

<b>Program Name</b>	<b>: Diploma in Plastic Engineering</b>
<b>Program Code</b>	<b>: PS</b>
<b>Semester</b>	<b>: Fifth</b>
<b>Course Title</b>	<b>: Diversified Engineering Applications of Plastics (Elective-II)</b>
<b>Course Code</b>	<b>: 22554</b>

### 1. RATIONALE

Many plastics with varying properties are available and their properties can be modified by use of additives and blending for various applications extending the scope of application of the plastics. This is creating alternative choice as against the traditional materials in various areas like space, biomedical, marine, agriculture etc. Plastic engineering technocrats will develop skills in using advanced materials for diversified plastic applications in industries. Industries manufacturing advanced plastic engineering products will hire technocrats possessing a good command of this course.

### 2. COMPETENCY

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

- **Select suitable plastic material for application in various diversified field.**

### 3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following *industry oriented* COs associated with the above mentioned competency:

- Select suitable plastic material for applications in automobile.
- Select suitable plastic material for applications in electrical and electronics.
- Select suitable plastic material for applications in aerospace and marine.
- Select suitable plastic material for applications in agriculture and horticulture.
- Select suitable plastic material for applications in medical.

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
			Max		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

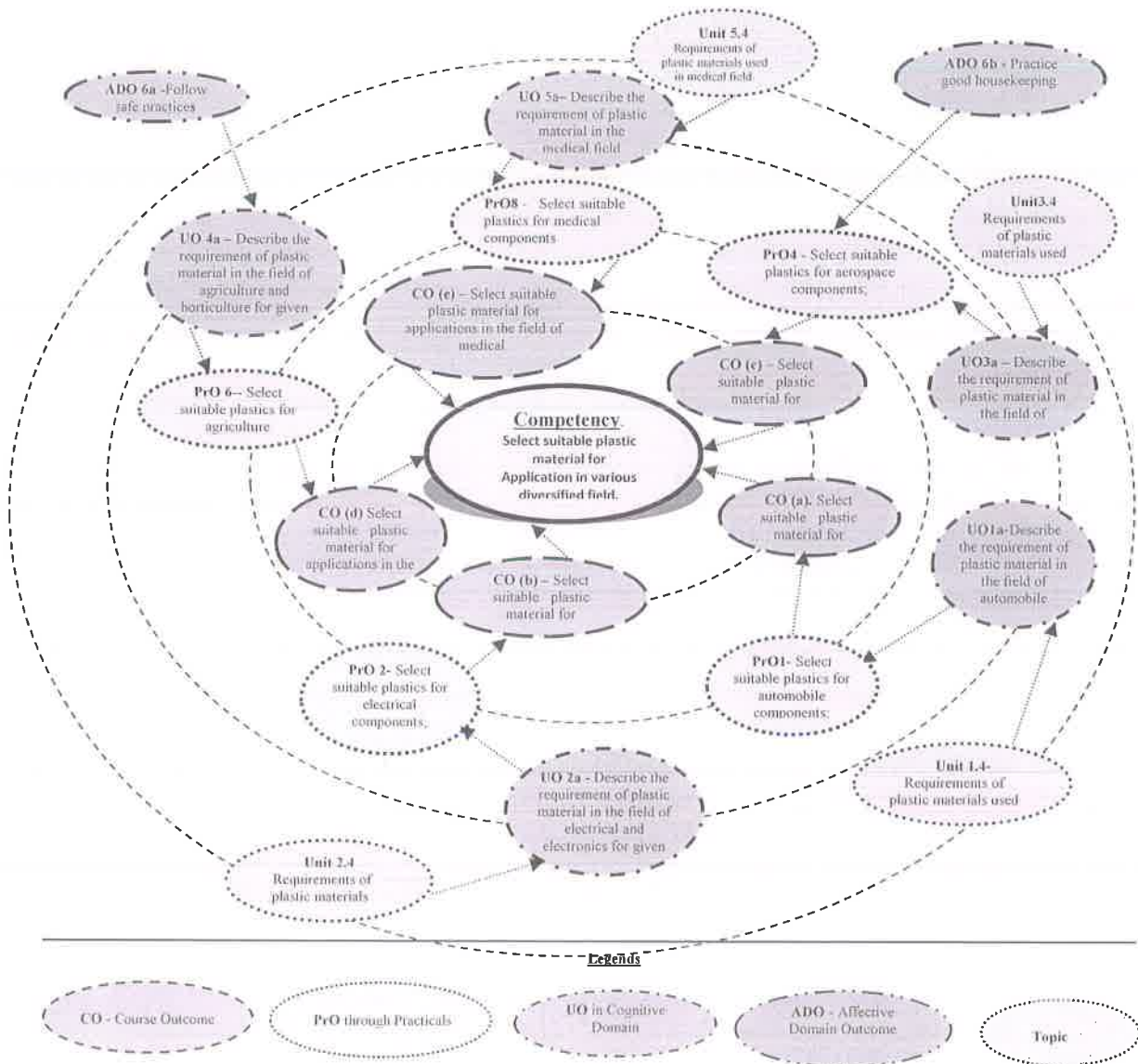
**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment.

### 5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the



course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.



**6. SUGGESTED PRACTICALS/ EXERCISES**

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Select suitable plastics for automobile components	I	04*
2.	Select suitable plastics for electrical components	II	04*
3.	Select suitable plastics for electronic components	II	04*
4.	Select suitable plastics for aerospace components	III	04*
5.	Select suitable plastics for marine components	III	04*
6.	Select suitable plastics for agriculture components	IV	04*
7.	Select suitable plastics for horticulture components	IV	04*



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
8.	Select suitable plastics for medical components	V	04*
	Total		32

**Note**

- i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so that the student reaches the 'Applying Level' of Blooms's 'Cognitive Domain Taxonomy' as generally required by the industry.
- ii. The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
a.	Approach relevance- problem identification	20
b.	Literature collection-data collection	20
c.	Application of concepts-generate alternate solutions	20
d.	Answer to sample questions	20
e.	Submit report in time	20
	<b>Total</b>	<b>100</b>

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- a. Follow safety practices.
- b. Practice good housekeeping.
- c. Work as a leader/a team member.
- d. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1<sup>st</sup> year
- 'Valuing Level' in 1<sup>st</sup> year
- 'Organisation Level' in 2<sup>nd</sup> year and
- 'Characterisation Level' in 3<sup>rd</sup> year.
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**7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. S. No
	Not Applicable	



## 8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
<b>Unit- I Plastics in Automobiles</b>	1a. Describe the requirements of plastic material in the field of automobile for given components. 1b. Explain with sketch the advantages and limitations of the given plastics used in the field of automobile. 1c. Describe the use of plastics in automobile field for given applications. 1d. Justify the selection of suitable plastic material for given application.	1.1 Plastics materials used in automobile, 1.2 Properties of plastics materials used in automobile 1.3 Characteristics of plastics materials used in automobile 1.4 Requirements of plastics materials used in automobile 1.5 Processing aspects of plastics materials used in automobile 1.6 Specific applications of plastics materials used in automobile field and their purpose served.
<b>Unit-II Plastics in Electrical and Electronics</b>	2a. Describe the requirement of plastic material in the field of electrical and electronics for given components. 2b. Explain the advantages and limitations of various plastics used in the field of electrical and electronics. 2c. Describe the use of plastics in electrical and electronics for given applications. 2d. Justify the selection of suitable plastic material for given application.	2.1 Plastics materials used in electrical and electronics field. 2.2 Properties of plastics materials used in electrical and electronics field. 2.3 Characteristics of plastics materials used in electrical and electronics field. 2.4 Requirements of plastics materials used in electrical and electronics field. 2.5 Processing aspects of plastics materials used in electrical and electronics field. 2.6 Specific applications of plastics materials used in electrical and electronics field and their purpose served.
<b>Unit- III Plastics in Aerospace and Marine</b>	3a. Describe the requirement of plastic material in the field of aerospace and marine for given components. 3b. Explain the advantages and limitations of the given plastics used in the field of aerospace and marine. 3c. Describe the use of plastics in aerospace and	3.1 Plastics materials used in the field of aerospace and marine. 3.2 Properties of plastics materials used in the field of aerospace and marine. 3.3 Characteristics of plastics materials used in the field of aerospace and marine. 3.4 Requirements of plastics materials used in the field of aerospace and marine. 3.5 Processing aspects of plastics materials used in the field of aerospace and marine. 3.6 Specific applications of plastics



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	marine for given applications. 3d. Justify the selection of suitable plastic material for given application.	materials used in the field of aerospace and marine and their purpose served.
<b>Unit- IV Plastics in Agriculture and Horticulture</b>	4a. Describe the requirement of plastic material in the field of agriculture and horticulture for given components. 4b. Explain the advantages and limitations of the given plastics used in the field of agriculture and horticulture. 4c. Describe the use of plastics in agriculture and horticulture for given applications. 4d. Justify the selection of suitable plastic material for given application.	4.1 Plastics materials used in the field of agriculture and horticulture. 4.2 Properties of plastics materials used in the field of agriculture and horticulture. 4.3 Characteristics of plastics materials used in the field of agriculture and horticulture. 4.4 Requirements of plastics materials used in the field of agriculture and horticulture. 4.5 Processing aspects of plastics materials used in the field of agriculture and horticulture. 4.6 Specific applications of plastics materials used in the field of agriculture and horticulture and their purpose served.
<b>Unit- V Applications of Plastics in the field of Medical</b>	5a. Describe the requirement of plastic material in the field of medical for given components. 5b. Explain the advantages and limitations of the given plastics used in the field of medical. 5c. Describe the use of plastics in medical for given applications. 5d. Justify the selection of suitable plastic material for given application.	5.1 Plastics materials used in the field of medical. 5.2 Properties of plastics materials used in the field of medical. 5.3 Characteristics of plastics materials used in the field of medical. 5.4 Requirements of plastics materials used in the field of medical. 5.5 Processing aspects of plastics materials used in the field of medical. 5.6 Specific applications of plastics materials used in the field of medical and their purpose served.

*Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'*

#### 9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER (INTERNAL) DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Applications of Plastics in the field of Automobile.	10	02	04	08	14
II	Applications of Plastics in the field of Electrical and Electronics.	10	02	04	08	14



Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
III	Applications of Plastics in the field of Aerospace and Marine.	10	02	06	08	16
IV	Applications of Plastics in the field of Agriculture and Horticulture.	10	04	06	08	18
V	Applications of Plastics in the field of Medical.	08	02	02	04	08
<b>Total</b>		<b>48</b>	<b>12</b>	<b>22</b>	<b>36</b>	<b>70</b>

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

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

## 10. SUGGESTED STUDENT ACTIVITIES

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

- Prepare chart on various applications of plastics.
- Collect information on applications of plastics in artificial human organs.
- Visit agricultural farm having mulching or drip irrigation or artificial pond.

## 11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

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

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Guide student(s) in undertaking micro-projects.
- Demonstrate students thoroughly before they start doing the practice.
- Encourage students to refer different websites to have deeper understanding of the subject.
- Observe continuously and monitor the performance of students in Lab.
- Demonstrate students thoroughly before they start doing the practice.
- Encourage students to refer different websites to have deeper understanding of the subject.

## 12. SUGGESTED MICRO-PROJECTS

**Only one micro-project** is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually**



undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

- a. Applications of plastics in Automobile sector: Power point presentation
- b. Application of plastics in irrigation: Chart preparation
- c. Sterilization conditions of plastics used in medical field: Data Collection
- d. Any other micro-projects suggested by subject faculty on similar line.

### 13. SUGGESTED LEARNING RESOURCES :

S. No.	Title of Book	Author	Publication
1	Plastic Technology Handbook	Manas, C. and Salil, K. Roy	CRC Press, Florida, 2006. ISBN: 9780849370397
2	Plastic Materials	Brydson, J.A.	Butterworth-Heinemann, Kidlington, 1999. ISBN: 9780750641326
3	Plastics: Materials and Processing	Strong, A.B.	Pearson Prentice Hall, Delhi, 2006 ISBN: 9780131145580
4	SPI Handbook of Plastic Engineering	Berins, M. L.	Springer - Verlag, New Delhi, 1991. ISBN:9780412991813
5	Industrial Plastic: Theory & Applications	Richardson, Terry L.	Cengage Learning, Delhi, 2004 ISBN:9781401804695

### 14. SOFTWARE/LEARNING WEBSITES

- a. <https://www.youtube.com/watch?v=yQRFz9TIGxk> for plastics in cars.
- b. <https://www.youtube.com/watch?v=glcDR3cNLIQ> for plastics in automotive.
- c. <http://www.dupont.com/products-and-services/electronic-electrical-materials/media/videos/video> for in mould electronic ink.
- d. <https://www.youtube.com/watch?v=GV5FnSyq01Q> for vinyl protectant in aerospace and marine field.
- e. <https://www.youtube.com/watch?v=ex54lkG5afw> for medical field.
- f. <https://www.youtube.com/watch?v=BfyndCv-0uE> for plastic injection moulding in medical field.



