

**DEPARTMENT OF TECHNICAL EDUCATION (DIPLOMA SECTOR)
UTTAR PRADESH**

**CURRICULUM FOR DIPLOMA PROGRAMME
IN
PLASTIC MOULD TECHNOLOGY
(5th to 6th Semester)**

=====
Semester System
=====



(EFFECTIVE FROM YEAR 2026-27)

Prepared By:

**INSTITUTE OF RESEARCH, DEVELOPMENT & TRAINING, U.P., KANPUR
DEPARTMENT OF TECHNICAL EDUCATION
UTTAR PRADESH**

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PREFACE

An important issue generally debated amongst the planners and educator's world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization have created an environment for free flow of information and technology through fast and efficient means. This has led to the shrinking of the world, bringing people from different culture and environments together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. To cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Technical Education, UP to revise the existing curricula of diploma programmes as per the needs of the industry and making them NEP-2020 compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much-needed dynamism in the system

Director

Institute of Research Development & Training.

Kanpur

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- 6 All the participants from industry/field organizations, engineering colleges, polytechnics, and other technical institutions for their professional inputs during curriculum workshops.

Coordinator

Institute of Research Development & Training,

Kanpur, U.P.

1. SALIENT FEATURES

1. Name of the Programme: Diploma Programme Plastic Mould Technology
2. Duration of the Programme: Three years (Six Semesters)
3. Entry Qualification: Matriculation or as Prescribed by State BTE, UP
4. Intake: As prescribed by the Board
5. Pattern of the Programme: Semester Pattern
6. Ratio between theory and Practical: 40:60 (Approx.)

2. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN PLASTIC MOULD TECHNOLOGY

The following are the major employment opportunities for diploma holders in Plastic Mould Technology:

- In manufacturing industry primarily in private sector and to some extent in public sector
- In service sector like Railways, Hospitals, Military Engineering Services, Boards and Corporations, Construction Companies, Transportation Telecommunication, PWD and Rural Development Agencies.
- In marketing sector for sales and after- sales services
- As an entrepreneur Departments,

Though the diploma holders in Plastic Mould Technology find placement in all functional areas like R&D, planning, shop floor production, quality control, inventory management but majority of them find employment in shop floor management.

PROGRAM OUTCOMES (POs)

P01: Basics and Discipline specific Knowledge

Assimilate knowledge of basic mathematics, science, engineering fundamentals, and electronics and communication engineering.

P02: Problem's Analysis and solution

Identify, analyse and solve problems using standard methods and established techniques.

P03: Design and Development

Design solutions for technical problems.

Assist in designing components, systems, or processes to meet specific requirements.

P04: Engineering Tools, Experimentation, and Testing

Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

P05: Socio/ Economic /Environmental impact assessment/remedy.

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

P06: Project Management and Communication

Apply engineering management principles, work effectively as an individual or in a team, and communicate clearly on activities.

P07: Lifelong Learning

Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

**STUDY AND EVALUATION SCHEME FOR PLASTIC MOULD TECHNOLOGY
FIFTH SEMESTER**

SR. NO.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME PERIODS/WEEK			CREDITS	MARKS IN EVALUATION SCHEME										TOTAL MARKS OF INTERNAL & EXTERNAL
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
			L	T	P		TH	PR	TOT	TH	HRS	PR	HRS	TOT			
5.1	Polymer Additives & Compounding	Program Core (Theory)	3	-	-	3	40	-	40	60	3	-	-	60	100		
5.2	Industrial Management and Entrepreneurship Development	Program Core (Theory)	3	-	-	3	40	-	40	60	3	-	-	60	100		
5.3	Plastics Testing-II	Program Core (Practicum)	2	-	4	4	-	60	60	-	-	40	3	40	100		
5.4	Program Elective – I (Any One)	Program Core (Theory)	3	-	-	3	40	-	40	60	3	-	-	60	100		
5.5	Program Elective – II (Any One)	Program Core (Practicum)	2	-	3	3	-	60	60	-	-	40	3	40	100		
5.6	** Summer Internship-II (4 - 6 Weeks)	Summer Training/Internship	-	-	-	2	-	60	60	-	-	40	3	40	100		
5.7	Open Elective-III 5.7.1 Artificial Intelligence 5.7.2 Disaster Management	Open Elective-III	2	-	-	2	50		50	-	-	-	-	-	Qualifying		
	Advanced Skill Certification-III																
5.8	*Indian Constitution	Audit Course	2	-	-	-	50	-	50	-	-	-	-	-	Qualifying		
#Student Centered Activities			-	-	12	-	-	50	50	-	-	-	-	-	50		
Total			17	-	19	20	120	230	350	180	-	120	-	300	650		

** Students will present a seminar on their summer internship along with certificate, project and report.

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. Photography etc., Seminars, Declamation Contests, voluntary contribution in physical activities, Educational Field Visits, NCC, NSS, Cultural Activities and Self-Study. SCA periods can also be utilized for completing the syllabus in respective semester.

**STUDY AND EVALUATION SCHEME FOR PLASTIC MOULD TECHNOLOGY
SIXTH SEMESTER**

A: NORMAL PATHWAY

SR. NO.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME PERIODS/WEEK			CREDITS	MARKS IN EVALUATION SCHEME									TOTAL MARKS OF INTERNAL & EXTERNAL
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P		TH	PR	TOT	TH	HRS	PR	HRS	TOT		
6.1	**Entrepreneurship and Startup	--	2	-	-	2	40	-	40	60	3	-	-	60	100	
6.2	Computer Aided Mould Design Lab	Program Core (Practical)	0	-	6	3	40	-	40	-	3	60	-	60	100	
6.3	Plastic Recycling & Waste Management	Program Core (Theory)	3	-	0	3	40	-	40	60	3	-	-	60	100	
6.4	*In-house Project	Project	-	-	24	12	-	240	240	-	-	160	-	160	400	
#Student Centered Activities			-	-	1	-	-	50	50	-	-	-	-	-	50	
TOTAL			5	-	31	20	120	290	410	120	-	220	-	340	750	

*Students will present a seminar on their project along with project report.

Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. Photography etc., Seminars, Declamation Contests, voluntary contribution in physical activities, Educational Field Visits, NCC, NSS, Cultural Activities and Self-Study. SCA periods can also be utilized for completing the syllabus in respective semester.

SIXTH SEMESTER
B: INTERNSHIP PATHWAY

SR. NO.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME PERIODS/WEEK			CREDITS	MARKS IN EVALUATION SCHEME									TOTAL MARKS OF INTERNAL & EXTERNAL
							INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P		TH	PR	TOT	TH	HRS	PR	HRS	TOT		
6.1	**Entrepreneurship and Startup (Online)	--	-	-	-	2	-	-		100	3	-	-	100	100	
6.2	*Industrial Internship 6.2.1 Industry Hands on Practice	Industrial Internship	-	-	-	8	-	-	-	-	-	-	-	-	350	
	6.2.2 Industrial Project					8		-	-	-	-	-	-	200		
	6.2.3 Seminar (In Institute)					2	-	100	100	-	-	-	-	100		
TOTAL			-	-	-	20	-	100	100	100	-	-	-	100	750	

***Students will present a seminar on Industrial Internship along with project report.**

NOTE:

1. The Industrial training tenure should not be less than 4 months.
2. Industry must be registered with MSME / Directorate of industries/Limited Organization/ State/Central Government establishments.
3. Monthly progress reports of Intern/ Trainee should be attested and forwarded by industrial supervisor (allotted to Intern/Trainee) during industrial Internship/Training.
4. The Industrial unit/organisation must evaluate students using the format provided by polytechnic in the form of marks.
5. The Industrial Hands on Practice, Industrial Project and seminar must be evaluated on the basis of the BTE Internship / Training Policy -2025.
6. "Entrepreneurship and Start-up" course is also mandatory in Industrial internship/training mode. It will be conducted online mode by his/her polytechnic institute. After completing the online course, students must appear for exam conducted by the Board of Technical Education, Lucknow.

PROGRAM ELECTIVE-I (FIFTH SEMESTER)**(Any one)**

SR. NO.	SUBJECT NAME
5.4.1	Plastics Packaging
5.4.2	Technology of Elastomer
5.4.3	Plastic Composites

PROGRAM ELECTIVE-II (FIFTH SEMESTER)**(Any one)**

SR. NO.	SUBJECT NAME
5.5.1	Advance Plastics Processing Techniques
5.5.2	Advance Mold Manufacturing Techniques

OPEN ELECTIVE-III (FIFTH SEMESTER)

SR. NO.	SUBJECT NAME
1	Artificial Intelligence
2	Disaster Management
3	ANY COURSE OF MINIMUM 02 CREDIT FROM ● NPTEL ● MOOCS THROUGH SWAYAM ● AICTE-ELIS AND CENTRALLY FUNDED TECHNICAL INSTITUTES ● C-DAC ● CERTIFICATES CONDUCTED BY THE INSTITUTE OF NATIONAL IMPORTANCE (IIT, NIT, IIT ETC.) ● ISRO E-LEARNING ● OTHER RELEVANT GOVERNMENT, INTERNATIONAL/NATIONAL PLATFORMS OF REPUTE, NEILIT ● COURSE RUN BY TATA TECHNOLOGY ESTABLISHED IN GOVERNMENT POLYTECHNICS.(Annexure:1)

5.1	POLYMER ADDITIVES & COMPOUNDING	L	T	P	C
THEORY		3	0	0	3

INTRODUCTION

Polymer Additives and Compounding is a critical subject in the field of polymer science, directly linking the chemical structure of materials with their performance, manufacturability, and real-world functionality. This topic serves as a bridge between polymer compounding and application, enabling students to understand how raw polymers are transformed into functional, commercially viable products.

COURSE OBJECTIVE

1. This course is to impart in-depth knowledge of polymer degradation mechanisms and the role of additives, fillers, and reinforcements in polymer formulations.
2. The course also aims to provide a strong understanding of processing aids, curing systems
3. To acquire Knowledge of Additives and their properties for modifying the properties of plastics & Compounding processes used for incorporating the additives
4. To understand about various compounding machinery used in the polymer industry
5. To modify and enhance the properties of polymers for specific applications.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the definition, function, purpose, and selection criteria of polymer additives.

CO2: Explain the definition, classification, role and chemical nature of plasticizers.

CO3: Classify fillers and fibres used in polymer composites based on different sources.

CO4: Demonstrate knowledge of polymer compounding techniques.

CO5: Explain desired properties of polymer additives, plasticizers, fillers for engineering and industrial applications.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	NA	1	NA	NA	2	*	*
CO2	3	2	NA	2	NA	NA	2	*	*
CO3	3	2	NA	2	1	NA	2	*	*
CO4	3	3	2	3	2	2	2	*	*
CO5	3	3	3	2	2	2	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I: (10 PERIOD)

Polymer Additives

Plasticizers, Stabilizers, Modifiers, Lubricants, Colourants, Antistatic agents Flame retardants, Blowing agents, Antioxidants, Antiozonants, UV absorber, UV stabiliser, Heat stabiliser etc.

UNIT-II: (10 PERIOD)

Plasticizers

Definition and classification of plasticizers, role of plasticizers chemical nature, theory of plasticization, efficiency of plasticizers.

UNIT-III : (10 PERIOD)

Fillers

Fillers: Types of fillers: Based on source – Based on reinforcement – Based on colour – Types of carbon black- Fibres – Types of fibres: Based on source – Natural fibre- Sisal fibre, Synthetic fibre Glass fibre and its types – Carbon fibre and its types – Aramid fibre and its types – Nano filler vs conventional filler

Unit-IV

Compounding (12 PERIOD)

Introduction to compounding, difference between mixing and compounding, properties of plasticised compound, Preparation of pre-mix, Two-Roll Mill, High Speed Mixers, Banbury Mixer, Dry blending, Kneader, Extruders, etc.

Text Books:

1. Holloway - Composite materials – Elsevier, Amsterdam, 1966.

References:

1. Brian Parkyn – Glass Reinforced Plastics , 1970.
2. Gibbs & Cox – Marine Design Manual for FRP- McGraw Hill Book Co. – 1960.
3. P.Ghosh – Fiber science and technology – Tata McGraw Hill, New Delhi, 2004
4. Geoffery Pritchard – Reinforced Plastics Durability – Wood head Publishing – 2000
5. R.H.Sonneborn - Fiberglass Reinforced Plastics – Reinhold, New York, 19

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted(%)
1	10	25
2	10	25
3	10	25
4	12	25
Total	42	100

5.2	INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
THEORY		3	0	0	3

Rationale

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mindset with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the concept, need, qualities, and functions of an entrepreneur and analyze barriers in entrepreneurship.

CO2: Identify and utilize support schemes by national, state, and district-level entrepreneurial agencies.

CO3: Evaluate ideas and convert them into viable business opportunities considering product selection criteria.

CO4: Explain the definitions, importance, and functions of management.

CO5: Explain the concept of leadership and motivation & management scope in different areas.

CO6: Explain the importance of healthy work culture.

CO7: Explain the basics of accounting and finance.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
CO1	3	3	1	NA	2	2	1	*	*
CO2	3	1	1	NA	2	3	NA	*	*
CO3	2	3	3	NA	2	3	NA	*	*
CO4	3	1	1	NA	1	2	1	*	*
CO5	2	2	2	NA	1	3	NA	*	*
CO6	1	1	1	NA	3	2	1	*	*
CO7	3	1	2	NA	1	3	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

SECTION – A

ENTREPRENEURSHIP

UNIT-I: Introduction

(04 Periods)

- 1.1 Concept /Meaning and its need
- 1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship
- 1.3 Sole proprietorship and partnership forms and other forms of business organisations
- 1.4 Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

UNIT-II: Market Survey and Opportunity Identification/Ideation

(04 Periods)

- 2.1 Scanning of the business environment
- 2.2 Salient features of National and Haryana State industrial policies and resultant business opportunities
- 2.3 Types and conduct of market survey
- 2.4 Assessment of demand and supply in potential areas of growth
- 2.5 Identifying business opportunity
- 2.6 Considerations in product selection
- 2.7 Converting an idea into a business opportunity

UNIT-III: Project report Preparation

(04 Periods)

- 3.1 Preliminary project report
- 3.2 Detailed project report including technical, economic and market feasibility
- 3.3 Common errors in project report preparations
- 3.4 Exercises on preparation of project report
- 3.5 Sample project report

SECTION –B MANAGEMENT

UNIT-IV: Introduction to Management

(04 Periods)

- 4.1 Definitions and importance of management
- 4.2 Functions of management: Importance and process of planning, organising, staffing, directing and controlling
- 4.3 Principles of management (Henri Fayol, F.W. Taylor)
- 4.4 Concept and structure of an organisation
- 4.5 Types of industrial organisations and their advantages
- 4.6 Line organisation, staff organisation
- 4.7 Line and staff organisation
- 4.8 Functional Organisation

UNIT-V: Leadership and Motivation

(04 Periods)

- 5.1 Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders
- 5.2 Motivation: Definition and characteristics, Importance of self motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas,

McGregor)

UNIT-VI: Management Scope in Different Areas (10 Periods)

6.1 Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods

6.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ

6.3 Marketing and sales: Introduction, importance, and its functions, Physical distribution, Introduction to promotion mix, Sales promotion

6.4 Financial Management: Introductions, importance and its functions, knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

UNIT-VII: Work Culture (04 Periods)

7.1 Introduction and importance of Healthy Work Culture in organization

7.2 Components of Culture

7.3 Importance of attitude, values and behavior

7.4 Behavioural Science – Individual and group behavior.

7.5 Professional ethics – Concept and need of Professional Ethics and human values.

UNIT-VIII: Basic of Accounting and Finance (04 Periods)

8.1 Basic of Accounting: Meaning and definition of accounting, Double entry system of book keeping, Trading account, PLA account and balance sheet of a company

8.2 Objectives of Financial Management: Profit Maximization v/s Wealth Maximization

UNIT-IX: Miscellaneous Topics (04 Periods)

9.1 Total Quality Management (TQM): Statistical process control, Total employees Involvement, Just in time (JIT)

9.2 Intellectual Property Right (IPR) : Introduction, definition and its importance, Infringement related to patents, copy right, trade mark

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg

6. E-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted(%)
1	04	10
2	04	10
3	04	10
4	04	10
5	04	10
6	10	20
7	04	10
8	04	10
9	04	10
Total	42	100

5.3	PLASTICS TESTING -II	L	T	P	C
Practicum		2	0	4	4

RATIONALE

This course provides essential knowledge and practical skills for evaluating the electrical, optical, and chemical properties of polymers. Accurate testing is vital for material selection, quality control, and product development. By understanding standard test methods and equipment, students are prepared to meet industry demands in polymer processing and application. Also, various product testing as per the given standard

COURSE OBJECTIVE

1. Understand the electrical, optical, chemical, and mechanical properties of polymers through standard test methods.
2. Learn to operate and interpret data from various testing equipment used in polymer characterisation.
3. Gain practical knowledge in conducting tests such as dielectric strength, transmittance, flammability, and biodegradation.
4. Evaluate the performance and durability of plastic products under environmental and mechanical stress.
5. Interpret and apply national and international testing standards (e.g., IS, ASTM, UL) for plastic materials and products.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the electrical and optical properties of polymers.

CO2: Determine the chemical resistance and flammability characteristics properties of polymers,.

CO3: Assess the weathering behaviour of plastics.

CO4: Evaluate the biodegradation characteristics of polymer films.

CO5: Perform testing of plastic products such as pipes, films, tanks, woven sacks, and containers.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
C01	3	1	1	2	1	1	1	*	*
C02	3	3	1	2	2	1	1	*	*
C03	2	2	1	2	3	1	1	*	*
C04	2	2	1	2	3	1	2	*	*
C05	3	2	2	3	2	2	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Unit I: ELECTRICAL AND OPTICAL PROPERTIES OF POLYMERS (10 Periods)

Electrical properties: Requirements of an insulator – Dielectric strength, equipment and procedure – Factors affecting Dielectric strength. – Arc resistance – equipment and procedure. Optical properties: Light Transmittance and Haze – equipment and procedure – Gloss – equipment and procedure.

Experiment

1. Identifying Dielectric Strength
2. Evaluation of the Accelerated Weathering Effect
3. Determination of Transmittance of given sample

UNIT -II: CHEMICAL & FLAMMABILITY PROPERTIES (10 Periods)

Chemical properties: Solvent stress cracking resistance – equipment and procedure – Environmental Stress Cracking Resistance (ESCR) – equipment and procedure, Volatile Content, Ash Content, Filler content, carbon black content, Introduction to Flammability test, Flammability Test as Per UL 94, Limiting oxygen index, smoke density.

EXPERIMENT

1. Determination of Ash Content of the given material
2. Determination of CBC content of the given material
3. Determination of Flammability of characteristics as per UL 94

UNIT III: WEATHERING AND BIODEGRADATION CHARACTERISTICS (04 Periods)

Introduction to weathering, environmental factors affecting plastics, Long-term weathering, Accelerated weathering test. Test method for Bio degradation, resistance to biodegradation, criteria for evaluation of biodegradable characteristics.

EXPERIMENT

1. Evaluation of the Biodegradation of Film
2. Evaluation of the Accelerated Weathering effect,

UNIT IV: TESTING OF PLASTIC PRODUCT (04 Periods)

Testing of the Plastics product as per standard, Testing of Pipe, Testing of Water Tank, Woven Sacks, Plastics Films, Testing Plastics Bottles Containers, carets for milk sachets.

EXPERIMENT

1. Testing of Pipe as per BIS Standard IS 4984/IS 4985
2. Testing of Plastic Film

INSTRUCTIONAL STRATEGY

The teacher should give small assignments to the students. Give industrial-based practical problems for material and Testing

MEANS OF ASSESSMENT

Assignments and quiz/class tests

Mid-term and end-term written test

Text Book

1. Textbook on Fundamentals of Plastics Testing - Prof. (Dr.) S.K.Nayak
2. Handbook of Plastics Testing Technology (Society of Plastics Engineers Monographs), Vishu Shah (Author) 2nd Revised edition, Wiley–Blackwell **18 November 1998**

Reference

1. Simple Methods for Identification of Plastics, Dietrich Braun (Author) 4th Revised ed., Carl Hanser Verlag GmbH & Co **4 April 2013**

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	10	30
2.	10	30
3.	04	20
4.	04	20
Total	28	100

5.4	PROGRAM ELECTIVE- I (ANY ONE) 5.4.1 PLASTIC PACKAGING	L	T	P	C
THEORY		3	0	0	3

INTRODUCTION

Plastic packaging is widely used for protecting and storing products such as food, medicines, and consumer goods. It is lightweight, strong, economical, and easy to manufacture in different forms. Plastic packaging helps in maintaining product quality and shelf life.

COURSE OBJECTIVE

After completing the course, students will be able to:

- Understand basic plastic packaging materials and types.
- Identify common plastic packaging applications.
- Learn basic manufacturing processes used in plastic packaging.
- Understand recycling and environmental aspects of plastic packaging.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the fundamental concept of plastic packaging.

CO2: Describe the scope of plastic packaging.

CO3: Describe the packaging design and phases of development.

CO4: Explain packaging materials and technology.

CO5: Analyze ancillary materials for packaging.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	NA	1	1	1	*	*
CO2	3	1	1	NA	2	1	1	*	*
CO3	2	2	3	1	2	2	1	*	*
CO4	3	1	2	2	1	1	1	*	*
CO5	2	3	2	1	2	1	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(12 Periods)

Fundamentals of Packaging:

Packaging Concepts, Food Packaging, Automobile Packaging, Cosmetic Packaging, Pharmaceutical Packaging, Classification of Packaging, Types of Packaging, Functions of Packaging Status of Packaging Industry, India and International and Export Packaging, Principles, Functions, Concept and Modern Role of Packaging.

UNIT-II

(10 Periods)

Packaging Design and Development:

Factors and Criteria, Product and Packaging, Materials Design and Characteristics, Introduction to Global & Indian Packaging Industry scenario, Concept of Packaging Design and Sustainable Package Design

UNIT-III

(10 Periods)

Packaging Materials and Technology:

Paper, Paper Boards, Metal, Glass, Plastic, Flexible, Composites, Basic Concept
Printing on Packaging, Various Types of Packaging Machinery.

UNIT-IV

(10 Periods)

Ancillary Materials:

Labels, Caps/Closures, Reinforcements, Adhesives, Corrosion Preventives, Marking and Coding, Bar codes.

REFERENCES:

1. Packaging hand book.
2. Food Packaging Technology.

3. Hand book of printing, packaging and lamination.

4. Plastic film in food Packaging

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	12	35
2.	10	25
3.	10	20
4.	10	20
Total	42	100

5.4	PROGRAM ELECTIVE- I (ANY ONE) 5.4.2 TECHNOLOGY OF ELASTOMERS	L	T	P	C
THEORY		3	0	0	3

INTRODUCTION

Elastomers are polymeric materials that possess high elasticity and flexibility. They are widely used in products such as tyres, tubes, seals, hoses, belts, and footwear. The technology of elastomers deals with the study of elastomeric materials, their properties, processing methods, and applications in various industries.

COURSE OBJECTIVE

After completing the course, students will be able to:

- Understand the basic properties and types of elastomers.
- Learn processing and compounding techniques of elastomers.
- Identify applications of elastomers in industrial products.
- Understand basic testing and quality control of elastomer products.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the fundamental concepts of elastomers.

CO2: Describe the composition, processing, properties, and applications of natural rubber.

CO3: Explain the principles of rubber compounding and vulcanization methods.

CO4: Explain the fundamentals of thermoplastic elastomers (TPE).

CO5: Identify and compare different natural and synthetic elastomers.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	NA	1	1	1	*	*
CO2	3	2	1	1	2	1	1	*	*
CO3	3	2	2	1	1	2	1	*	*
CO4	3	1	2	1	1	1	1	*	*
CO5	2	3	2	NA	2	1	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(10 Periods)

Elastomer Fundamentals:

Definition, types of Elastomer, Cross-linking, molecular structure, Properties: elasticity, viscoelasticity, and stress-strain behaviour, Applications of Elastomers in different sectors.

Introduction of natural Rubber latex, composition, coagulation, Processing of latex, Properties and application of natural rubber.

UNIT-II

(10 Periods)

Rubber Compounding:

Vulcanization, curing agents, accelerators, filler, vulcanization method and techniques, role of filler and additive, scorch time, Factors influencing the properties of elastomers during processing, such as temperature, pressure, and additives.

UNIT-III

(10 Periods)

Thermoplastic Elastomer:

Fundamental of thermoplastic Elastomer (TPE), Classification and types of TPEs, static and dynamic vulcanisations, Properties and applications of thermoplastic elastomers.

UNIT-IV

(12 Periods)

Classification & Applications of Elastomers:

Detailed study of specific elastomers like natural rubber, synthetic rubbers (SBR, BR, nitrile rubber, neoprene), silicones, polyurethanes, etc., and their specific applications. Elastomer Degradation and Recycling.

REFERENCES:

1. Handbook of thermoplastic elastomer.
2. Advance in elastomer
3. Elastomer Technology handbook.
4. Handbook of speciality elastomer
5. Handbook of plastic, elastomer and composite.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	10	20
2.	10	20
3.	10	25
4.	12	35
Total	42	100

5.4	PROGRAM ELECTIVE- I (ANY ONE) 5.4.3 PLASTICS COMPOSITES	L	T	P	C
THEORY		3	0	0	3

INTRODUCTION

This subject provides an idea about the plastic composites and its applications. Plastic composites are advanced engineering materials made by combining a polymer matrix with reinforcing materials.

COURSE OBJECTIVE

After completing the course, students will be able to:

- Understand the fundamentals, classification, and properties of plastic composite materials.
- Identify various types of polymer matrices and reinforcing materials.
- Explain the manufacturing processes used for producing plastic composite products.
- Understand the industrial applications of plastic composites in different sectors.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the fundamentals, classification, advantages & applications of plastic composites.

CO2: Identify different matrix and reinforcement materials used in plastic composites.

CO3: Explain the manufacturing processes of plastic composites.

CO4: Select suitable plastic composite materials and processing techniques.

CO5: Apply the knowledge of plastic composites in various industrial sectors.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	NA	NA	NA	NA	1	*	*
CO2	3	2	2	NA	1	NA	1	*	*
CO3	2	3	3	2	1	1	1	*	*
CO4	2	3	3	2	2	1	1	*	*
CO5	2	2	2	1	3	3	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(10 Periods)

Introduction to plastics composite:

Definition of plastics composite, Classification of composite, Advantages of plastics composite & Applications.

UNIT-II

(10 Periods)

Matrix and reinforcement:

Definition of matrix and reinforcement materials, Plastics materials used as matrix, Reinforcing materials: natural fibres, glass fibres, carbon fibres, graphenes, Kevlar fibres, properties and applications.

UNIT-III

(10 Periods)

Processing of plastics composite:

Extrusion, Manufacture of DMC, SMC and prepreg – Hand layup process – Filament winding process – Vacuum bag moulding – Compression moulding – Resin transfer moulding etc.

UNIT-IV

(12 Periods)

Applications:

Applications of plastics composite: Aerospace, Transport, Marine, Building, Industry, Electronic and electrical energy, Biomedical industry.

REFERENCES:

1. Composite Materials: Science and Engineering, 3rd Edition, Springer, 2012.
2. Handbook of Composites, Springer.
3. Callister's Materials Science and Engineering (Adopted by R. Balasubramaniam), Wiley Publication.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	10	20
2.	10	20
3.	10	25
4.	12	35
Total	42	100

5.5	PROGRAM ELECTIVE- II (ANY ONE) 5.5.1 ADVANCE PLASTIC PROCESSING TECHNIQUES	L	T	P	C
Practicum		2	0	3	3

INTRODUCTION

Advanced plastics recycling, also called chemical recycling, refers to several different technologies that convert post-use plastics into their original building blocks, to produce new plastics, chemicals, and other valuable products.

COURSE OBJECTIVE

- To meet industry demands modern industries require high-performance plastic products with precise quality, strength, and design. advanced techniques help achieve this.
- To work with complex materials and products new polymers and composites need specialized processing methods like gas-assisted injection molding, co-extrusion, or multi-layer blow molding.
- To improve product quality and efficiency advanced processing helps reduce defects, minimize waste, and improve surface finish, strength, and dimensional accuracy.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the principle and process of advanced blow moulding.

CO2: Analyze advanced extrusion process.

CO3: Describe co-extrusion and its application.

CO4: Explain the fundamentals of reaction injection moulding (RIM).

CO5: Explain and compare non-conventional injection moulding processes.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	2	1	1	1	1	*	*
CO2	3	3	2	2	1	1	1	*	*
CO3	3	2	2	2	2	1	1	*	*
CO4	3	2	2	1	1	1	1	*	*
CO5	3	3	2	1	1	1	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT 1:

(07 Periods)

Advanced blow moulding processes:

Stretch blow moulding:- Introduction, Single stage & two stage processes and its comparison, Orientation and stretch ratio, Pre-forming, Extrusion stretch blow moulding.

Co-extrusion blow moulding: Co-extrusion equipment and Process. Miscellaneous blow moulding processes:- Neck ring process, Drape process, Dip/displacement processes, Blow moulding of irregular profiles.

Experiment

1. Study of Stretch Blow Moulding Machine
2. Comparison of Single Stage and Two Stage Stretch Blow Moulding
3. Study of Co-extrusion Blow Moulding Equipment

UNIT 2:

(07 Periods)

Advanced extrusion techniques:

Advanced extruder machine features:- Intermeshing and Non-Intermeshing, Twin screw extruder, Counter rotating and co-rotating twin screw extruder, Vented screw extruder designs, Internal Bubble cooling.

Co-extrusion:- Co-extrusion structures, Advantages of co-extrusion products, Applications of co-extruded products.

Specialized processes:- Reinforced pipes, Nylon braided pipes, Hose pipe, Fishing net, Heat shrink film, Cling film, Corrugated sheets and pipes.

Experiment

1. Study of Twin Screw Extruder
2. Study of Vented Extruder
3. Study of Co-extrusion Die

UNIT 3:

(07 Periods)

Advanced injection moulding processes:**Reaction injection moulding (RIM):**

Introduction to RIM process, Materials and additives, Features of RIM process and variables, Flow diagram of RIM process, Merits and demerits of RIM process.

Experiment

1. Study of Reaction Injection Moulding (RIM) Setup
2. Study of Process Variables
3. Comparison of Conventional Injection Moulding and RIM

UNIT 4:

(07 Periods)

Non conventional injection moulding process:

Gas-assisted injection moulding, Sandwich injection moulding, Structural foam injection moulding, Metal filled, Multicolour moulding, Injection moulding of reinforced thermoplastics.

Experiment

1. Study of Gas-Assisted Injection Moulding
2. Study of Sandwich Injection Moulding
3. Study of Multi-colour Injection Moulding

REFERENCES:

- 1-Plastics Blow moulding hand book, authors by Norman lee, publication by Rapra Technology Limited.
- 2-Blow moulding of plastics, authors by E G Fisher, publication by The Plastics Institute.
- 3-Hand book of plastic processing technology, authors by D. V. Rosato, publication by Springer.
- 4-Blow moulding hand book, authors by Rosato & Rosato, publication by Hanser Publishers.
- 5-Plastics Extrusion Technology, authors by Fried helm Hence, publication by Hanser Publishers.
- 6-Polymer Extrusion, authors by Chris Rauwendaal, publication by Hanser Verlag.
- 7-Extrusion of Plastics, authors by Fisher, publication by The Plastics Institute.
- 8-Plastics Engineering Hand book, authors by Bearins.
- 9-Plastics processing data hand book, authors by Rosato & Rosato.
- 10-Fundamentals of RIM, authors by Macosko.
- 11-Developments in injection moulding, authors by Whelen and goff.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	07	25
2.	07	25
3.	07	25
4.	07	25
Total	28	100

5.5	PROGRAM ELECTIVE- II (ANY ONE) 5.5.2 ADVANCE MOULD MANUFACTURING TECHNIQUES	L	T	P	C
Practicum		2	0	3	3

INTRODUCTION

Advanced mould manufacturing techniques involve modern methods like high-speed CNC machining, EDM, Wire-cut EDM, and 3D printing to produce precise and complex moulds. These techniques improve accuracy, reduce production time, and support the creation of high-quality plastic components. With the use of CAD/CAM, automation, and simulation, mould making becomes faster, more efficient, and suitable for today's demanding industrial applications.

COURSE OBJECTIVE

This course focuses on the advanced methodologies and technologies employed in the design and manufacturing of plastic moulds. It emphasizes the integration of computer-aided tools and modern machining techniques to enhance the efficiency and precision of mould production.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain advanced CNC machining systems.

CO2: Apply CAD/CAM/CAE tools for mould design, simulation, and manufacturability analysis.

CO3: Develop process plans and perform cost analysis for mould manufacturing.

CO4: Design jigs, fixtures, and gauges to improve accuracy, repeatability, and efficiency.

CO5: Implement quality control and quality assurance techniques.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	1	2	1	1	1	*	*
CO2	3	2	3	3	1	1	1	*	*
CO3	2	2	2	1	1	3	1	*	*
CO4	3	2	3	2	1	2	1	*	*
CO5	2	2	1	2	2	2	1	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(05 Periods)

Understand Advanced Machining Techniques: Gain proficiency in operating CNC machines, including turning and milling, for the fabrication of mould components.

Experiment

1. Study of CNC Turning Machine Operation
2. Study of CNC Milling Machine Operation

UNIT-II

(05 Periods)

Utilize CAD/CAM/CAE Tools: Apply computer-aided design, manufacturing, and engineering software for designing and simulating moulds, ensuring optimal performance and manufacturability.

Experiment

1. Study of CAM Tool Path Generation
2. Study of CAM Tool Path Generation

UNIT-III

(06 Periods)

Implement Process Planning and Cost Analysis: Develop process plans for mould manufacturing and conduct cost analyses to ensure economic feasibility.

Experiment

1. Study of Process Planning for a Plastic Injection Mould
2. Study of Cost Estimation of a Mould Component

UNIT-IV

(06 Periods)

Design Jigs, Fixtures, and Gauges: Create supportive tools to enhance the accuracy and efficiency of the mould manufacturing process.

Experiment

1. Study of Design of a Drilling Fixture
2. Study and Measurement Using Gauges

UNIT-V

(06 Periods)

Apply Quality Control Measures: Understand and implement quality assurance practices to maintain high standards in mould production.

Experiment

1. Study of Dimensional Inspection of Mould Components
2. Study of Preparation of Quality Inspection Report

REFERENCE BOOKS FOR ADVANCED MOULD MANUFACTURING TECHNIQUES

1. "Injection mould design"
Author: R.G.W. Pye
Description: a classic book covering detailed design aspects of moulds, materials, and cooling systems.
2. "Plastic Mould Engineering Handbook"
Author: D.V. Rosato
Description: comprehensive guide on mould types, design principles, and advanced processing techniques.
3. "Tool And Manufacturing Engineers Handbook – Volume 2: Forming"
Publisher: Society Of Manufacturing Engineers (Sme)
Description: covers advanced tooling and die/mould manufacturing practices, including cnc and edm.
4. "Mould Making Handbook"
Authors: Günter Mennig & Karsten Günther
Description: a modern handbook covering cad/cam, high-speed machining, and rapid tooling.
5. "Fundamentals Of Tool Design"
Author: C. Thomas Olivo
Publisher: Sme

description: useful for understanding tool and die design with modern manufacturing technologies.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	05	20
2.	05	20
3.	06	20
4.	06	20
5.	06	20
Total	28	100

5.6	Summer Internship-II (4-6 Weeks) after IVth Sem.	L	T	P	C
SI-II		0	0	0	2

RATIONALE

It is needless to emphasize further the importance of Industrial/summer Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

DETAILED CONTENT

This document includes guided and supervised industrial/summer training of 4-6 weeks duration to be organised during the semester break starting after first year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An Internal & External assessment of 60 & 40 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of summer training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity	15%
b) Initiative in learning new things	15%
c) Presentation and Viva	15%
d) Industrial training report	55%

5.7	OPEN ELECTIVE- III/Advanced Skill Certification-III (ANY ONE) 5.7.1 ARTIFICIAL INTELLIGENCE	L	T	P	C
Qualifying		2	0	0	2

RATIONALE

Introducing AI at the diploma level enables students to understand the fundamentals of intelligent systems, machine learning, decision-making algorithms, and data-driven technologies. The subject provides insights into how machines can simulate human intelligence to perform tasks like speech recognition, vision processing, problem-solving, and autonomous control.

COURSE OBJECTIVE

The objective of the course is to:

- Describe the scope and applications of AI in different fields.
- Understand the basic concepts of machine learning and intelligent agents.
- Apply basic search and logic algorithms to solve engineering problems.
- Analyze the role of data in training and testing AI models.
- Demonstrate awareness of AI's ethical, societal, and environmental impacts.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the fundamentals of Artificial Intelligence and its applications in engineering and industry.

CO2: Analyse intelligent agents and different types of environments for solving AI-based problems.

CO3: Apply search algorithms to solve simple AI problems.

CO4: Explain the concepts of fuzzy logic, membership functions for intelligent decision-making systems.

CO5: Describe the structure and working of artificial neural networks.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	NA	NA	2	1	2	*	*
CO2	3	3	2	NA	1	1	2	*	*
CO3	2	3	3	2	NA	1	2	*	*
CO4	3	2	2	3	2	NA	2	*	*
CO5	3	2	3	3	1	1	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(06 Periods)

Introduction to Artificial Intelligence:

- Artificial Intelligence (AI) definition
- Goals of AI
- History of AI
- Applications of AI

UNIT-II

(06 Periods)

Agents and Environments:

- Agent Terminology
- Types of Agents – Simple Reflex Agents, Model Based Reflex Agents, Goal Based Agent
- Nature of Environments, Properties of Environments

UNIT-III

(06 Periods)

Search Algorithms Terminology:

- Brute Force Search Strategies – Breadth First Search, Depth First Search
- Heuristic Search Strategies, Local Search Algorithms

UNIT-IV

(05 Periods)

Fuzzy Logic Systems:

- Introduction to Fuzzy Logic and Fuzzy systems
- Membership functions
- Fuzzification/Defuzzification.

UNIT-V

(05 Periods)

Neural Networks:

- Basic structure of Neural Networks
- Perceptron
- Back-propagation

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial and start- up qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organizations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests

REFERENCES:

- Artificial Intelligence By Example: Develop machine intelligence from scratch using real artificial intelligence use cases Denis Rothman Packt Publishing ISBN – 978-1788990547
- Artificial Intelligence by E. Balagurusamy
- Artificial Intelligence: A Simplified Approach by Sinha, P.Royston
- Introduction to Artificial Intelligence by Dan W. Patterson.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	06	20
2.	06	20
3.	06	20
4.	05	20
5.	05	20
Total	28	100

5.7	OPEN ELECTIVE- III/Advanced Skill Certification-III (ANY ONE) 5.7.2 DISASTER MANAGEMENT	L	T	P	C
Qualifying		2	0	0	2

RATIONALE

Disaster Management is an essential subject because it equips individuals and communities with the knowledge and skills needed to prepare for, respond to, and recover from natural and human-made disasters. As disasters such as earthquakes, floods, cyclones, fires, pandemics, and industrial accidents become more frequent and impactful, understanding disaster risk reduction is increasingly important.

COURSE OBJECTIVE

The objective of the course is:

- To learn about various types of natural and man-made disasters
- To know pre- and post-disaster management for some of the disasters
- To know about various information and organizations in disaster management in India
- To get exposed to technological tools and their role in disaster management

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

C01: Explain the fundamental concepts of disasters, hazards, vulnerability, risk, capacity.

C02: Classify various types of natural, technological, and human-induced disasters.

C03: Apply the principles of the disaster management cycle for effective disaster risk reduction.

C04: Explain the disaster management framework in India for intelligent decision-making systems.

C05: Describe the applications of science and technology for disaster management.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
C01	3	2	NA	NA	3	1	2	*	*
C02	2	3	2	1	3	1	2	*	*
C03	2	3	3	2	3	2	2	*	*
C04	3	2	2	NA	3	3	2	*	*
C05	2	2	3	3	3	1	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(04 Periods)

Understanding Disaster:

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity –Disaster and Development, and disaster management.

UNIT-II

(08 Periods)

Types, Trends, Causes, Consequences and Control of Disasters:

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Man made Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends–Emerging Risks of Disasters–Climate Change and Urban Disasters.

UNIT-III

(06 Periods)

Disaster Management Cycle and Framework:

Disaster Management Cycle–Paradigm Shift in Disaster Management. Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre –Incident Command System – Relief and Rehabilitation –Post-disaster–Damage and Needs Assessment, Restoration of Critical Infrastructure–Early Recovery –Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Frame- work of Action.

UNIT-IV

(06 Periods)

Disaster Management in India:

Disaster Profile of India–Mega Disasters of India and Lessons Learnt. Disaster Management Act 2005 Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies.

UNIT-V

(04 Periods)

Applications of Science and Technology for Disaster Management:

Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non-Structural Mitigation of Disasters; S&T Institutions for Disaster Management in India.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial and start- up qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organizations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests

REFERENCES:

- Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
- Srivastava, H.N., and Gupta G.D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
- Alexander, David, Natural Disasters, Kluwer Academic London
- Ghosh, G.K., Disaster Management, APH Publishing Corporation
- Murthy,D.B.N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	04	15
2.	08	30
3.	06	20
4.	06	20
5.	04	15
Total	28	100

5.8	(AUDIT COURSE) INDIAN CONSTITUTION	L	T	P	C
Qualifying		2	0	0	0

RATIONALE

The rationale of the Indian Constitution is to create a sovereign, socialist, secular, democratic republic that guarantees justice, liberty, equality, and fraternity to all citizens. It provides the framework for governance, protects individual rights, promotes social harmony, and ensures the overall development of the nation. These ideals are most clearly expressed in the Preamble, which serves as the guiding philosophy of the Constitution.

COURSE OBJECTIVE

The objective of the course is to:

- Understand the history, principles, and key interpretations of the Indian Constitution.
- Understand the structure and key roles of the Indian Union Government.
- Understand the powers, and functions of the Lok Sabha, Rajya Sabha, and the Supreme Court.
- Understand the powers of the Governor, Chief Minister, Council of Ministers.
- Understand the structure and functions of local administration.
- Understand the structure, role, and functions of the Election Commission of India

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Explain the historical background, Preamble, Fundamental Rights of the Constitution of India.

CO2: Describe the structure, powers, and functions of the Union Government.

CO3: Explain the composition, powers, and functions of the Indian Parliament and the Supreme Court.

CO4: Describe the structure and functions of State Government, Local Administration.

CO5: Explain the structure, powers, and functions of the Election Commission of India.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	NA	NA	3	1	2	*	*
CO2	3	2	1	NA	2	3	2	*	*
CO3	3	3	2	NA	2	3	2	*	*
CO4	2	2	2	NA	3	3	2	*	*
CO5	3	2	1	NA	3	2	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I (06 Periods)

The Constitution – Introduction:

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation

UNIT-II (06 Periods)

Union Government:

- Structure of the Indian Union Government
- President – Election, Role and Power
- Prime Minister and Council of Ministers

UNIT-III (06 Periods)

Indian Legislature & Judiciary:

- Composition of Lok Sabha and Rajya Sabha
- Powers & Functions of Lok Sabha and Rajya Sabha
- Structure of Supreme Court including Appointment of Judges
- Powers & Functions of Supreme Court

UNIT-IV (03 Periods)

State Government:

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

UNIT-V (04 Periods)

Local Administration:

- District Administration
- Municipal Corporation
- Zila Panchayat

UNIT-VI (03 Periods)

Election Commission:

- Structure of Election Commission of India
- Role and Function of Election Commission

INSTRUCTIONAL STRATEGY

Teach the Indian Constitution through interactive methods like case studies, debates, and role-plays to engage students. Use visuals and simplified texts to explain key features like fundamental rights and duties. Encourage discussions on amendments and landmark judgments. Incorporate quizzes and group projects to foster critical thinking and civic awareness.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests

REFERENCES:

- Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
- The Constitution of India, B.L. Fadia, Sahitya Bhawan; New edition (2017)
- Introduction to the Constitution of India, DD Basu, Lexis Nexis; Twenty-Third 2018 edition
- Our Constitution, Subhash Chand Kashyap, NBT New Delhi.

SUGGESTED SOFTWARE/LEARNING WEBSITES:

- <https://www.constitution.org/cons/india/const.html>
- <http://www.legislative.gov.in/constitution-of-india>
- <https://www.sci.gov.in/constitution>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	06	20
2.	06	20
3.	06	20
4.	03	10
5.	04	20
6.	03	10
Total	28	100

6.1	ENTREPRENEURSHIP AND START-UPS	L	T	P	C
Theory		2	0	0	2

RATIONALE

The subject of Entrepreneurship and Start-Ups is essential for diploma students as it fosters an entrepreneurial mindset and equips them with the skills needed to identify and capitalize on business opportunities. This subject encourages creativity, innovation, and critical thinking, which are crucial for developing new business ideas and solving real-world problems. By studying entrepreneurship, students learn how to create business plans, understand market dynamics, and manage resources effectively. This knowledge not only prepares them to start their own ventures but also makes them valuable assets in any organization by promoting intrapreneurship—innovation within a company.

COURSE OBJECTIVE

The objective of the course is to:

- Acquiring Entrepreneurial spirit and resource fullness.
- Familiarizing various uses of human resource for earning dignified means of living.
- Understanding the process of entrepreneurship and its contribution.
- Acquiring entrepreneurial quality, competency, and motivation.
- Learning the process and skills of creation and management of entrepreneurial venture

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

C01: Explain entrepreneurship concepts, traits, business structures, and intrapreneurship.

C02: Identify business opportunities and prepare a basic business plan for a start-up.

C03: Apply marketing, management, and strategic planning tools such as STP and SWOT.

C04: Explain organizational management practices, recruitment, training, financing options and intellectual property rights.

C05: Describe investor pitching, succession planning, dissolution, and harvesting strategies.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
C01	3	2	1	NA	2	2	3	*	*
C02	2	3	3	1	2	3	3	*	*
C03	2	3	3	2	2	3	2	*	*
C04	3	2	2	2	3	3	2	*	*
C05	2	2	3	1	3	3	3	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT-I

(05 Periods)

Introduction to Entrepreneurship and Start-ups:

Definitions, Classification of Entrepreneur, Traits of an Entrepreneur, Intrapreneurship, Motivation, Types of Business Structures- On the Basis of size and on the basis of ownership, Similarities/differences between entrepreneurs and managers.

UNIT-II

(05 Periods)

Business Ideas and their implementation:

Discovering ideas and visualizing the business, Activity map, Business Plan (Case Study).

UNIT-III

(05 Periods)

Ideas to Start-up:

Marketing and Accounting- Definition and Importance, Market Analysis – STP (Segmentation, Targeting, Positioning), Competition evaluation and Strategy Development – Vision, Mission, Goal, Objectives, Risk analysis- SWOT Analysis.

UNIT-IV

(05 Periods)

Management:

Definition Concept and Functions of Management, Company's Organization Structure- Concept and Classification, Recruitment and Selection- Definition, Training and Development- Importance.

UNIT-V

(04 Periods)

Financing and Protection of Ideas:

Financing methods available for Entrepreneurship/ Start-ups in India (Government Scheme, Banking, NBFCs, SHG and Micro Financing), Intellectual Property Rights- Overview of - Copyrights, Trademark, Geographical Indicators, Patenting and Licenses, Communication of Ideas to potential investors- Investor Pitch.

UNIT-VI

(04 Periods)

Succession, Dissolution and Harvesting strategy:

Ways of succession, Types of Dissolution.

INSTRUCTIONAL STRATEGY

To effectively teach Entrepreneurship and Start-Ups to diploma students, a variety of instructional strategies can be employed. Interactive lectures can be used to introduce key concepts, supported by visual aids such as diagrams and flowcharts to enhance understanding. Case studies and real-world examples can help students relate theoretical knowledge to practical applications.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Sessional test
- Actual Practical Performance
- Viva-voice

REFERENCES:

- The Start-up Owner's Manual: The Step-by-Step Guide for Building a Great Company, Steve Blank and Bob Dorf, K&S Ranch, ISBN-978-0984999392
- Entrepreneurship Development (A new Venture creation) Vasant Desai, Himalya Publication
- Entrepreneurship Development, Khanka S.S, S Chand & Company Limited New Delhi
- Entrepreneurship Development, Gupta and Srinivsan, S Chand & Company Limited New Delhi.

SUGGESTED SOFTWARE/LEARNING WEBSITES:

- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/>
- <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>
- NPTEL Course on Entrepreneurship https://onlinecourses.nptel.ac.in/noc23_mg74/preview

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1.	05	20
2.	05	20
3.	05	20
4.	05	20
5.	04	10
6.	04	10
Total	28	100

6.2	COMPUTER AIDED MOULD DESIGN LAB	L	T	P	C
PRACTICAL		0	0	6	3

RATIONALE

This subject will equip students with computer based design knowledge of die and mold for plastic processing. In this practical subject, the students are required to learn the basics of software such as Mechanical Desktop, Mould Creator, Mould Flow etc. and further to design at least 2 moulds for given components using these software.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Create and manage 2D CAD drawings by using coordinate systems & basic drawing commands.

CO2: Apply dimensioning techniques & plotting commands to prepare industry-ready engineering drawings.

CO3: Create and manage 3D CAD drawings by using coordinate systems & basic drawing commands.

CO4: Analyze CAD tools to design different moulds.

CO5: Integrate CAD standards, best practices, and modelling techniques.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	2	3	NA	NA	1	*	*
CO2	2	2	2	3	NA	NA	1	*	*
CO3	3	2	2	3	NA	NA	1	*	*
CO4	3	3	3	3	NA	1	2	*	*
CO5	3	2	3	3	NA	NA	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

1. Starting up, practice on – how to create a new drawing file, setting drawing limits and saving a file, drawing lines in different ways using absolute co-ordinates, user co-ordinates, WCS, UCS, drawing lines, circles, arcs, ellipses, polygons, splines, polylines, zoom commands.

2. Practice on Edit commands such as erase, copy, mirror, array, offset, rotate, oops, undo, redo, scale, stretch, trim, break, extend, chamfer, fillet
3. Practice on text commands, single line text, paragraph text, editing text, text size, text styles, changing properties commands
4. Practice on layer commands, creating layer, freeze, layer on/off colour assigning, making a layer, current layer, load line type, lock and unlock layer, move from one layer to other.
5. Practice on Hatching-Hatch pattern selection
6. Practice on dimensioning – linear dimensioning, angular dimensioning radius/diameter dimensioning, O-snap command, aligned dimensioning, editing of dimensioning, tolerances in dimensioning
7. Blocks and X-refs - How to make a block, how to insert a block, using block in any drawing, working with x-refs, x-ref options
8. Practice on print/plot commands. Export/import commands
9. Practice on making complete drawings of components by doing exercises
10. 3D view point, resin, 3d modeling; wire frame, solids, surface modeling; evaluation command, creating surfaces, union, subtraction, extrude commands; 3D array, mirror, rotate, align etc.

List of Practical's

1. To design hand injection mould
2. To design mould elements
3. To design Single impression Two plate mould
4. To design Multi Impression Two plate mould
5. To design Three plate mould (Multi Impression)
6. To design Split Mould.
7. Mould design for integrated undercuts

INSTRUCTIONAL STRATEGY

Stress should be given on the practical application of AutoCAD on mould design therefore students should be asked to design sample mould in AutoCAD.

RECOMMENDED BOOKS

1. AutoCad by RW Leigh, Galgotia, N.D.
2. Engineering Drawing with AutoCAD 2000 by T. Jaypooran, Vikas Publishing House
3. Auto CAD – 2004, Umesh Shethigan, Abdul Khader, Janatha Publishers
4. Auto CAD reference manuals by Autodek
5. Mastering CAD/CAM by Ibrahim Zeid
6. Computer Aided Analysis and design by Srinivasa Praksh Regalla

6.3	PLASTIC RECYCLING & WASTE MANAGEMENT	L	T	P	C
THEORY		3	0	0	3

RATIONALE

This subjects provides an idea about the recyclability & value addition by plastic waste in the environment. The impact of mishandling of the waste could lead a disastrous situation in the environment. Students will get InSite of the energy addition by the plastic waste system.

COURSE OUTCOMES (CO): After undergoing this course, the students will be able to:

CO1: Identify and classify sources, collection & sorting of plastic waste.

CO2: Explain and analyze plastics recycling methods and their applications in different sectors.

CO3: Describe the mechanical recycling processes.

CO4: Explain additives used in plastic waste recycling.

CO5: Evaluate the environmental impacts of plastics waste and apply knowledge of legislation.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Develop ment of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Manage ment	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	1	2	1	NA	1	*	*
CO2	3	2	2	2	2	NA	2	*	*
CO3	3	2	2	2	1	NA	1	*	*
CO4	2	2	2	1	2	NA	1	*	*
CO5	2	3	2	1	3	NA	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

UNIT –I

Plastics Wastes and its Separation

(12Periods)

Introduction – Sources of Plastics Waste – Collection of Plastics Waste – Sorting and segregation methods viz. simple identification techniques, Density Separation, Solvent Separation, Air classification, melt filtration and Equipment based sorting techniques.

UNIT –II

Plastics Waste Management Techniques

(10 Periods)

Plastics Recycling – 4 R & I approach – code of Practice – types of Recycling viz. Primary, Secondary, Tertiary and quaternary techniques with examples – Fuel from Plastics Waste - Energy recovery from Plastic Waste – Co-processing in cement kiln
Plastic Waste in Road Construction.

UNIT –III

Machinery and Value addition

(10 Periods)

Process flow chart by mechanical route - Basic Mechanical recycling Plant – Additives for improving quality of recycled products – value addition in Plastics recycling viz., PP/HDPE woven sacks to Pots, PE/PE multilayer film waste to moulded products.

UNIT – IV

Plastics Waste and Environment

(10 Periods)

Environmental issues and Guidelines for Recycling of Plastics Wastes – Environmental legislation in India.

INSTRUCTIONAL STRATEGY

Main focus of this subject must be plastic waste management and separation techniques. Teachers should visit a plastic waste management plant with students to workshop for physical observation and value addition by plastic waste.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests

RECOMMENDED BOOKS

- 1 Technical Manual on Plastics Processing –
- 2 Recycling & Plastics Waste Management – Dr. J S Anand
- 3 Environmental Engineering & Management – Suresh k. Dameja
- 4 E-books/e-tools/relevant software to be used as recommended by AICTE/ BTE/ NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	12	30
2	10	20
3	10	25
4	10	25
Total	42	100

6.4	PROJECT WORK	L	T	P	C
PROJECT		0	0	24	12

RATIONALE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

LEARNING OUTCOMES

After undergoing the project work, students will be able to:

Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place the learner for project oriented practical training in actual work situation for the stipulated period with a view to:

- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute-based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

General Guidelines

The project paper will be of two parts. Part-A will contain the problems to evaluate students learning. The Part-B will be regarding students awareness of the plans and programmes running for rural development, Ecological balance and Environmental pollution control.

Part-A

Choose any one problem of Mould for any type of plastic products used in daily life in commercial or domestic.

PART-B:

The student will survey a village and prepare a report giving details of population, Means of lively hood, Health and hygienic conditions, Education facilities and various Programmes/ projects running for the development and the personnel's and agencies involved in the work. He will also make observation on environmental pollution and ecological disturbances and will make a mention of that in his report with its reason, suggesting remedies or ways to minimize it. Without it the project will not be taken as complete. The student will also do some constructive work for pollution Control as advised by the guiding teacher.

GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- 10 Marks for general behavior and discipline (by HODs in consultation with all the teachers of the department)
- 10 Marks for attendance as per following: (by HODs in consultation with all the teachers of the department)
 - a) 75 - 80% 8 Marks
 - b) 80 - 85% 9 Marks
 - c) Above 85% 10 Marks
- 30 Marks maximum for Sports/ NCC/ Cultural/ Co-curricular/ NSS activities as per following: (by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 30 State/National Level participation
 - b) 25 Participation in two of above activities
 - c) 15 Inter-Polytechnic level participation

RESOURCE REQUIREMENT

PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Equipment requirement:

Following Laboratories are required for Diploma Program in Plastic Mould Technology

Equipment Requirement for Plastic Mould Technology

APPLIED PHYSICS LABORATORY			
Sr. No.	Description	Qty	Approx. Total Price (Rs)
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	3,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	3,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	3,000
4.	Mirrors (convex, concave and plane)	5 Each	1,500
5.	Pendulum Setup	03	6,000
6.	Gravesand's Apparatus	02	4,000
7.	Double Inclined Plane Setup	02	4,000
8.	D type Galvanometers Sensitivity: 20 microamperes per scale division,	10	10,000
9.	Resistance boxes (dial type) assorted	03	3,000
10.	Rheostats	02	1,000
11.	Stoke's Apparatus with all accessories	2	10,000
12.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
13.	Ohmic resistance coil	10	5,00
14.	Slide wire bridge with all accessories	2	8,000
15.	PN Junction diode Apparatus kit	2	10,000
16.	Numerical aperture setup	1	25,000
17.	Ohms law setup kit	2	4,000
18.	Series and parallel resistance combination kit	2	4,000

19.	Hooks law setup with pan and weights	2	3,000
20.	Optical bench with all accessories (setup) (with three holder in each setup)	2	7,000
21.	Mercury Thermometer measuring room temperature (range 0°C to 100°C)	5	3,000
22.	Coefficient of friction apparatus setup with pan and weights	2	4400
23.	Kirchhoff's law setup	2	5,000
24.	Miscellaneous (glycerin, glass slab for Snell's law, convex lens, optical fiber, bar magnet, compass needle, carbon composition resistors as per requirement .	LS	25,000
25	Digital Multimeter (AC & DC current & Voltage can be measured, resistance & capacitance can be measured .	05	10,000

APPLIED CHEMISTRY LABORATORY

Sr. No.	Description	Qty	Approx. Per Unit Price (Rs)
1.	Digital Balance	1	85,000
2.	Burette 50ml	30	250
3.	Pipette 25ml	60	200
4.	Beakers 100ml	60	200
5.	Burette stand	30	1,000
6.	Glazed tile	30	30
7.	Conical flask 50ml (Titration flask)	60	200
8.	Standard measuring flask 250/100ml	30	300
9.	Able's Flash Point apparatus	2	8,000
10.	(1/10)°C thermometer	06	1,000
11.	Candles	20	5
12.	Crucible with lid	06	700
13.	Muffle furnace	1	25,000
14.	Desiccator	06	3,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	150 200
16.	Digital hot plate with magnetic stirrer	2	17,000
17.	Conductivity meter with electrode	1	5,000
18.	Photo colorimeter	1	10,000
19.	Bomb calorimeter	1	1,30,000

20.	Ammeter (0-500mA)	5	800
21.	Rheostat (200ohm, 1A)	1	1,000
22.	Cuvette	20	800
23.	Copper electrode	1	6,500
24.	Salt bridge tube	5	800
25.	Zinc rod	1	1,000
26.	Voltameter (0-12V)	1	700
27.	DC variable voltage source(0-30V)	1	8,000
28.	Chemicals - EDTA-1 kg - Eriochrome Black-T(solochrome black T)-200g - Buffer solution (NH₃ - 2.5 ltr, NH₄Cl – 1 kg) - Zinc sulphate- 1kg - H₂SO₄- 2.5 ltr - Phenolphthalein indicator (as per requirement) - Methyl orange indicator (as per requirement) - Charcoal (as per requirement) - Kerosene (as per requirement) - KCl & agar-agar - Distilled water (as per requirement) - Cement - Ferrous ammonium sulphate - 40%Ammonium thiocyanate - Fuels(solid & Liquid) - Oxalic acid - Copper sulphate - NaOH - KMnO₄, Na₂CO₃, KOH, 2-Propanol - Hematite ore, copper pyrite ore - Hypo(Na₂S₂O₃) , 10% KI, CH₃COOH	LS	40,000
29.	Miscellaneous	LS	10,000

COMMUNICATION LAB

Sr. No.	Description	Qty	Approx. Total Price (Rs)
1.	Stools	40	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500

ENGINEERING WORKSHOP PRACTICE

S.No.	Description	Qty.	Approx. Total price (Rs.)
CARPENTRY SHOP			
1.	Work benches fitted with 4 carpenter vices 9"	5	60,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Bench drilling machine with different drill bits	1	8,500
6.	Wood turning lathe machine	1	40,000
7.	Wood planner	1	20,000
8.	Tool accessories measuring and marking instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500

PAINTING AND POLISHING SHOP			
1	Spray gun 1 Ltr. cup capacity with hose pipe	1	3,000
2	Paint brushes & rollers	20	3,000
3	Paint/varnish	LS	2,000
4	Air compressor with 2 hp motor	1 set	21,000
5	Miscellaneous	LS	2,000
WELDING SHOP			
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas cutting unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Portable welding machine (220 amp)	1	9,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000
8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000
10.	Soldering irons	3	1,000
11.	Pedestal grinder	1	3,000
12.	Angle grinder	1	3,000
13.	Metal spraying gun	1	10,000
14.	Spot welding machine	1	25,000
15.	Tig welding set	1	1,00,000
16.	Mig welding set	1	1,00,000
17.	Welding partition screen	5	2,500
18.	Miscellaneous	LS	3,000

FITTING AND PLUMBING SHOP			
1.	Work benches with vices (4 vices on each bench)	5	60,000
2.	Marking tables with scribes	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, v blocks, height, gauges steel rules and scribes	25	50,000
5.	Tool kits —taps, dies, drills, number punch, letter punch	25	40,000
6.	Tool kits — chisels, hammers, files, hacksaw	25	25,000
7.	Bench drilling machine 3 phase	1	10,000
8.	Hand drill machine	1	5,000
9.	Pipe vice	2	10,000
10.	Chain wrenches	2	2,000
11.	Bench grinder	1	6,500
12.	Ring spanner set	5	600
13.	Pipe die set 2"	2 set	2,000
14.	Pipe bending device	1	5,000
15.	Various plumbing fittings	LS	2,000
16.	Miscellaneous	LS	1,500
SHEET METAL SHOP			
1.	Hammers	8	3,000
2.	Mallets (hard & soft)	5	2,000
3.	Sheet and wire gauges	2	8,00
4.	Hand shearing machine	1	20,000
5.	Bar folding machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron)	1 Each	1,000
8.	Hand shears/snippers	4	2,000
9.	Nuts, bolts, rivets, screw	LS	1,000
10.	Miscellaneous	LS	2,000

INTRODUCTION TO IT SYSTEMS LAB /COMPUTER LAB

S.N.	Name of Equipment	No. of Equipment	Ap-prox. Total Price
1	Computer System with latest configuration	30	21,00,000
2	Printer (MFP)	1	25,000
3	Printer (Laser)	1	35,000
4	Antivirus Software	LS	10,000
5	Internet Facility on Computers	LS	2,00,000
6	LCD Projector	1	70,000
7	UPS	30	60,000
8	Software (latest MS Office, Others) A4,A3 Size	1	1,00,000
9	Scanner (A4,A3 Size)	1	10,000

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

S.N.	Instruments	Quantity	Approx. unit price (Rs.)
1	Voltmeter	6	3000
2	Ammeter	6	3000
3	Wattmeter	6	4000
4	Single Phase Transformer	1	10000
5	Single Phase Variac	1	4000
6	Resistive Load	1	4000
7	Digital Multi-meter	6	10000
8	Variable Choke coil	1	5000
9	Bread board	5	500
10	Soldering stations temperature controlled	1	10500
11	Soldering Set	2	3000
12	PN junction experimental kit	1	3500
13	Digital logic trainer	2	20000
14	Miscellaneous (PN junction diodes, resistors, capacitors, CRO probes, multipurpose PCB, connecting wires, different logic gate ICs, etc.)	LS	7000
15	Decade resistors, capacitors and inductor box	2 each	4500
16	D.C regulated power supply	2	8000
17	CRO	2	30000
18	Function Generator	2	12000

ENGINEERING GRAPHICS

Sr No.	Instruments	Qty	Approx. unit Price in Rs.
1.	Drawing Boards (700 x 500mm)	60	800
2.	Draughtsman Tables	60	3,000
3.	Draughtsman Stools	60	750
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Wooden Model of different solids- cone, cylinder, prism, and polygon.	1set	2,000
6.	Wooden Model of different hollow cut sections- cylinder, cube, and Rectangle.	1set	1,500
7.	Miscellaneous	LS	10,000

Note- This subject will be evaluated as a theory examination.

ENGINEERING MECHANICS LABORATORY

Sr No.	Instruments	Qty	Approx. unit Price in Rs.
1.	Polygon law of forces apparatus	1	2,000
2.	Jib crane	1	4,000
3.	Apparatus for reaction at supports	1	5,000
4.	Inclined plane and friction apparatus	1	2,500
5.	Screw jack	1	1,000
6.	Worm and worm wheel	1	3,500
7.	Single Purchase Winch Crab	1	4,000
8.	Miscellaneous	LS	1,000

HYDRAULIC & PNEUMATIC LABORATORY			
1.	Piezometer tube	2	100
2.	U tube differential manometer	2	2,000
3.	Bourdon's Tube pressure gauge	1	1,000
5.	Hydraulic jack	1	4,000
6.	Hydraulic press Working Model	1	5,000
7.	Bernoulli's apparatus	1	15,000
8.	Venturimeter apparatus with differential manometer	1	10,000
9.	Pipe friction apparatus	1	15,000
10.	Reciprocating pump- Cut Section Model	1	20,000
11.	Centrifugal pump	1	25,000
12	Working Model of Pelton Wheel Turbine	1	20,000
13	Working Model of Francis Turbine	1	20,000
14	Working Model of Kaplan Turbine	1	20,000
15	Hydraulic Circuit Trainer Kit	1	50,000
16	Pneumatic Circuit Trainer Kit	1	50,000
17	Working Model of Hydraulic Brake system	1	50,000
18	Working Model of Hydraulic Ram	1	5,000
METROLOGY & MEASURING INSTRUMENTS LABORATORY			
1.	Digital vernier calliper	3	5,000
2.	Digital micrometer	3	5,000
3.	Height gauge	2	1,500
4.	Depth gauge	2	1,000
5.	Combination set	1	1,000
6.	Bevel protractor	1	1,000
7.	Sine bar	1	1,000
8.	Precision balls and rollers	1	500
9.	Surface plate	2	15,000
10.	Slip gauges set	1	10,000
11.	Comparator – Mechanical , Pneumatic	2	40,000
12.	Gear tooth vernier	1	2,000
13.	Snap and ring gauges	1	1,500
14.	Feeler gauge, radius gauge	1	1,000

15.	Angle plate	1	1,000
16.	Tool makers microscope	1	40,000
17.	Profile projector	1	75,000
18.	Surface roughness tester	1	60,000

PLASTIC PROCESSING LAB-I & II

Sr. No.	Description	Qty	Total Price (Rs)
1.	Hand injection moulding Machine With heaters and(15gm/20gm./25gm.) Temp. controllers.	3	105000
2.	Hand blow moulding machine (15gm./30gm.)	3	150000
3.	Semi-automatic moulding Blow moulding machine(15gm.)	1	500000
4.	Hand compression moulding	1	60000
5.	Automatic compression Moulding machine-(30ton)	1	500000
6.	Vacuum forming m/c (smallest size)single chamber	1	200000
7.	Scrap grinding m/c(small)	1	100000
8.	PVC Welding m/c/hot welding Machine	1	80000
9.	Different moulds for all Machines.	10/Each	300000
10.	Extruder machine(one inch)	1	1500000
11.	Gravure printing m/c	1	3000000
12.	Pad printing m/c	1	150000

PLASTIC TESTING LAB

Sr. No.	Description	Qty	Total Price (Rs)
1.	Restivity test equipment	1	300000
2.	U.T.M m/c(2ton)	1	600000
3.	Impact testing machine	1	100000
4.	Hardness testing machine (Shore A & Shore D)	1	30000
5.	Film dart Impact testing machine	1	100000
6.	Melt flow machine	1	80000
7.	HDT machine	1	80000
8.	Software's as per requirements	one	500000

Computer Aided Mould Design Lab Equipment

Sr. No.	Description	Qty	Total Price (Rs)
1.	Open Source/Freeware Software for Mould Design	-	-
2.	Computer System (Intel i5/AMD Ryzen 5 latest generation or higher, 8GB RAM, 1TB HDD or 512 SSD, 19.5 Inch Monitor, Window 10 pro or latest)	35	35,00,000/-
3.	Printer (All in one Ink Tank Printer -01 No., All in One laser Printer-01 No.)	02	70,000/-
4.	Anti Virus (3 Years License)	35	87,500/-
5.	Online UPS(5KVA) with Battery and stand Warranty on UPS: 03 Years, Warranty on Batteries: 02 Years)	01	1,25,000/-

Note:

1. The specifications and price of equipment mentioned above used as broad guidelines for purchase of equipment.

2. Any other items not mentioned in the list of equipment can be purchased as provision has been made for purchase under the item miscellaneous for each lab/shop.
3. Any additional equipment, already available in the institute, may be used for demonstration to the students.

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

(C) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

10.2 Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its COURSE OBJECTIVE :and philosophy.
2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.
3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.
4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time

judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.
2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.
3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.
4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.
5. Concept and content based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.
6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.
7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feed back to every student
8. The student centred activities may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.
9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.
10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.
11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.
13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

List of Participants:

The following experts have participated /contributed in workshop for Developing the Curriculum scheme/competency profile according to AICTE and NEP-2020 of Three Year Diploma Course in Plastic Mould Technology at I.R.D.T., U.P., Kanpur

1. Sanjay Kumar Patel, Lecturer Plastic Mould Technology, Government Polytechnic, Lucknow.
2. Sunil Kumar Patel, Lecturer Plastic Mould Technology, Government Polytechnic, Lucknow.
3. Ranveer Rawat Lecturer Plastic Mould Technology, Government Polytechnic, Kanpur.
4. Shubham Gupta, Lecturer Plastic Mould Technology, MMIT Auraiya
5. Gaurav Kishor Kanaujiya, Assistant Professor/Course Co-Ordinator, IRDT U.P. Kanpur.

Annexure: 1

Proposed Courses by TATA Technology (Advance Skill Certification)

S. No.	Course Name
1	Fundamentals of Innovation and Design Thinking
2	Product Design and Development
3	Product Verification and Analysis
4	Advanced Automobile
5	Electric Vehicle
6	Internet of Things
7	Advanced Manufacturing
8	Advanced Welding & Painting using Simulator
9	Industrial Automation and MES
10	Industrial Robotics
11	Inspection and Quality Control
12	Advanced Plumbing
13	AI and ML