

**GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**

**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**

I – Semester

Course Title: **Plastic Engineering Workshop**

(Course Code: C4312302)

<b>Diploma programme in which this course is offered</b>	<b>Semester in which offered</b>
Plastics Engineering	First

**1. RATIONALE**

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices with Plastics Engineering concepts is included in the curriculum in order to provide hands-on experience about use of different tools and measuring instruments. This course aims at developing in general, manual and machining skills in the students. Besides above, it aims at development of dignity of labor, precision, safety at work place, team spirit and right attitude which are essential for getting placement.

**2. COMPETENCY**

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Operate machines and hand tools with safety and precision.**

**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 following COs:

- Use carpentry machines and hand tools with precision and safety.
- Use fitting machines and hand tools with precision and safety.
- Use welding machines and hand tools with precision and safety.
- Use fabrication machines and hand tools with precision and safety.
- Promote reuse of scrap material.

**4. TEACHING AND EXAMINATION SCHEME**

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	CA	ESE	CA	ESE	
-	-	4	2	-	-	25*	25	50

(\*):For this practical only course, 25 marks under the practical CA has 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. *These PrOs need to be attained to achieve the COs.*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Prepare wooden block as per drawing	I	06
2	Prepare wooden mould elements (Bolster)	I	06
3	Prepare rectangular or square job of MS as per dimensions	II	08
4	File the job by straight edge & angle for matching two components	II	06
5	Drill on metal plate as specified	II	04
6	Tap on metal plate as specified	II	04
7	Cut and drill acrylic sheet as per drawing	II	04
8	Join two metal pieces by welding	III	04
9	Prepare FRP sheet as per dimensions	II	08
10	Fabricate work using FRP sheet	VI	06
	<b>Total</b>		<b>56</b>

### **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. 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	Identify various tools and basic machines	05
2	Prepare of experimental setup	20
3	Operate the equipment setup	20
4	Follow safe practices measures	05
5	Record observations correctly	20
6	Interpret the result and conclude	30
	<b>Total</b>	<b>100</b>

## 6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Basic work shop tools (hammer, chisel, filing, measuring instruments, Vise fitting, fastening devices etc)	1,2,3,4,5,6,7, 8,9,10
2	Welding machine (Out put current 20-200 Amp DC, V 220, Input current 6.3kVA, Suitable for 2.5mm rod)	8
3	Hack saw hand operated and automatic	1,2,3,7,9,10
4	Wooden blocks various sizes	1,2,4
5	Metal plates & bars various sizes	3,4,5,6,8
6	Acrylic Sheets various sizes	7
7	FRP Sheet various sizes	9,10
8	Hand drill & Taps (No load speed 2600RPM, Power input 350 W, Maximum drill dia 10mm)	5,6

## 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 fulfil the development of this course competency.

- a) Follow safety precautions & rules.
- b) Work as a leader/a team member.
- c) Follow ethical practices.
- d) Practice environmental friendly methods and processes. (Environment related)**

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 1<sup>st</sup> year
- ii. 'Organization Level' in 2<sup>nd</sup> year.
- iii. 'Characterization Level' in 3<sup>rd</sup> year.

## 8. UNDERPINNING THEORY

Only the major Underpinning Theory is formulated as higher level UOs of *Revised Bloom's taxonomy* in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
<b>Unit – I</b> <b>Carpentry</b>	1a. Identify different carpentry tools. 1b. Select relevant carpentry hand tools for given job. 1c. Perform various operations like marking, planing, sawing and chiseling with care 1d. Prepare wooden mould elements 1e. Follow safety precautions in carpentry	1. Carpentry tools. 2. Marking, planing, sawing and chiseling 3. Preparation of wooden mould elements 4. Safety precautions in carpentry shop 5. Reuse of carpentry scrap and waste material
<b>Unit– II</b> <b>Fitting</b>	2a. Identify different fitting hand tools, gauges, metals and plastics. 2b. Select relevant fitting hand tools for a given job. 2c. Sequence and perform fitting operations for a given job. 2d. Prepare fitting jobs with precision.	1. Metals and plastic-Steel, Brass, Copper, Aluminum, Plastics etc. 2. Different shapes-i.e. Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section 3. Holding devices and files-demonstration 4. Safety precautions in Fitting shop 5. Reuse of fitting scrap and waste material
<b>Unit– III</b> <b>Welding</b>	3a. Identify different welding tools and equipment. 3b. Explain the procedure of welding two metals. 3c. Differentiate between different welding methods. 3d. Follow safety precautions during	1. Welding equipment 2. Welding types 3. Safety precautions during welding 4. Reuse of welding scrap and waste material

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
	welding. 3e. Weld given job with precision.	
<b>Unit – IV Fabrication</b>	4a. Identify different Fabrication/FRP (Fiber Reinforced Plastic) tools and equipment. 4b. Describe the process of preparing FRP articles with care 4c. Follow safety precautions during fabrication 4d. Prepare the FRP job with precision.	1. Identify different FRP tools. 2. Safety precautions in the Fabrication shop 3. Procedure of FRP fabrication 4. Reuse of fabrication scrap and waste material

**Note:** The UOs need to be formulated at the 'Application Level' and above of Revised Bloom's Taxonomy' to accelerate the attainment of the COs and the competency.

#### 9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Practical Marks			
			R Level	U Level	A	Total Marks
I	Carpentry	12	3	7	7	17
II	Fitting	12	3	7	7	17
III	Welding	12	3	7	9	19
IV	Fabrication	12	3	7	7	17
<b>Total</b>		<b>48</b>	<b>12</b>	<b>28</b>	<b>30</b>	<b>70</b>

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

**Note:** This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.

## 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 conduct following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

1. Collect various products made up of wooden, Mild Steel, Acrylic and FRP. Make a collage.
2. Prepare the chart on safety precautions and rules.
3. Prepare the list of major machines/tools used with their brand, price, specifications, electrical consumption, output per hour. Make a presentation to other students

## 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/sub topics.
- 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) Guide students on how to address issues on environ and sustainability (**Hand operated tools are being used which are not consuming generated energy**)
- g) Guide students for using data manuals.

## 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-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

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

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

1. Prepare wooden hand injection mold elements
2. Prepare model using acrylic sheet
3. Prepare article using FRP sheet

### 13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Elements of Workshop Technology ( Volume I,II and III)	Choudhary Hajra S.K and Choudhary Hajra A.K.	Media Promoters & Pub Pvt Ltd, Mumbai, 2014, 5551234002069
2	Workshop Technology	Bawa H.S.	Tata McGraw Hill Education Pvt. Ltd, Delhi, 2015, 9780070671195
3	Workshop/Manufacturing Practices	Kumar Kaushik, Kalita Hridayjit	Vikas Publishing House, New Delhi, 2019, 9789353387419
4	A Course In Workshop Technology Vol I	Raghuwansh B.S.	Dhanpat Rai and Co., New Delhi, 2019, 9781020092015
5	Plastics Engineering Handbook	Berins M	Springer Science & Business Media, Singapore, 1991, 9780412991813
6	Plastics Materials And Processes	Schwartz Seymour S., Goodman Sidney H.	Van Nostrand Reinhold, USA, 1982, 9780442227777

### 14. SOFTWARE/LEARNING WEBSITES

1. <http://www.fao.org/docrep/012/a1360e/a1360e.pdf>
2. <https://www.gopracticals.com/workshop/workshop-practical-carpentry-shop-t-lap-joint/>
3. [http://www.bspublications.net/downloads/05229cf9b012a3\\_workshop\\_Ch\\_1.pdf](http://www.bspublications.net/downloads/05229cf9b012a3_workshop_Ch_1.pdf)
4. <https://egyankosh.ac.in/bitstream/123456789/29753/1/Unit-3.pdf>

### 15. PO-COMPETENCY-CO MAPPING

Semester I	Plastic Engineering Workshop (Course Code: C4312302)									
	POs and PSOs									
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning	PSO 1 An ability to apply principles of material selection, product & mold/die design and development in plastic engineering	PSO 2 An ability to conduct safe and environment friendly manufacturing and recycling of plastic products.	PSO 3 (If needed)
<b>Competency Operate machines and hand tools with safety and precision.</b>	2			3	2					
<b>Course Outcomes</b>										
1. Use carpentry machines and hand tools with precision and safety.	2	-	-	3	2	-	-	-	-	-
2. Use fitting machines and hand tools with precision and safety.	2	-	-	3	2	-	-	-	-	-
3. Use welding machines and hand tools with precision and safety.	2	-	-	3	2	-	-	-	-	-
4. Use fabrication machines and hand tools with precision and safety.	2	-	-	3	2	-	-	-	-	-

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

### 16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

#### GTU Resource Persons

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