GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering
Level: Under Graduate
Branch: Plastic Technology
Subject Code : BE05023021
Subject Name: Plastic Extrusion Technology

w. e. f. Academic Year:	2024-25
Semester:	5
Category of the Course:	Professional Core Course

Prerequisite:	The student should have a knowledge of subjects like Polymer Science, Heat Transfer and Properties of different plastic materials.
Rationale:	The course provides the fundamental expertise required to convert raw polymers into continuous extruded products like pipes, films, profiles and filaments. This subject enables. the student to understand the constructional features of single and twin screw extruder. They will learn various types of extruder dies and extruder lines. The student will be able to operate an Extruder and troubleshoot complex industrial processing challenges.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand the basic extrusion process and its applications.
02	Explain the constructional feature of extruder, Screw design for extruder & compare single and twin screw extruder.
03	Draw and explain various extruder dies and extruder lines.
04	Troubleshoot the extrusion defects.

Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial /Practical			
L	T	P	PBL	TH		ESE (E)	PA (M)	PA (I)	TW/ SL(I)	ESE (V)	
45	00	30	15	90	03	70	30	20	30	50	200

Where L = Lecture, T= Tutorial, P= Practical, PBL=Problem Based Learning, TH = Total Hours, ESE = End- Semester Examination, PA = Progressive Assessment

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction:** Basic principle of Extrusion, Extrusion techniques like Ram Extrusion, Wet Extrusion, Extrusion Pump and spinneret extrusion, Dry extrusion, Terminologies of extruder and extruder machine, Drag flow, Pressure flow, Leak flow in extruder.	5	10
2.	**Constructional features of screw Extruder:** Extruder Screws Barrel and feed throat Feed Hopper Grooved Barrel Technology Heating & Cooling systems, Thrust bearing assembly Die assembly: Breaker plate, screen and screen changers Extruder drives, Material Selection Criteria, Melting Mechanism.	8	20
3.	**Twin screw extruder**: Twin vs. single screw extruder, Intermeshing (Co-rotating and counter-rotating) and non intermeshing twin screw extruders.	4	5
4.	**Screw design for extruder** : Standard extruder screw, Modifications of standard extrusion screw, Devolatizing Extruder screws- Conventional Vented extruder screw & multivent extruder screw, cascade extruder and venting through screw , Multi-flighted extruder screw , Mixing screws.	8	15
5.	**Extrusion lines:** Pipe and tube Wire coating and Cable coating Sheet and film (Tubular and Flat) Monofilaments Profile extrusion Palletizing Coating Co extrusion BIS Standard- IS 4984: Polyethylene (PE) Pipes for Water Supply:	10	25
6.	**Dies for extruder** Typical extrusion dies-Straight through, cross head dies and offset dies. Wire covering cross head die Dies for tubular film, Flat film dies Sheet dies Pipe and Tube dies Dies for solid sections Coextrusion dies	7	20
7	**Trouble shooting extruders:** Problems, its causes and remedies	3	5
	Total	**45**	**100**

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	25	15	10	5	0

Suggested Specification Table with Marks (Theory):

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Polymer Extrusion by Rauwendaal
2. Extrusion of Plastics by Fisher
3. Twin Screw Extrusion by White
4. Plastics Extrusion technology by Allan Griff
5. Plastics Extrusion Technology by Hensen

(b) Open source software and website:

1) https://nptel.ac.in/

2) https://pslc.ws/

Suggested Course Practical List: If any

Practical based on above topics.

Sustainable Development Goals:

The Plastic Extrusion Technology course advances SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production) by equipping students with the technical skills to manage high-efficiency manufacturing systems that minimize material waste. Furthermore, the application of extruded products in renewable energy sectors supports SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action) through the production of durable, energy-saving components.

Problem Based Learning Activities

Sr. No.	Activity	No. of hours	Total hours claimed	Evaluation Criteria
1	Seminar based on technical topics	Duration- 10 hrs	10	Based on content, report preparation and presentation
2	Mini project	Duration-10 hrs	10	Based on content, literature review, report preparation and presentation
3	Micro project	Duration-05 hrs	05	Based on content, literature review, report preparation and presentation
4	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h	10	Based on report submitted.
5	Poster/chart/power point preparation on technical topics	Duration = 10 h	10	Based on Poster/Chart/PPT preparation and presentation skills
6	Assignment writing.	5 assignments of 2h each.	10	Based on the assignment submitted.
7	Technical Video based learning related to the subject	Duration of video = 5h Report preparation = 5h	10	Report /presentation based on the video learning outcomes.
8	Group Discussion on emerging/trending technical topics based on subject	Duration = 1 h each	--	Based on performance in group discussion, technical depth, knowledge etc.
9	Attending Expert Lecture/Webinar/Seminar	Duration- 1hr each	--	Based on Short report
10	Self-learning on-line course	Minimum duration of the course should be 10h.	10	Examination based assessment at the end of course. Basedon the certificate produced
11	Exhibition/ Conference/ Trade Fair/ Industrial exposure for 2-3 days	Visit- 15 hr Report preparation- 5 hr	20	Based on learning, observations and short report.
12	Working model on technical topics	Working = 15 h	15	Based on design, understanding & presentation of the model

13	Non-working model on technical topics	Non- working = 5 h	5	Based on design, understanding & presentation of the model
14	Videos on Industrial safety aspects based on subject	Duration of video = 5h Report preparation = 5h	10	Based on report submitted

Above activities are suggestive, faculty can choose any of these activities and cover up the Problem based learning hours. The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity. However, the total number of hours is fixed.

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