GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-V

Course Title: Industrial Training - I
(Course Code: 4352301)

Diploma programme in which this course is offered	Semester in which offered
Plastics Engineering (Sandwich Pattern)	5th Semester

1. RATIONALE

The aim for industrial training is to provide individuals with hands-on experience and skills in areas of plastic processing, machine manufacturing, mold and die making, testing, recycling, designing etc. that cannot be learned in a classroom or through theoretical learning alone. It allows individuals to gain practical experience in their chosen field or profession, which can be valuable when seeking employment or advancing in their career. Second, it helps bridge the gap between academic learning and real-world applications, providing individuals with a more comprehensive understanding of their field.

Industrial training also allows individuals to develop professional networks and gain exposure to different work environments and organizational cultures. The course has been designed to develop soft skills such as communication, problem-solving, and teamwork, which are essential in the workplace.

2. COMPETENCY

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

- **Technical skill development along with professionalism, teamwork, adaptability and safety**

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:

a) Solve real life problems of working environment.
b) Acquire/adopt practical knowledge, new skills and current technologies.
c) Develop opportunities to be a prospective employee.
d) Analyze problems and find/suggest possible solutions.
e) Present a project report based on weekly diary and work experience during training.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	0	30	15	0	0	500	300	800

Evaluation of 500 marks for PA will be done by the internal examiner at institute level based on:

- Weekly diary containing industry details, joining report, weekly report and monthly progress report by industry
- Monthly progress report by institute faculty
- Training report

Evaluation for ESE by the External examiner: - Evaluation of 300 marks for ESE will be done by the external examiner on following criteria –

1. Knowledge gained related to:

- Plastic raw materials
- Plastic products
- Types of major equipment's/instruments/machines used in industry with their specification, approximate cost and specific use.
- Manufacturing/production process
- Quality control
- Problem identification and rectification
- Maintenance and repair
- Recycling
- Safety procedures
- Production planning and scheduling

2. Skills learned related to:

- Technical knowledge
- Quality control
- Safety
- Machine operation
- Problem solving
- Communication

3. Incidents/ cases from Experiences-

The students should record classic cases for learning for others, such as

- Tricky problems and their solutions
- Typical fault diagnosis and their solutions

- Part modifications
- System modifications
- Cost reduction cases
- Quality improvement
- Improvement Method

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

5. SUGGESTED WORKLOAD

- This training being a part of the curriculum, the institute should have the arrangement for close supervision of this training. Faculty of the parent institute has to visit industry at least once in a month for evaluating student's activity and their progress.
- The number of industries providing training and number of students are varying every year. In this consequence and considering role of faculty in training, workload for this course is allotted to faculty for industrial visit.
- Work load allotted to faculty per batch of 15 students is 30 Hrs / week. Institute has to prepare time table of the staff in such a manner that one faculty must be remained free for one whole day for industrial visit/counseling of the trainee. Trainee should be distributed equally among the faculty involved and the faculty will be considered as guide/counsellor for those students. Progressive assessment will be carried out by that guide/counsellor.

6. 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 competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Practice environmentally friendly methods.

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

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 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 vary slightly from above table.*

7. 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 individually or in group and prepare reports for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Students can observe the production process of plastic products, from raw materials to finished products.
b) Students can be involved in quality control activities such as testing the raw materials and finished products for quality and durability.
c) Students can work on designing new plastic products and creating prototypes using computer-aided design (CAD).
d) Students can learn how to optimize the plastic production process to minimize waste and increase efficiency.
e) Students can learn about safety procedures and regulations, as well as environmental regulations and practices for the plastic industry.
f) Students can learn about the marketing and sales process for plastic products, including market research, product positioning, and sales strategies.
g) Students can learn about maintenance and repair of plastic manufacturing equipment, including troubleshooting and repairs.
h) Students can learn about inventory management systems and practices for the plastic industry, including tracking and managing raw materials and finished products.

8. 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.11***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide students on how to address issues on environment and sustainability.
g) Provide students with guidance and supervision during their industrial training.
h) Encourage students to work together on projects or assignments, share their experiences and knowledge, and provide feedback to each other.
i) Incorporate technology and online resources.
j) Encourage students to view industrial training as a stepping stone to a lifetime of learning and growth.

9. GUIDELINES FOR SANDWICH APPRENTICESHIP INDUSTRIAL TRAINING (Under Board of Apprenticeship Training [BOAT], Western Region)

Duration of the training: The duration of the sandwich training will be of 24 to 26 weeks. It should start **within two weeks** from the date of completion of GTU examination of the semester IV.

Eligibility: Student will be allowed for Industrial Training-I subject to GTU eligibility criteria for particular semester.

Apprenticeship Board: The training will be covered under the Apprenticeship (amendment) Act 1973 and as per current rule; the trainee will be eligible for a stipend of Rs. 7000/- per month out of which 50% will be paid by the employer and 50% will be reimbursed by Board of Apprentice Training (BOAT), Western Region, Mumbai. Stipend will be revised periodically by Board of Apprenticeship.

Area of Training: Students can be trained in the fields of Plastic Processing, Machine Manufacturing, Raw Material Manufacturing, Mould/die making, Testing, Recycling and Designing of Machine/Mold/Die/Product. Students should be sent to industry strictly based on merit.

Provisions of Apprenticeship Act (Chapter II)

- **Health, Safety and welfare of apprentices:** Where any apprentices are undergoing training in a factory, the provisions of Chapters III, IV and V of the Factories Act, 1948 (63 of 1948), shall apply in relation to the health, safety and welfare of the apprentices as if they were workers within the meaning of that Act.
- **Hours of work and overtime:** The weekly and daily hours of work of an apprentice while undergoing practical training in a workplace shall be as determined by the employer subject to the compliance with the training duration. No apprentice shall be required or allowed to work overtime except with the approval of the Apprenticeship Adviser who shall not grant such approval unless he is satisfied that such overtime is in the interest of the training of the apprentice or in the public interest.
- **Grant of leave and holidays to apprentices:** An apprentice shall be entitled to such leave and holidays as are observed in the establishment in which he is undergoing training. **(a) Casual leave** should be admissible for maximum of 12 days in a year. **(b)Medical leave** upto fifteen days for each year of training may be granted to the apprentice who is unable to attend duty owing to illness. **(c)Extraordinary leave** upto a maximum 10 days or more in a year may be granted to the apprentice after he has exhausted the entire casual and medical leave.
- **Employer's liability for compensation for injury:** If personal injury is caused to an apprentice by accident arising out of and in the course of his training as an apprentice, his employer shall be liable to pay compensation which shall be determined and paid, so far as may be, in accordance with the provisions of the Workmen's Compensation Act, 1923 (8 of 1923), subject to the modifications specified in the Schedule.

- **Conduct and discipline:** In all matters of conduct and discipline, the apprentice shall be governed by the rules and regulations in the establishment in which the apprentice is undergoing training.
- **Apprentices are trainees and not workers:** Save as otherwise provided in this Act (a) every apprentice undergoing apprenticeship training in a designated trade in an establishment shall be a trainee and not a worker; and (b) the provisions of any law with respect to labour shall not apply to or in relation to such apprentice.

ROLE OF DEPARTMENT

- Department has to send training request letter to various industries well in advance before commencement of training.
- After getting sufficient number of seats from the industries, students will be placed in different industries for their 5th semester training.
- Department has to upload data required by Board of Apprenticeship Training (BOAT) for all students for upcoming training on **https://portal.mhrdnats.gov.in/** through institute login.
- A bonafide certificate for each student will be generated for uploading on portal.
- Department will issue an order letter to industry for the said training mentioning the name and enrollment number of students.
- During the training period, the head of the department will maintain a schedule for follow–up of industrial training and according to it send the faculty to various industries.
- The faculty will check the progress of the student in the training, attendance; discipline and project report preparation and also give necessary guidance to students.
- The department has to prepare Progress Report of the trainee for the industrial training.
- At the end of the training, concerned faculty will do assessment of the work done by trainee.

GUIDE LINE FOR STUDENTS

- Student has to upload data required by Board of Apprenticeship Training (BOAT) for upcoming training on **https://portal.mhrdnats.gov.in/** through student login.
- Students have to submit training order letter to training officer in the industry on the first day of training and get joining letter duly signed from the industry and submit it to department in college.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the industry.
- During the training period students will keep record of all the useful information and maintain the weekly diary.
- He/she will prepare a detailed training report about the whole process and will submit it to the department at the time of examination.

ROLE OF INDUSTRY

- Industry has to register and upload data required by Board of Apprenticeship Training (BOAT) for upcoming training on **https://portal.mhrdnats.gov.in/** through industries login and proceed for contract generation with BOAT.
- Industry will give effective training to the students for improving their practical skills.
- Industry may provide training in-charge for the group of the students under training.
- Training in-charge has to evaluate each student every week and signed weekly diary with appropriate remarks.
- Industry may allot project to individual or group of students under training and students has to prepare report on the same project.
- Training in-charge has to guide students for preparing their project report.
- Industry has to maintain attendance for the student under training and report for any irregularity of the students to their parent institute.

10. 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 is 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.

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:

- Students can create a small product using plastic injection molding or any other process. This will help student to learn the design and manufacturing process of plastic products.
- Students can perform analysis on different types of plastic materials used in the industry to understand their properties and characteristics.
- Students can learn about the quality control and testing procedures used in the plastic industry. This can include testing the physical, mechanical, and thermal properties of plastic materials.
- Students can work on optimizing the plastic manufacturing process to improve efficiency and reduce costs. This can involve analyzing the current process, identifying areas for improvement, and implementing changes.

- Students can work on recycling plastic waste into useful products. This can involve understanding the recycling process, identifying the types of plastic that can be recycled, and developing new ways to recycle plastic.
- Students can learn about the maintenance and repair of plastic manufacturing machinery. This can involve understanding the various components of the machinery, troubleshooting problems, and performing routine maintenance.
- Students can work on projects related to environmental sustainability in the plastic industry. This can involve identifying ways to reduce waste and pollution, developing new materials that are more environmentally friendly, or finding ways to recycle plastic waste.

11. SUGGESTED FORMAT OF TRAINING REPORT

- Title Page
- Certificate
- Preface
- Acknowledgement
- Introduction of industry
- Industry layout
- Hierarchy of industry/organization chart
- Product
- Raw materials
- Types of major equipment/instruments/machines used in industry with their specification, approximate cost and specific use
- Manufacturing/production process
- Faults and remedies
- Maintenance
- Safety features
- Conclusion
- References
- Bibliography

12. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1.	Plastic Materials and Processes- A Concise Encyclopaedia	Harper C.A, Petrie E.M	John Wiley & Sons, New Jersey, 2003, 9780471456032
2.	The Complete Part Design Handbook	Campo, E.	Hanser Publications, Ohio, 2006, 9783446412927
3.	Plastic Materials	Brydson J.A	Elsevier, USA, 2016, 9781569902820

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
4.	Plastics: Product Design and Process Engineering	Harold Belofsky	Hanser-Gardner Publications, 1995, 9781569901427
5.	Injection Mould Design Fundamentals	Denton E.N & Glanvill A.B.	Industrial Press, 2011, 9780831110338
6.	Plastic Materials & Processes	Schwartz S.S. & Goodman S.H.	Van Nostrand Reinhold, 1982, 9780442227777
7.	Plastic Engineering Handbook	Berins M.L	Van Nostrand, 1991, 9780412991813
8.	Injection Moulding Handbook	Rosato D.V & Rosato D.V	Springer Science & Business Media, 2012, 9781461545972

13. SOFTWARE/LEARNING WEBSITES

1. Society of Plastics Engineers (SPE) - https://www.4spe.org/
2. Institute of Chemical Technology (ICT) - http://www.ictmumbai.edu.in/
3. Paulson Training Programs - https://www.paulsontraining.com/
4. Plastindia Foundation - https://www.plastindia.org/
5. Indian Institute of Technology (IIT) - https://www.iitb.ac.in/
6. American Injection Molding (AIM) Institute - https://www.traininteractive.com/
7. Society of Manufacturing Engineers (SME) - https://www.sme.org/
8. Plastics Industry Association (PLASTICS) - https://www.plasticsindustry.org/
9. Central Manufacturing Technology Institute (CMTI) - https://www.cmti-india.net/

14. PO-COMPETENCY-CO MAPPING

Semester IV	Industrial Training - I (Course Code: 4352301)									
	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)
Competency Technical skill development along with professionalism, teamwork, adaptability and safety.	1	2	3	3	3	3	3	3	3	

Course Outcomes										
1. Solve real life problems of working environment.	1	3	2	2	2	3	3	2	2	
2. Acquire practical knowledge, new skills and current technologies.	1	2	3	3	2	2	3	2	2	
3. Develop opportunities to be a prospective employee.	1	2	3	3	2	3	3	2	2	
4. Analyze problems and find/suggest possible solutions.	1	3	3	2	2	2	3	2	2	
5. Present a project report both in oral and written form based on work experience during training.	1	1	2	2	2	3	3	2	2	

Legend: '**3'** for high, '**2**' for medium, **'1'** for low or **'-'** for the relevant correlation of each competency, CO, with PO/ PSO

15. 16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

Sr. No.	Name and Designation	Institute	Contact No.	Email
1	Shri Dharmendra M. Makwana, Head of Plastic Engineering	G.P., Valsad	9426359006	1224dmm@gmail.com
2	Shri Jaymin R. Desai Lecturer in Plastic Engineering	G.P., Ahmedabad	9428159779	jayminrdesai@yahoo.com
3	Shri Ajay S. Amin Lecturer in Plastic Engineering	G.P., Valsad	9426044254	ajayamin2000@yahoo.co.in

WEEKLY DIARY

FOR

INDUSTRIAL TRAINING

YEAR: 20 - 20

Department : _____

Name of student : _____

Semester : _____

Enrollment Number : _____

BOAT Contract Registration Number : _____

Name of Industry with Postal Address	
(1)	**(2)**

JOINING REPORT

From : _____

_____

_____

_____

_____

To,

The Principal,

Government Polytechnic,

Ahmedabad/Valsad/Halol.

Subject : Joining report _____

_____

Respected Sir/Madam,

As per your training order number_____ dated _____ , I have reported for training at _____ on _____. The weekly off day of the industry is _____.

Thanking you,

Yours faithfully,

( )

Signature and Stamp of Training Officer

(To be send immediately after joining the industry)

Details of the Industry

(A) Name of industry with full address: **(1)** _____

_____

_____

_____

(2) _____

_____

_____

_____

(B) Period of Training : _____

(C) Name of training officer with designation **(1)** _____

_____

(2) _____

_____

(D) Details of weekly off day **(1)** _____

(2) _____

WEEKLY REPORT

(To be filled by training officer)

PERIOD :- FROM _____ TO _____ = _____ DAYS

OFF DAYS:- _____ = _____ DAYS

LEAVE ENJOYED ON _____ = _____ DAYS

TOTAL DAYS ATTENDED _____ = _____ DAYS

DETAILS OF ACTIVITIES DURING WEEK:

Signature of Training Officer **Signature of Student**

MONTHLY REPORT

(To be filled by training officer)

PERIOD :- FROM _____ TO _____ = _____ DAYS

TOTAL WEEKLY OFF DAYS:- _____ = _____ DAYS

TOTAL WORKING DAYS _____ = _____ DAYS

TOTAL LEAVE ENJOYED _____ = _____ DAYS

TOTAL DAYS ATTENDED _____ = _____ DAYS

EVALUATION:

Sr. No.	Particulars	Evaluation by Training Officer	
		Grade	Signature
1	Punctuality		
2	Participated in work allotted		
3	Practical level reached		
4	Industrial relationship		
5	Project write up prepared		
6	Any other remarks		

Grade Nomenclature: A = Excellent B = Very Good
C = Good D = Fair

MONTHLY PROGRESS REPORT (FOLLOW-UP REPORT)

(To be filled by Institute Faculty)

Name and address of the industry						
Name of Student with Contact Number	**Punctuality**	**Participation in work allotted**	**Practical level reached**	**Industrial relationship**	**Project write-up preparation**	**Total Marks**
	Marks (Out of 10)	**Marks (Out of 10)**	**Marks (Out of 10)**	**Marks (Out of 10)**	**Marks (Out of 10)**	**Marks (Out of 50)**

Date of Visit: _____

Name of faculty: _____

Signature of faculty: _____