) of the report shall be in small Roman numerals and should be centered at the bottom of the pages.

The numbering of the prefacing material starts from the Inside Title Page. However, the number is not printed on the Inside Title Page. Each new item of the prefacing materials listed above should start on a fresh paper on right page. If the content of the prefacing material exceeds one page, it has to be printed on both sides of the paper by starting from the right-side page. For example, if the item „Table of Contents" extends for 5 pages, it should be printed in fresh paper on right side page with second page of the „Table of Contents" on the back of the paper and then continued. The page numbers of the prefacing material will be printed in small Roman numerals continuously counting blank pages also. However, the numbers are not printed on the blank pages

The body of the report starting from Chapter 1 should be paginated in Arabic numerals and should be centered at the bottom of the pages. The pagination should start with the first page of Chapter 1 and should continue throughout rest of the report. Each side of a sheet of paper should be counted as a separate page, even if the back side of a sheet of paper is blank. The odd numbered pages are always on the right and even-numbered pages are always on the left. If the end of a chapter is in odd page (right side page) the next chapter should start on odd page i.e., on a fresh paper, and should be numbered as odd only by counting the blank even page also. However, the page number is not printed on the blank pages.

Each of the items - Inside cover page, Certificate, Acknowledgements, executive summary, Table of Contents, List of Figures, List of Tables, Abbreviations, Notations, Nomenclature, each new Chapter, References, and each new Appendix should start on an odd page i.e., on the right side

Non-Paper Material

A report may contain non-paper material, such as specimen, CDs and DVDs, Pen drive if necessary. They have to be accommodated in a closed pocket in the back cover page of the report. The inclusion of non-paper materials must be indicated in the Table of Contents. All non-paper materials must have a label each clearly indicating the name of the candidate, student Register number and the date of submission**.**

Binding

Two hard bounded copies of the project Report shall be submitted for evaluation; the cover page should be printed on sky blue card of 300 g/m2 or above**.** One copy is used for Semester End Examination and after the exam it should be maintained in the concerned Head of the department and another copy is maintained at cohort owner

Electronic Copy

An electronic version (PDF) of the project report should be submitted to the cohort owner and Head of the department. The file name should contain, student name, Register number and date of submission.

CAPSTONE PROJECT

GUIDELINES

FOR

FACULTY (COHORT OWNER), STUDENTS AND EXAMINERS

CAPSTONE PROJECT

How to design and deliver

The students of Polytechnic Programs will have an opportunity to be part of one of the most challenging educational experiences in the year-3. The students will be trained in the specialization pathways of their interest in fifth semester followed by an internship or a capstone project work in sixth semester. Those students who want to do a capstone project, requires to do developmental work on real-world problems which would motivate them to produce practical solutions. It is an opportunity for the students to use the problem-solving tools and techniques to solve the problems while doing the capstone project. With this approach, the learning process is gained through 'by-doing' experience and the students are expected to apply both the Capstone Project Management Skills and Technical Skills gained in previous years of polytechnic courses, which will enable them to participate and prepare for future employment.
Working under the guidance of a Cohort owner, students may shape the direction of what they want to be, as well as gain better understanding of the responsibilities they need to shoulder when they undertake a capstone project. Teamwork will be inculcated with the development of good and professional relationships with their cohort owner and team members. The undertaken capstone project can also be used as a basis for employment or Startup by fully exploiting the learning process they have gone through, the skills they have gathered and the experience they have gained from the capstone project.
The guidelines are prepared for Cohort owner, students and examiners enabling them to execute their respective roles and responsibilities in an effective manner.

Aims of Capstone

1. Promote integration and synthesis within the program of study.
2. Promote meaningful connections between the program of study and career experiences.
3. Improve learner's career preparation and pre professional developments.
4. Demonstrate professional identity as learner's transition from academic to professional World.

Job Alignment and Professional Scenario

While developing a capstone the goal should always to;

1. Use a real world professional scenario- built out with employer engagement where ever possible.
2. Align skills to be assessed to a job.
3. Explicitly and intentionally developed important learner's skills, competencies and perspectives that are tacitly developed in the curriculum and required in the workplace.
4. Give learner's the freedom to showcase their learning though a demonstrable artifact or output e.g. Technical Product, System, Service that resolves a real world problem.

Employer Engagement

Support in capstone development:

- Provide a problem statement
- Provide a case study background
- Review and feedback on case studies/scenarios developed

Support in class

- Mentor learner's during the capstone
- Support cohort owners during class-workshop seminars

Presentation of Capstone

- Sit on presentation panel for learners to give feedback.

Outcomes

On successful completion of the capstone project, students will be able to:

- Write Capstone project scope document
- Prepare a capstone project execution plan
- Manage the capstone project from start to finish meeting stated milestones and timelines
- Test and validate the findings
- Demonstrate interpersonal skills, teamwork, and effective use of appropriate technology required for the capstone project

Responsibilities of the Head of the Department

The Head of the Department shall coordinate in Executing the Capstone projects, their responsibilities can be summarized as follows:

- To ensure that the Capstone project scope document is relevant to the specialization pathway opted by the students in Fifth semester
- To assign Cohort owner to the students
- To maintain a centralized capstone project hub repository to facilitate capstone project management and keeping track of all capstone projects and design changes

Responsibilities of the Faculty (Cohort owner):

Students will be supervised by Cohort owner; their responsibilities can be summarized as follows:

- To guide the students in writing the Capstone project scope document
- To guide the students in preparing capstone project execution plan
- To interact with the students once in a week to review the progress of the capstone project work, these sessions shall reinforce/review the concepts, findings and focus on addressing issues relevant to weekly meetings.
- To guide the students in managing the capstone project from start to finish, meeting the stated milestones and timelines

- To guide the students in preparing the capstone project report
- Develop appropriate Rubrics and evaluate the capstone project work as per assessment criteria
- To oversee the capstone project work until the submission of the final report, and Semester End Examination
- Maintain all the documents related to the capstone project work

Responsibilities of the Students

Students are also required to exercise self-discipline, self-management, job co-ordination, teamwork, and trustworthiness to ensure the success of the capstone project.

The expected responsibilities are:

- To write the Capstone project scope document
- To prepare a capstone project execution plan
- To adhere to the weekly meeting schedule with the cohort owner for the purpose of updating their progress and seeking advice on capstone project matters (Attendance is compulsory as per regulation) and submit weekly report
- To Manage the capstone project from start to finish meeting stated milestones and timelines
- To report immediately to the cohort owner any difficulties encountered that would interrupt the work.
- To submit all reports on time

Group Member Roles and Contributions

The Capstone project groups often function more effectively when group members have designated roles. Each capstone project group shall consist of not more than **four students**. The Three core roles and responsibilities are:

- **Capstone project Lead**: One student in the group shall act as a capstone project lead, who is responsible for keeping the group on task, distributing the workload, meeting deadlines, and ensuring smooth group communication and coordination as well as accountability with the cohort owner and capstone project requirements
- **Documenter Lead**: One student in the group shall act as a documenter lead, who is responsible for recording group discussions and decisions, documenting various aspects of the capstone project's progress, and ensuring well-formed reports and capstone project documents are produced.
- **Development Lead**: Two students in the group shall act as a Development lead, who are responsible for overseeing the collaborative aspects of the capstone project, troubleshooting major technical problems.

The entire capstone project team should be engaged in discussions, documentation, and development of the capstone project. All members are expected to contribute towards the capstone project.
Groups will a have to rotate the roles among members for different stages of the capstone project. This will allow members to gain experience through being responsible in different areas of capstone project management.

Assessment of the capstone project work

This section is addressed to the Faculty (Cohort owner) and examiners. It provides information on assessment criteria for the capstone project work. It also provides guidance to students about what examiners will be looking for in evaluating the capstone projects. The Capstone project work will be assessed for 100 marks through formative and summative assessment tools, in formative assessment the capstone project will be evaluated for 50 marks and in summative assessment capstone project will be evaluated for 50 marks

The Formative Assessment- (Continuous Internal Evaluation- CIE)

The Formative Assessment is conducted for 50 marks throughout the course in three developmental phases as CIE-I, CIE II and CIE-III. Students shall complete CIE-I before taking CIE-II and complete CIE-II before taking CIE-III, otherwise they will not be eligible to take Semester End Examination

Continuous Internal Evaluation- CIE - I conducted at the end of 4th week		
Sl No	**Assessment of parameter**	**Marks**
1	Writing the Capstone project scope document	10
2	**Capstone project Planning**: • Work Breakdown Structure (WBS) - 05 marks • Time-line Schedule - 10 marks • Cost Breakdown Structure (CBS) - 10 marks • Risk Analysis - 10 marks	35
3	Identification of Methodology (Including Literature survey)	05
	Total	**50**

Continuous Internal Evaluation- CIE - II conducted at the end of 8th week		
Sl No	**Assessment of parameter**	**Marks**
1	**Capstone project Details:** • Description of Technology Used • Details of Hardware devices • Details of software products • Programming languages • Descriptions of the components in the system • Component diagrams and required design if any • Construction or Fabrication details • Any other information needed to execute the capstone project	50
	Total	**50**

Continuous Internal Evaluation- CIE - III conducted at the end of 13th week		
Sl No	**Assessment of Parameter**	**Marks**
1	**Testing and validation**: Details of laboratory experiments/programming/modelling/simulations/ analysis/fabrication/construction etc.,	30
2	Results and inference	20
	Total	**50**

Note: Average Marks obtained in the above Three CIE's (CIE-I,CIE-II & CIE-III) shall be recorded as Formative assessment for 50 Marks.

The Summative assessment- Semester End Examination (SEE)

During the Summative assessment, students shall demonstrate the outcomes of their Capstone project work to the Panel of Examiners comprising a cohort owner and an external Subject expert

The evaluation criteria are as follows:

Sl No	Parameters	Marks
1	Power point presentation on outcomes of the Capstone project work	20
2	Demonstration the Capstone project work	20
3	Capstone project Report -Format and Technical writing skill	10
	Total	**50**

Plagiarism

Plagiarism is the act of obtaining or attempting to obtain credit for academic work by representing the work of another as one's own without the necessary and appropriate acknowledgment. If a student is in doubt of the nature of plagiarism, he/she should discuss the matter with the supervisor. If a student is caught committing plagiarism, disciplinary action will be taken against the student

Keeping in view the policy of plagiarism, and avoid piracy of intellectual property, the student needs to follow the citation policy:

- When 10 words are taken together from some established core work, citation becomes essential.
- When the copied content reaches 40 words in accumulation, the fragment needs to be kept under inverted comma (“_”) in italic.
- It is necessarily required to cite reference in case of any content adopted from anywhere other than internet open sites. It is also that, even in case of open site internet source or any other source the copied contents if found more than 35 percent in aggregate during plagiarism detection, the work shall not be considered for further process and asked to resubmit the report again for the evaluation

Copyright

The Polytechnic institutions shall be the owner for all findings, designs, patents, and other intellectual property rights.

FORMATS

Department of Technical Education

Capstone project

Format- 1

Capstone project Scope Document

Capstone project Scope Document

The capstone project scope clearly describes what the capstone project will deliver and outlines all the work required for completing the capstone project.

Capstone project Title:

Group Members:

Problem Statement: Objectives:

Capstone project description:

Capstone project Deliverables:

Key milestones:

Constraints:

Estimated Capstone project Duration: Estimated

Capstone project cost:

Date

Signature of the student Signature

of the cohort owner

Department of Technical Education

Capstone project

Format- 2

Work Breakdown Structure

Capstone project Name: <State the Title of the capstone project >

Capstone project Members: <List of group members>

Capstone project Objective(s): < statements describing the capstone project's objective(s)>

Work Breakdown Structure - Deliverables

1. Identify the deliverables (in the scope statement) to be produced in the capstone project.
   This highlights the work to be done.
2. Decompose each large deliverable into a hierarchy of smaller deliverables. This involves taking a deliverable and breaking it down into lower and lower levels of detail.
3. The lowest level of detail is called a 'work package' which consists of activities and tasks.

Date

Signature of the student Signature

of the cohort owner

Department of Technical Education

Capstone project

Format- 3
Time - line Schedule

Capstone project Name: <State the Title of the capstone project >

Capstone project Members: <List of group members>

1. Identify the activities and tasks needed to produce each work package.
2. Identify resources for each task (e.g., time, knowledge, monetary costs etc.)
3. Estimate how long it will take to complete each task. Consider constraints - resources, time, knowledge
4. Determine which tasks are dependent on other tasks and develop a critical path.
5. Develop a schedule of all activities and tasks - weekly and monthly. Work out when eachtask is scheduled to begin and end. Use a Gantt chart.

Date

Signature of the student

Signature of the cohort owner

Department of Technical Education

Capstone project

Format- 4
Cost Breakdown Structure

Capstone project Name: <State the Title of the capstone project >

Capstone project Members: <List of group members>

A cost breakdown structure (CBS) breaks down cost data into different categories, and helps you manage costs efficiently. It is a crucial part of the capstone project planning and management process, as it allows you to gain better insight into how much you spend and what you spend your capstone project budget on. When you have a solid structure in place, you can have better control of your capstone project costs to avoid going over budget.

1. **Analyze your Work Breakdown Structure**
   - Before you can identify your costs, you must first determine what your capstone project entails.
   - You can do this by looking at your work breakdown structure in detail, and work out the components that will contribute to the capstone project costs.
2. **Estimate the labor cost of work**
   - The next step is to estimate the labor cost of work for each task or activity you have identified in your WBS.
   - The time it takes for your team members to finish each work package in the WBS contribute to your labor costs.
   - Once you have estimated the labor costs of work for all the tasks, you can use them to work out the final cost of labor for your capstone project.
3. **Estimate the cost of materials**

The next step is to look at the cost of the materials needed to complete each task you identified in your WBS. These costs include

- Raw material costs
- Equipment and parts purchased for this capstone project
- Anything rented for the purpose of the capstone project

4. **Overhead costs.**
   - Ensure your CBS also includes an appropriate allocation to overhead costs.
   - Overhead include various costs that aren't related to specific tasks, but are necessary for the capstone project to take place.
5. **Build contingency into your CBS**
   - No matter how accurate your estimates are, you should still allow for some contingency in your cost breakdown structure in the CBS

6. Final-check

- The last step in creating a cost breakdown structure is to check your estimates against your available budget.
- If it your estimate is within the available budget, then you can be confident that the financial aspect of your capstone project will be smooth sailing
- If your CBS comes in higher than the available budget, you can look at ways to control costs.

Date

Signature of the student

Signature of the cohort owner

Department of Technical Education

Capstone project

Format- 5
Capstone project Execution Document

Capstone project Name: <State the Title of the capstone project >

Capstone project Members: <List of group members>

- Main Deliverables -

1) **Design:** descriptions of the components in the system, Component diagrams, and required design if any.
2) **Description of Technology Used:** provide details of Hardware devices, software products, programming languages etc.
3) **Fabrication**: fabrication or construction details
4) **Testing and validation**: provide the details of Methodologies/ laboratory experiments/ computer programming/ modelling/ simulations/ analysis/ findings etc
5) **Results and inference**

Date

Signature of the student

Signature of the cohort owner

Department of Technical Education
Capstone project

Format- 6
Weekly Meeting Record

<For Cohort Owner Use>

Capstone project Title:		
Group Members	1) 2) 3) 4)	□Present □Present □Present □Present
Date		
Meeting venue		□On Time
Documents Submitted	□ Status Report	□On Time
Issues Group Working on		
Assessment of Progress	□Excellent □Good □Satisfactory □Fair □Poor	
Notes/ Concerns/ Comments		

Signature of the Cohort owner

Department of Technical Education

Capstone project

Format- 7
Weekly Status Report

Capstone project Name: <State the Title of the capstone project >

Capstone project Members: <List of group members>

Status:

Briefly describe and illustrate the progress.

Highlights

List any items of note. Breakthroughs, accomplishments, major decisions, or changes in the capstone project plan Are you on schedule, ahead of schedule or behind schedule?

Risks or Issues List

In the following table, list any risk or issue that is critical for the success of the capstone project. This could be anything from "*we need to get data*" to "*how do we ensure that the system is usable*" to "*performance is unacceptable*". This should be a complete historical list that is kept from the beginning of the capstone project until the end.

Status should be one of *New*, *ongoing*, *Closed*.

The resolution column should be filled in if the issue or risk has been taken care of.

A capstone project may be expected to have around 1-3 active issues or risks that are being managed (new or ongoing) at any given time. If you have more than three, then either you have a capstone project in serious trouble or your criteria for what is "critical to success" is too loose.

Date	Risk or Issue	Description	Resolution	Status

Contd..

Tasks in Progress or Completed:

List the tasks that each member of the capstone project worked on up to the present time.

Task Name	Description	Team Member Responsible	Percentage Complete

Upcoming Tasks:

List the tasks that each capstone project member is planning to work on in the upcoming Task.

Task Name	Description	Team Member Responsible

Date:

Signature of the students

Department of Technical Education

Capstone project

Format- 8

Student's Daily Log Book

Capstone project Name: <State the Title of the capstone project >

Capstone project Members: <List of group members>

Day-1	Date:
Capstone project Name:	
Name of the student	
Name of the Cohort owner:	
Remarks of the Cohort owner:	
Record Main actives of the day (including observation, sketches, discussions, etc): Signature of the Cohort owner	

Note: Prepare a A4 size hard bound Student's Diary/ Daily Log book using this format with college and student details

Department of Technical Education

Capstone project

Format- 9

Capstone project Report Template

The contents of the capstone project report shall be arranged in the following order:

1. Cover Page
2. Inside Title Page
3. Certificate signed by the Cohort owner and HOD
4. Declaration signed by the Candidate
5. Acknowledgements
6. Executive Summary
7. Table of Contents
8. List of Figures
9. List of Tables
10. Abbreviations/ Notations/ Nomenclature
11. Text of the Report
    - Chapter 1
    - Chapter 2
    - --
    - --
    - Chapter... n
12. References
13. Appendices
14. non-paper materials (if any)

The different Chapters in the capstone project report shall have the following content,

Chapter 1

- Introduction
- Scope of the capstone project

Chapter 2

Capstone project planning

- Work breakdown structure (WBS)
- Timeline Development – Schedule
- Cost Breakdown Structure (CBS)
- Capstone project Risks assessment

Requirements Specification

- Functional
- Non-functional (Quality attributes)

- User input
- Technical constraints

Design Specification

- Chosen System Design
- Discussion of Alternative Designs
- Detailed Description of Components/Subsystems
- Component 1- n

Chapter 3

Approach and Methodology

Discuss the Technology/Methodologies/use cases/ programming/ modelling/ simulations/ analysis/ process design/product design/ fabrication/etc used in the capstone project

Chapter 4

Test and validation

i. Test Plan
ii. Test Approach
iii. Features Tested
iv. Features not Tested
v. Findings
vi. inference

Describe what constitute capstone project success and why? Discuss the product/service tests that will confirm the capstone project succeeds in doing what it intended to do.

Chapter 5

Business Aspects

Discuss the novel aspects of this service or product. Address why a company or investors should invest money in this product or service**.**

- Briefly describe the market and economic outlook of the capstone project for the industry
- Highlight the novel features of the product/service.
- How does the product/service fit into the competitive landscape?
- Describe IP or Patent issues, if any?
- Who are the possible capstone projected clients/customers?

Financial Considerations

- Capstone project budget
- Cost capstone projections needed for either for profit/nonprofit options.

Conclusions and Recommendations

- Describe state of completion of capstone project.
- Future Work
- Outline how the capstone project may be extended

General Guidelines

Report Size - Report may contain maximum of about 100 pages including references and

appendices.

Paper Size - Use A4 size paper

Paper Quality - White bond paper weighing 85 g/m2 or more should be used. Photographs or images with dense colors may be printed in single side on glossy paper.

Margins - A margin of 40 mm is to be provided on left and 30 mm on right sides, whereas top and bottom margins should be 30 mm. No print matter should appear in the margin except the page numbers. All page numbers should be centered inside the bottom margin, 20mm from the bottom edge of the paper.

Font - Times New Roman (TNR) 12-point font has to be used throughout the running text. The captions for tables and figures should have font size of 11 and foot notes should be set at font size 10. Font sizes for various levels of headings are given in the table below

CHAPTER 3

TITLE PAGE-CENTERED TNR 17-POINT BOLD ALL CAPS

3.1. Section Heading

Left aligned with number, TNR 17 points, bold and leading caps

3.1.1. Second level section heading

Left aligned with number, TNR 14 points, bold and sentence case.

3.1.1.1 Third level section heading

Left aligned with number, TNR 12 points, bold and sentence case.

Fourth-level section heading

Numbered subsections beyond third level are not recommended. However, fourth-level subsection headings may be included without numbering, TNR 12-point font, left aligned and italicized

Running text should be set in 12-point TNR and fully justified. First line of paragraph should have indentation of 15 mm.

Line Spacing - The line spacing in the main text should be 1.5, for quotations, figure captions, table captions, figure legends, footnotes, and references. The equations, tables, figures, and quotations Single line spacing should be given.

Table / Figure/equation Format-

Tables, figures, and equations shall be numbered chapter-wise. For example, second figure in Chapter 3 will be numbered Figure 3.2. The figure can be cited in the text as Figure 3.2, Tables shall be numbered similarly (Table 2 in Chapter 3 will be numbered Table 3.2) and shall be cited in the text as Table 3.2. Figure caption shall be located below the figure. Table number and caption shall be located above the table.

Listing of the References:

Referencing is a way to give credit to the writers from whom you have borrowed words and ideas. By citing the work of a particular scholar, you acknowledge and respect the intellectual property

rights of that researcher. As a student or academic, you can draw on any of the millions of ideas, insights and arguments published by other writers, many of whom have spent years researching and writing. All you need to do is acknowledge their contribution to your assignment. References are to be listed after last chapter. They are to be listed in alphabetical order and numbered. Within a reference the line spacing should be single. Each reference should be separated by one blank line. The reference number should be left aligned. The text of the reference should have an indentation of 10 mm. The reference format to be followed for journal articles, text books, conference proceedings etc. are given below.

Journals

1. Parkas, K. (2011). Feedback and optimal sensitivity: Model reference transformations, multiplicative semi norms, and approximate inverses. IEEE Transactions on Automatic Control, 26(2): 301–320.

Text books

1. Myers, D. G. (2007). Psychology (1st Canadian ed.). Worth: New York.

Conference proceedings

1. Payne, D.B. and Gunhold, H.G. (1986). Digital sundials and broadband technology, In Proc. IOOC-ECOC, 1986, pp. 557-998.

Reports

1. Milton, M and Robert, L. (2004). Atmospheric carbon emission through genetic algorithm, Environment and Technical Report No.3., Indian Meteorological Department., New Delhi

Online journals with a DOI (Digital Object Identifier)

1. Krebs, D.L. and Denton, K. (2006). Explanatory limitations of cognitive developmental approaches to morality. Psychological Review, 113(3): 672- 675. doi: 10.1037/0033-295X.113.3.672

Online journals without a DOI

1. Vicki, G.T., Thomae, M., Cullen, A. and Fernandez, H. (2007). Modeling the hydrological impact on Tropical Forests. Forest Ecology, 13(10): 122-132. Retrieved from http://www.uiowa.edu/~grpproc/crisp/crisp.html

Online books

1. Perfect, T.J. and Schwartz, B. L. (Eds.) (2002). Applied metacognition. Retrieved from http://www.questia.com/read/107598848 (--If DOI is available, use the DOI instead of a URL

Chapters from a book

1. Krebs, D.L. and Denton, K. (1997). Social illusions and self-deception: The evolution of biases in person perception. In J. A. Simpson & D. T. Kenrick (Eds.), Evolutionary social psychology (pp.21-48). Hillsdale, NJ: Erlbaum

Appendices

Include data tables, drawings, background calculations, specification lists for equipment used, details of experimental configuration, and other information needed for completeness,

Page Numbering

Page numbers for the prefacing materials (Inside title page, dedication, certificate, declaration, acknowledgements, executive summary, table of contents, etc.) of the report shall be in small Roman numerals and should be centered at the bottom of the pages.

The numbering of the prefacing material starts from the Inside Title Page. However, the number is not printed on the Inside Title Page. Each new item of the prefacing materials listed above should start on a fresh paper on right page. If the content of the prefacing material exceeds one page, it has to be printed on both sides of the paper by starting from the right- side page. For example, if the item „Table of Contents" extends for 5 pages, it should be printed in fresh paper on right side page with second page of the „Table of Contents" on the back of the paper and then continued. The page numbers of the prefacing material will be printed in small Roman numerals continuously counting blank pages also. However, the numbers are not printed on the blank pages
The body of the report starting from Chapter 1 should be paginated in Arabic numerals and should be centered at the bottom of the pages. The pagination should start with the first page of Chapter 1 and should continue throughout rest of the report. Each side of a sheet of paper should be counted as a separate page, even if the back side of a sheet of paper is blank. The odd numbered pages are always on the right and even-numbered pages are always on the left. If the end of a chapter is in odd page (right side page) the next chapter should start on odd page i.e., on a fresh paper, and should be numbered as odd only by counting the blank even page also. However, the page number is not printed on the blank pages.
Each of the items - Inside cover page, Certificate, Acknowledgements, executive summary, Table of Contents, List of Figures, List of Tables, Abbreviations, Notations, Nomenclature, each new Chapter, References, and each new Appendix should start on an odd page i.e., on the right side

Non-Paper Material

A report may contain non-paper material, such as specimen, CDs and DVDs, Pen drive if necessary. They have to be accommodated in a closed pocket in the back cover page of the report. The inclusion of non-paper materials must be indicated in the Table of Contents. All non-paper materials must have a label each clearly indicating the name of the candidate, student Register number and the date of submission**.**

Binding

Two hard bounded copies of the capstone project Report shall be submitted for evaluation; the cover page should be printed on sky blue card of 300 g/m2 or above**.** One copy is used for Semester End Examination and after the exam it should be maintained in the concerned Head of the department and another copy is maintained at cohort owner

Electronic Copy

An electronic version (PDF) of the capstone project report should be submitted to the cohort owner and Head of the department. The file name should contain title of the capstone project, student Register number and date of submission.

Government of Karnataka
Department of Technical Education
Board of Technical Examinations

C-25 SEE Theory Question Paper Pattern

Course Name: Course Code:
Time: 3 Hours Max. Marks :100

Instructions:

For Part-A questions, only the first written answers will be considered for evaluation.

PART A

I. Select the correct answer from the choices given: 15X1 = 15 Marks

1. Multiple Choice Question-1
   A.
   B.
   C.
   D.
2. Multiple Choice Question-2
   A.
   B.
   C.
   D.
3. Multiple Choice Question-3
   A.
   B.
   C.
   D.
4. Multiple Choice Question-4
   A.
   B.
   C.
   D.
5. 5. Multiple Choice Question-5

   A.

   B.

   C.

   D.

6. Multiple Choice Question-6

   A.

   B.

   C.

   D.

7. Multiple Choice Question-7
    A.
    B.
    C.
    D.
8. Multiple Choice Question-8
    A.
    B.
    C.
    D.
9. Multiple Choice Question-9
    A.
    B.
    C.
    D.
10. Multiple Choice Question-10
    A.
    B.
    C.
    D.
11. Multiple Choice Question-11
    A.
    B.
    C.
    D.
12. Multiple Choice Question-12
    A.
    B.
    C.
    D.
13. Multiple Choice Question-13
    A.
    B.
    C.
    D.

14. Multiple Choice Question-14

    A.

    B.

    C.

    D.

15. Multiple Choice Question-15

    A.

    B.

    C.

    D.

II. Fill in the blanks by choosing appropriate answer from those given in the bracket: (Answer-1, Answer-2, Answer-3, Answer-4, Answer-5) 5X1 = 05 Marks

1. Question-1
2. Question-2
3. Question-3
4. Question-4
5. Question-5

PART B

III. Answer any FIVE questions: 5X2 = 10 Marks

1. Question-1
2. Question-2
3. Question-3
4. Question-4
5. Question-5
6. Question-6.
7. Question-7
8. Question-8

PART C

IV. Answer any FIVE questions: 5X3 = 15 Marks

1. Question-1
2. Question-2
3. Question-3
4. Question-4

5. Question-5
6. Question-6
7. Question-7
8. Question-8

PART D (Section I)

V. Answer any FIVE questions: 5X5 = 25 Marks

1. Question-1
2. Question-2
3. Question-3
4. Question-4
5. Question-5
6. Question-6
7. Question-7
8. Question-8

PART D (Section II)

VI. Answer any THREE questions: 10X3 = 30 Marks

1. Question-1
2. Question-2
3. Question-3
4. Question-4
5. Question-5