GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2022 (COGC-2022)
Semester-II

Course Title: Civil Engineering Workshop
(Course Code: 4320602)

Diploma programme in which this course is offered	Semester in which offered
Civil Engineering	Second

1. RATIONALE

Civil Engineering workshop is a basic engineering course. Diploma students must understand the fundamentals of civil engineering operations such as masonry, mixing, concreting, and finishing work to fulfil their duties on site. As a result, this course provides an opportunity to develop basic skills and emphasize the need of safety. Students will able to supervise construction activities, implement quality control procedures, and maintain tools and equipment in a safe manner for themselves, co-workers, and the building's constructed component. Working in the field develops a teamwork and safety awareness. This course offers a unique fieldwork experience.

2. COMPETENCY

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experience:

- Perform basic civil engineering jobs like masonry, concreting, plumbing, finishing work etc. using appropriate tools and equipments
- Follow safe practice to handling of construction materials, tools and equipments required for construction work

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the industry oriented following COs:

a. Identify different construction activities at site
b. Perform masonry and concrete activities
c. Perform plumbing activities
d. Identify finishing activities for building construction

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	0	2	1	00	00	25*	25	50

(*): For this practical only course, 25 marks under the practical CA have two components i.e., the assessment of micro-project, which will be done out of 10 marks and the remaining 15 marks are for the assessment of practical. This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

Legends: ***L****-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit,* ***CA*** *- Continuous Assessment;* ***ESE*** *-End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. *Some of the* ***PrOs*** *marked* ***'*'*** *are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'*.

Sr. No.	Practical Outcomes (PrOs)	Unit No.		Approx. Hrs. Required
1.	Identify the construction activities and the equipments being used at site during the site visit.	I		2*
2.	Carry out market survey of construction materials and prepare of cost estimation.	All		2*
3.	Visit a nearby site where construction is at initial stage and observe for following (if necessary, visit two/three times with a gap of a week). If drawings are available relate/match activities with the drawings. • Digging and filling • Foundation preparations • Brick/stone masonry • Concrete laying and Curing • Laying of sewerage/sanitary lines • Bar bending and bar laying for columns, beams, and ceiling. • Onsite testing for quality • Onsite preparation for construction work • Erection and removal of form work, scaffolding, centering / shuttering Prepare a brief report on construction activities observed and methods, tools, equipment, and materials being used.	I, II		4*
4.	Visit a nearby site where construction is at advance stage and observe for following (if necessary, visit two/three times with a gap of a week): • Plumbing • Welding, fittings, • Plastering • Flooring • POP work Prepare a brief report on construction activities observed and material, tools, equipment, and methods being used	III, IV		4*
5.	Assemble a brick wall of 120 cm length and 20 cm thickness and 60 cm height by arranging bricks in	II		2*

	different bonds (using only wet mud as mortar). Ensure that wall is in line, plumb and at right angle to a given structure. (Group of 10 students)			
6.	Mark level of given height from ground level at different locations in the workshop using water pipe technique. (Group of 10 students)	II		2*
7.	Identify and observe the quality test for cement on site	II	Any two	2
8.	Identify types of bent up bar and stirrups at site	II		2
9.	Identify and observe the field test for bricks on site	II		2
10	Demonstration/Prepare the brief report of different plumbing tools and pipe fittings.	III	Any two	2
11	Prepare the report with sketch, specifications, and applications of demonstrated plumbing tools and pipe fittings.	III		2
12	Carry out market survey of plumbing materials and prepare of cost estimation	III		2
13	Assemble a pipeline as per given drawing using pipes of one inch diameter, pipes of half inch diameter, nipple, reducer, union, T, elbow, tap etc. (This may involve basic tasks such as marking, cutting, threading, etc and use of appropriate techniques so that water leakage does not occur) and then dissemble this pipeline. (Group of 10 students)	IV		4*
			Total	**28**

Note

*i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

ii. Care must be taken in assigning and assessing study report as it is a first-year study report. Study report, data collection and analysis report must be assigned in a group. Teacher has to discuss about type of data (which and why) before group start their market survey.

*iii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Performance on site visit	20
2	Setting and operation of practical	20
3	Follow safe practices measures	10
4	Record observations correctly	20
5	Interpretation of conclusion	10
6	Answer to questions	10
7	Report submission in time	10

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to user in uniformity of practicals in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1.	Raw material such as bricks, cement, sand, reinforcement bars, etc.	5, 7, 8, 9
2.	String, Level / Water tube, Plumb bob, Right Angle	5, 6
3.	Plumbing materials such as pipes and accessories for different size and materials	10, 11, 12, 13
4.	Portable hammer, Spade, Pans, Thread	5, 9

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this course competency.

a. Work as a leader/a team member.
b. Follow safety practices.
c. Practice good housekeeping.
d. Maintain tools and equipment.
e. Follow ethical practice.

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit-I **Civil Engineering Activities at**	1a. Describe basic construction activities to be undertaken for the given component of civil structure. 1b. Identify the construction activities at the given site.	1.1 Construction activities such as excavation, brick masonry, concreting, plumbing, etc.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Construction Site	1c. Describe different safety precautions to be taken at construction site.	1.2 Importance and Interdependency of various activities. 1.3 Technical aspects involved in workmanship and Safety precautions.
Unit– II **Masonry and Concreting**	2a. Apply the basic techniques for the given type of masonry and concreting works with justification. 2b. Use quality control measures for masonry and concreting works with justification. 2c. Describe the methods of plastering and pointing to be undertaken in the given situation. 2d. Describe the methods of the framework for the given type of building.	2.1. Brick and stone Masonry work, Different type of joints/bonds (vertical and horizontal). 2.2. Concept of line dori, plumb bob, right angle, and water level tube. 2.3. Plastering, Pointing. 2.4. Proper Mixing of concrete, Concrete Laying. 2.5. Use of tools like concrete mixtures and vibrators, different types of vibrators. 2.6. Formwork, Scaffolding. 2.7. Centering and Shuttering.
Unit-III **Plumbing Works**	3a. Install the plumbing and fixtures in building using proper plumbing tools. 3b. Observe the technical aspects involved in workmanship of various plumbing tasks. 3c. Observe the safety precautions.	3.1 Different types of pipes, joints, tapes, fixtures, and accessories used in plumbing. 3.2 Component used in water supply, sanitary and sewerage lines (pipes, valves, bends, etc.). 3.3 Scheme/plan for water supply and sanitary system for a simple residential building.
Unit-IV Finishing Works	4a. Provide and fix the false ceiling, aluminum – glass works and flooring. 4b. Carry out whitewashing and painting procedure for walls / steel / wooden structure	4.1 False ceiling, Plaster of Paris (POP) work, aluminum – glass works, cladding. 4.2 Flooring, skirting and dado. 4.3 Whitewashing and painting: brush, roller and spray painting, types of finishing, preparation of surface, need of primer

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
		for timber, steel, and plastered surface

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Civil Engineering Activities at Construction Site	Not Applicable				
II	Masonry and Concreting					
III	Plumbing Works					
IV	Finishing Works					

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

10. SUGGESTED STUDENT ACTIVITIES

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

a) Undertake a market survey of local dealers for procurement of civil engineering materials, plumbing materials and finishing items.
b) Organize a visit to construction site of different types such as simple residential building, multistoried building etc. observed the topic-based practices on the field.
c) Self-leading activates guided by teacher.
d) Mini- Project using course / library / internet.
e) Develop power point presentation for activates observed during site visit.
f) Prepare the Charts that classify recycling material for construction waste.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4***means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Introduce recycling materials and green materials used in construction among the students.
g) Guide students in undertaking micro projects.

h) Arrange visit to nearby construction site for understanding various construction activates and construction stages.

i) Show videos animations to explain various process like excavation, foundation brick work plastering water supply laying sewer pipeline etc.

j) Prepare Construction activist's chart for various civil engineering stages

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-projects are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the micro project should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) ***Bill preparation (Group of five to six students):***
   Prepare bill of materials for given pipeline layout.

b) ***Masonry and concreting (Individual activity):***
   i. Each student will collect the information regarding the IS provisions for the construction materials like cement, send, bricks and reinforcement.
   ii. Collect five samples of bricks from different suppliers and test them in field to assess its quality and write a report.
   iii. Prepare a cement mortar of various proportion and applied plaster on plain wall of 120 mm X 90mm and observed the line, level and plumb.
   iv. Prepare a cement concert of various proportion and prepare a cubical block of it to determine its strength.
   v. Collect the list of availably brand of flooring tiles with there IS specification and make a report of it.

c) ***Masonry and concreting (Group of five students):***
   i. Undertake of market survey cement, aggregate, and send of various specifications from local Wenders.
   ii. Undertake the local survey for various shuttering materials along with its specifications.

d) ***Masonry and concreting (Group of ten students):***
   i. Assemble and dissemble the shuttering material for a beam / column of given dimensions using appropriate materials as directed by teachers.

e) ***Finishing work (individual activity):***

i. Collect the information form local market regarding the types, thickness, manufacturer, cost of various brands and make of aluminum extruded sections along with its specification laid in IS code.
ii. Undertake the survey for various brands of pain, painting tools and prepare a report with reference to cost, durability and aesthetic features.

f) ***Plumbing:***

i. Downloads the specifications for plumbing tools such as hammers, bench vice, pipe wrench and pipe accessories.
ii. Collect the technical information for various plumbing accessories such as GI / PVC pipes, bend, union, couplings of various dimensions and write brief report (individual activity).

g) ***Green and recycled material:***

Prepare a report for different types of Green and recycled materials.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	The Practical design of Structural Elements in Timber	Bull, J. W	Gower Press, London, 1989 ISBN: 9780566090288
2	Basic Plumbing with Illustrations	Massey, Howard C.	Revised Edition Craftsman Book Co, California
3	Workshop Technology	B.S. Raghuwanshi	Dhanpat Rai and sons, New Delhi
4	CPWD Specification of (Vol – 1 and Vol-2)	CPWD work manual	CPWD, Govt. of India, New Delhi
5	PWD - Standard Data Book for Building Work	PWD	PWD, Government of Maharashtra, Mumbai.
6	Modern Plumbing	Baker, E. Keith Blanken	Goodheart-Willcox Co. ISBN 978-1590703502
7	District schedule of rates (DSR)	PWD	PWD, Government of Maharastra, Mumbai.
8	A to Z of Practical Building Construction & its Management.	Mantri Sandeep	Satya Prakashan, New Delhi; 2015, ISBN: 978817842051
9	Sustainable Construction Materials	Ravindra K. Dhir, Jorge de Brito, Rui Silva, Chao Qun Lye	Woodhead Publishing, Old Delhi, 2019, ISBN: 9780081009857

14. SOFTWARE/LEARNING WEBSITES

- http:// www.asnu.com
- http: // www. Iarnvibilengineer.com / - building design and html
- wwww.mahapwd.com/

- cpwd.gov.in/
- https : // wrd. Maharastrae.gov.in/
- www.igbc.in
- www.grihaindia.org

15. PO-COMPETENCY-CO MAPPING

Semester I	Civil Engineering Workshop (Course Code: 4320602)						
	POs						
Competency & Course Outcomes	**PO 1 Basic & Discipline specific knowledge**	**PO 2 Problem Analysis**	**PO 3 Design/ develop-ment of solutions**	**PO 4 Engineering Tools, Experimen-tation & Testing**	**PO 5 Engineering practices for society, sustainability & environment**	**PO 6 Project Manage-ment**	**PO 7 Life-long learning**
Competency	• Perform basic civil engineering jobs like masonry, concreting, plumbing, finishing work etc. using appropriate tools and equipments • Follow safe practise to handling of construction materials, tools and equipments required for construction work						
Co 1: Identify the different construction activities at site	3	-	-	-	1	-	1
co 2: Performed masonry and concrete activities	3	2	-	-	1	-	1
Co 3: Performed plumbing job activities.	3	2	-	-	1	-	1
Co 4: Identify finishing activities for building construction.	3	2	-	-	1	-	1

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

S. No.	Name and Designation	Institute	Contact No.	Email
1	Dr. MohammedShakil Malek	F. D. (Mubin) Institute of Engineering and Technology, Bahiyal	079-25391112	shakil250715@yahoo.co.in
2	Shri. Nandan Patel	B & B Institute of Technology, V.V. Nagar	9601383494	nandan9601@gmail.com
3	Smt. Margee Milisia	Shri. K.J.Polytechnic, Bharuch	0264-2246402	margee.milisia@gmail.com
4	Shri Munaf Jagdu	Govt.Poly., Ahmedabad	079-26301285	mjagadu@gmail.com
5	Shri Darshan V Patel	Govt.Poly., Himatnagar	02772-229285	darshan.2228@gmail.com