

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION											
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES											
COURSE NAME: FULL TIME DIPLOMA IN PACKAGING TECHNOLOGY											
DURATION OF COURSE: 6 SEMESTERS											
SEMESTER: FOURTH											
BRANCH: PACKAGING TECHNOLOGY											
SR. NO	SUBJECT	CREDIT S	PERIODS			EVALUATION SCHEME					
			L	TU	PR	INTERNAL SCHEME			ES E	PR	Total Mark s
						TA	CT	Tot al			
1	Plastic Packaging	4	4	-	-	10	20	30	70	-	100
2	Metal Packaging	4	4	-	-	10	20	30	70	-	100
3	Glass Packaging	4	4	-	-	10	20	30	70	-	100
4	Ancillary material	3	3	-	-	10	20	30	70	-	100
5	Pharmaceutical packaging	2	2	-	-	5	10	15	35	-	50
6	Packaging Technology lab 4	2	-	-	4	-	-	-	-	100	100
7	Packaging Technology lab 5	2	-	-	4	-	-	-	-	100	100
9	Development of Life Skill-II	2	1	-	2	-	-	-	-	50	50
10	Professional Practice-II	2	1	-	2	-	-	-	-	50	50
Total:		25	19	-	12	45	90	135	315	300	750
STUDENT CONTACT HOURS PER WEEK:33 hrs Theory and Practical Period of 60 Minutes each. L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.											

Name of the course : <b>PLASTIC Packaging</b>			
Course code: PT/PP/S4		Semester: 4th	
Duration: 17 Weeks		Maximum Marks: 100	
<b>Teaching Scheme:</b>		<b>Examination Scheme:</b>	
Theory: 4hrs/week Tutorial: Nil		Internal Examination:20 Assignment & Attendance:10 End semester exam : 70	
Credit: 4			
Objective: After this course the student will be able to			
1.understand properties ,manufacturing technology, application , and limitation of plastics and polymers as packaging material			
2.perform the various tests on properties of those packaging materials			
Contents:			
		Group A	
		Hrs./unit	Marks
Unit – 1 Introduction	History, Definition, monomer, classifications of polymers (natural & synthetic), Polymerization, Properties of plastic materials commonly used for packaging. Plastic additive, Plasticizers. Environmental impact	9	13
Unit – 2 Plastics	Classification of plastic, Different types of plastic & Their properties & uses – Polyethylene (LDPE, LLDPE, HDPE, HM-HDPE), Polypropylene (PP), Polystyrene (PS), Polyvinyl Chloride (PVC), Polyvinylidene chloride (PVDC), Polyamide or Nylon (Nylon-6, Nylon 6,6, Nylon 6,10, Nylon 11).	9	10
		Group - B	
Unit – 3 Processing of Plastic and applications	Manufacturing process – Injection molding, Blow molding, Thermoforming, Rotational molding, Extrusion and compression molding.	9	13
		Group - C	
Unit – 4 Lamination	Processes and their applications – Labeling, Coating and Decoration.	9	10
Unit – 5 Adhesives	Types of adhesives and their properties, application.	8	10
		Group - D	
Unit – 6 General Packaging forms	Bag, Pouch, Blisters, Strip, Collapsible tubes, rigid containers, skin packaging.	8	09
Unit – 7 Plastic Woven	Introduction – Material – Method – Application.	8	5

Sacks: Expanded Polystyrene & Polyethylene:	Properties – Application in Packaging		
	Total	60(Lecturer +Tutorial)	70
Internal assessment Examination and preparation for semester examination		2 weeks (8 Lecture hour)	
Total		68 Lecture hour (17 Weeks)	

Text and Reference Books:			
S.N	Name of the Author	Title of the Book	Name of the Publishers
1.	S. Natarajan M. Govindarajan B.Kumar	Fundamental of Packaging Technology	PHI Learning Private Limited.
2.		Hand book of Packaging Technology	Engineers India Research Institute
3.	U.K Jain D.C Goupale S.Nayak	Pharmaceutical Packaging Technology	Pharma Med Press
4.			

### Examination Scheme Theoretical:

Name of the course : **PLASTIC Packaging**      Course code: PT/PP/S4

Internal Examination: 20    Assignment & Attendance: 5+5=10

End semester exam: 70

Group	Unit	Subjective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A	1, 2		Any five tacking at least one from each group	10	50
B	3				
C	4,5				
D	6,7				

Group	Unit	Objective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A	1, 2		Any twenty (20)	1	20
B	3				
C	4,5				
D	6,7				

Name of the course : <b>Metal Packaging</b>			
Course code: <b>PT/MP/S4</b>		Semester: 4th	
Duration: 17 Weeks		Maximum Marks: 100	
<b>Teaching Scheme:</b>		<b>Examination Scheme:</b>	
Theory: 4hrs/week Tutorial: Nil		Internal Examination:20 Assignment & Attendance:10 End semester exam : 70	
Credit: 4			
Objective: After this course the student will be able to			
1.Know the types of packages made of metals and their properties			
2.Understand the various types of packages forms			
3.Perform tests on properties of metals for packaging			
Contents:			
Group -A			
		Hrs./unit	Marks
Unit – 1 Introduction	Historical Background – Types of metal packaging material and their properties. Advantages of metal packaging.	10	10
Unit – 2 Packaging materials	2.1 Aluminum – Properties, Application, Precautions. 2.2 Aluminum Foil – Characteristics, Application, Advantages. 2.3 Tin & Lead –Properties and Application. 2.4 Collapsible Metal Tube – Material, Manufacture, Application, Advantages and Disadvantages. Testing.	15	20
Group -B			
Unit – 3 Aerosol Package	Characteristics, Working Principle (Propellant; Actuators, Over caps, Dip Tubes.) Advantages, Disadvantages, Application.	8	10

Group -C			
Unit – 4 Cans	Classification & Methods of Manufacture :- 3 – piece welded can, 2 – piece Drawn and Redrawn (DRD), Can, 2 – piece drawn and Wall – Ironed (DWI) Can, Aluminum rigid Container, Composite Containers. Easy open Ends can, Different types of cans (Aerosol can, Contour cans) names only. Decorating.	15	20
Unit – 5 Package Forms	Tinplate, Tin-free steel (TFS), Aluminum and its alloys, black Plate, Fiber drums, Collapsible tubes, Galvanized Drums, Steel Drums and Pails .	10	10
	Total	60(Lecturer +Tutorial)	70
Internal assessment Examination and preparation for semester examination		2 weeks (8 Lecture hour)	
Total		68 Lecture hour (17 Weeks)	

Text and Reference Books:			
S.N	Name of the Author	Title of the Book	Name of the Publishers
1.	S. Natarajan M. Govindarajan B.Kumar	Fundamental of Packaging Technology	PHI Learning Private Limited.
2.		Hand book of Packaging Technology	Engineers India Research Institute
3.	U.K Jain D.C Goupale S.Nayak	Pharmaceutical Packaging Technology	Pharma Med Press
4	Joseph F. Harlon Robert J. Kelsey Hallie E. Forcinio	Hand Book of Package Engineering	CRC Press

**Examination Scheme Theoretical:**Name of the course : **Metal Packaging**Course code: **PT/MP/S4**

Internal Examination: 20 Assignment &amp; Attendance: 5+5=10

End semester exam: 70

Group	Unit	Subjective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A	1,2		Any five tacking at least one from each group	10	50
B	3				
C	4,5				

Group	Unit	Objective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A	1, 2		Any twenty (20)	1	20
B	3				
C	4,5				

Name of the course : Glass Packaging			
Course code: <b>PT/GP/S4</b>		Semester: 3rd	
Duration: 17 Weeks		Maximum Marks: 100	
<b>Teaching Scheme:</b>		<b>Examination Scheme:</b>	
Theory: 4hrs/week Tutorial: Nil		Internal Examination:20 Assignment & Attendance:10 End semester exam : 70	
Credit: 4			
Objective: upon completion of this course students will be able			
1.To under stand glass packing method & equipment in brief			
2. To under stand Various properties of glass container depending on product inside it			
3.To understand testing of glass container			
Contents:			
Group - A			
		Hrs./unit	Marks
Unit – 1 Introduction	Characteristics of glass, Properties of glass (Physical, Chemical) Colouring agent,. Merits & Demerits.	20	25

	Type of glass for packaging & their properties – chemical inertness, clarity, rigidity, resistance to internal pressure, heat resistance.		
	Group - B		
Unit – 2 Glass Packaging Forms - (Container, Bottle)	Type, properties, design, quality standards, defects & risks. Labeling, decorating.	20	25
Unit – 3 Ampoules & Vials	Definition, Manufacture.	10	10
Unit – 4 Testing	Testing of Glass Container,	10	10
	Total	60(Lecturer +Tutorial)	70
Internal assessment Examination and preparation for semester examination		2 weeks (8 Lecture hour)	
Total		68 Lecture hour (17 Weeks)	

Text and Reference Books:			
S.N	Name of the Author	Title of the Book	Name of the Publishers
1.	S. Natarajan M. Govindarajan B.Kumar	Fundamental of Packaging Technology	PHI Learning Private Limited.
2.		Hand book of Packaging Technology	Engineers India Research Institute
3.	U.K Jain D.C Goupale S.Nayak	Pharmaceutical Packaging Technology	Pharma Med Press
4	Joseph F. Harlon Robert J. Kelsey Hallie E. Forcinio	Hand Book of Package Engineering	CRC Press

**Examination Scheme Theoretical:**Name of the course : Glass Packaging      Course code: **PT/GP/S4**

Internal Examination: 20    Assignment &amp; Attendance: 5+5=10

End semester exam: 70

Group	Unit	Subjective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A	1		Any five tacking at least one from each group	10	50
B	2,3,4				

Group	Unit	Objective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A	1		Any twenty (20)	1	20
B	2,3,4				

Name of the course : <b>ANCILLARY MATERIALS</b>			
Course code: PT/AM/S4		Semester: 4th	
Duration: 17 Weeks		Maximum Marks: 100	
<b>Teaching Scheme:</b>		<b>Examination Scheme:</b>	
Theory: 3hrs/week Tutorial: Nil		Internal Examination:20 Assignment & Attendance:10 End semester exam : 70	
Credit: 3			
Objective: After satisfactory completion of this course student will be able to			
1.understand various kinds of ancillary materials and their properties			
2.understand the application of ancillary materials in packaging			
3.To perform different tests on ancillary materials			
Contents:			
		Hrs./unit	Marks
Unit – 1 Introduction	Different forms of Ancillary Materials.	2	7
Unit – 2	Theory & principles of adhesion & factors affecting bond	6	7



Adhesives	strength, Different types of adhesives, vegetable, animal, inorganic & synthetic adhesive, gelatine, hot-melt adhesive, Dextrin adhesive. Adhesive tapes, gum tapes, pressure-sensitive tapes & their application.		
Unit – 3 Cushioning	Physical concepts in cushioning, energy-impact load & concept of shock at complex of declaration & impulse time .Prevention of shock daw age to articles lay various means & their measure meant. Types of cushioning material & properties-spa fillers-paper shaving, wood wool, saw dust, coir.	6	7
Unit – 4 Non-Resilient Materials	Rigid plastics & foams, Honeycomb, Corrugated Fibre Board (CFB), Expanded polystyrene (EPS), Thermoforming, Cellophane, Ethylene-Vinyl alcohol, Copolymers (EVOH) in packaging.	6	7
Unit – 5 Resilient Materials	Rubberised hair, Rubberised coir, Polyurethane foams, Cross-Linked EPS foams, springs, Metal shock mounts.	6	7
Unit – 6 Seals & Closures	Normal seals, Pressure seals, Vacuum seals etc.	3	5
Unit – 7 Labeling	Labels & labelling including instant labels.	2	4
Unit – 8	Coding & Marking.	3	4
Unit – 9 Reinforcements	Straps – steel, Plastic, Rayon etc.	4	4
Unit – 10 Miscellaneous Ancillary Materials	Inks, colorants – dyes & pigments in packaging, Lamination, Waxed papers in packaging, Corrosion, Environmental pollution in packaging, Biodegradable materials.	7	5
	Total	45(Lecturer +Tutorial)	70
Internal assessment Examination and preparation for semester examination		2 weeks (6 Lecture hour)	
Total		51 Lecture hour (17 Weeks)	

Text and Reference Books:			
S.N	Name of the Author	Title of the Book	Name of the Publishers
1.	S. Natarajan M. Govindarajan	Fundamental of Packaging Technology	PHI Learning Private Limited.

	B.Kumar		
2.		Hand book of Packaging Technology	Engineers India Research Institute
3.	U.K Jain D.C Goupale S.Nayak	Pharmaceutical Packaging Technology	Pharma Med Press
5.	Joseph F. Harlon Robert J. Kelsey Hallie E. Forcinio	Hand Book of Package Engineering	CRC Press

**Examination Scheme Theoretical:**

Name of the course : **ANCILLARY MATERIALS** Course code: PT/AM/S4

Internal Examination: 20 Assignment & Attendance: 5+5=10

End semester exam: 70

Group	Unit	Subjective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A			Any five tacking at least one from each group	10	50
B					

Group	Unit	Objective Question			Total Marks
		To be set (10 Question)	To be answered	Marks per Questions	
A			Any twenty (20)	1	20
B					

**Sessional:**

Name of the course : <b>Packaging Technology Lab 4</b>	
Course code: <b>PT/L LPT4/S3</b>	Semester: 4th
Duration: 17 Weeks	Maximum Marks: 100
Teaching Scheme:	<b>Examination Scheme:</b>
Practical: 4hrs/week	Continuous Internal Assessment : 50 (Performance of job :30 + Notebook :20) External Assessment : 50
Credit :2	

**Objective:**

On satisfactory completion of the course, the student should be in a position to develop the skills corresponding to the knowledge acquired in the theoretical subject plastic Technology.

**Suggested List of Laboratory Assignment :**

1	Study of tensile strength of different sample of plastic used in packaging
2	Study of tear strength of different sample of plastic used in packaging
3	To measure water vapor transmission rate
4	To measure melt flow index of plastics granules
5	To measure coefficient of friction of different sample of plastic used in packaging
6	To study heat sealing of plastic material used in packaging
7	Study of dart impact on different sample of plastic used in packaging Dart impact tester
8	Bond strength tester Study of bond strength of different sample of plastic used in packaging

**List of equipment / apparatus for laboratory experiments :**

1	Tensile strength tester
2	Tear strength tester
3	WVTR/MVTR test chamber
4	Coefficient of friction tester
5	Melt flow index tester
6	Heat sealer
Note	

**Sessional:**

Name of the course : <b>Packaging Technology Lab 5</b>	
Course code: <b>PT/L LPT5/S4</b>	Semester: 4th
Duration: 17 Weeks	Maximum Marks: 100
Teaching Scheme:	<b>Examination Scheme:</b>
Practical: 4hrs/week	Continuous Internal Assessment : 50 (Performance of job :30+ Notebook :20) External Assessment : 50

**Objective:**

On satisfactory completion of the course, the student should be in a position to develop the skills corresponding to the knowledge acquired in the theoretical subject.

**Suggested List of Laboratory Assignment :**

1	Study of leakages from packages
2	Study of corrosion on metal
3	Study of stack load test
4	Bottle verticality test
5	Strain in glass test
6	Collapsibility of aluminum tubes
7	Determination of continuity of coating

**List of equipment / apparatus for laboratory experiments :**

1	Hydro static pressure tester
2	Salt spray tester
3	Stack load tester
4	Bottle verticality tester
5	Stress Analyser & strain viewer
Note	

<b>Name of the course: Professional Practice-II</b>	
<b>Course Code: PT/PP-II/S4</b>	Semester: 4th
Duration: 17 weeks (Teaching-15 weeks + Internal Exam-2 weeks )	Maximum Marks: 50
<b>Teaching Scheme:</b>	<b>Examination Scheme :</b>
Theory: 1 contact hours/ week	Internal Teachers' Assessment: 50 Marks
Tutorial:	
Practical: 2 contact hours/ week	End Semester Examination: Nil
Credit: 2	
<b>Rationale:</b>	
<p>In addition to the exposure both in theoretical and practical from an academic institution, it is desired that student should be familiar with the present day industry working environment and understand the emerging technologies used in these organization. Due to globalization and competition in the industrial and service sectors, acquiring overall knowledge will give student a better opportunity for placement facility and best fit in their new working environment.</p> <p>In the process of selection, normal practice adopted is to see general confidence, positive attitude and ability to communicate, in addition to basic technological concepts.</p> <p>The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.</p>	
<b>Objectives:</b>	
<p>The student will be able to-</p> <p>Student will be able to:Acquire information from different sources.</p> <ol style="list-style-type: none"> <li>1. Enhance creative skills</li> <li>2. Prepare notes for given topic.</li> <li>3. Present given topic in a seminar.</li> <li>4. Interact with peers to share thoughts.</li> <li>5. Acquire knowledge on Open Source Software and its utility</li> <li>6. Understand application of technologies in industry scenario.</li> <li>7. Prepare a report on industrial visit, expert lecture.</li> </ol>	

Content (Name of topic)		Periods	Marks
<b>Group-A</b>			
Unit 1	<b>Field Visits</b>	6	
	<p>Structured field visits (minimum one) be arranged and report of the same should be submitted by the individual student, to form a part of the term work.</p> <p>The field visit a) Dairy plant  b) Soft drink plant  c) Plastic Bottle Manufacturing Unit  d) Metal can manufacturing unit  e) Liquid product filling &amp; sealing unit  e) solid product filling &amp; sealing unit  e) Any other plant / quality control laboratory  s may be arranged in the following areas / industries:</p>		
Unit 2	<b>Aptitude and Reasoning Practice</b>	12	
	<p>1. Arithmetic Aptitude</p> <p>2. Verbal Reasoning</p>		
Unit 3	<b>Lectures by Professional / Industrial Expert/student seminar to be organized from of the following areas (any two)</b>	12	
	<p>a) Fire Fighting / safety Precaution and First Aids  b) Yoga Meditation  c) Problems of drinking water in rural areas  d) Interview techniques  e) Advancement of modern and new energy source  f) Green Energy Concept  k) Any other suitable topic</p>		
Unit 4	<b>Group Discussion</b>	09	
	<p>The student should discuss in a group of six to eight students. Two topics (at least) for group discussions may be selected by the faculty members. Some of the suggested topics are-</p> <p>a) Road safety rules awareness  b) CNG vs LPG as fuel</p>		

	<ul style="list-style-type: none"> <li>d) Safety in day to day life</li> <li>e) Energy saving in institute</li> <li>f) Tuitions should be banned</li> <li>g) Computers have resulted in unemployment</li> <li>h) Effects of cinema/media on y</li> <li>k) Any other suitable topic</li> </ul>		
Unit 5	<p><b>Free &amp; Open Source Software</b></p> <p><b>Introduction to LibreOffice Calc</b></p> <ol style="list-style-type: none"> <li>1. Getting started with LibreOffice Calc</li> <li>2. Working with Cells</li> <li>3. Working with Sheets</li> <li>4. Formatting data</li> <li>5. Basic data manipulation</li> <li>6. Working with data</li> </ol> <p><b>Different operations in LibreOffice Calc</b></p> <ol style="list-style-type: none"> <li>1. Using Charts &amp; graphs</li> <li>2. Images and graphics</li> <li>3. Advanced formatting and protection</li> <li>4. Formulas and functions</li> <li>5.</li> </ol> <p><b>Introduction to LibreOffice Impress</b></p> <ol style="list-style-type: none"> <li>1. Getting Started with LibreOffice Impress</li> <li>2. Creating a presentation document</li> <li>3. Viewing a presentation document</li> <li>4. Inserting Picture and objects</li> <li>5. Printing a presentation document</li> </ol> <p><b>Presentation in Impress</b></p> <ol style="list-style-type: none"> <li>1. Slide Master Slide Design</li> <li>2. Custom Animation</li> <li>3. Slide Creation</li> <li>4. Presentation Notes</li> </ol>	11	
	TOTAL	50	

Name of the course : <b>Pharmaceutical packaging</b>			
Course code: PT/PhP/S4		Semester: 4th	
Duration: 17 Weeks		Maximum Marks: 50	
<b>Teaching Scheme:</b>		<b>Examination Scheme:</b>	
Theory: 2hrs/week Tutorial: Nil		Internal Examination:10 Assignment & Attendance:05 End semester exam : 35	
Credit: 2			
Objective: After satisfactory completion of this course student will be able to			
<ol style="list-style-type: none"> <li>1. Basics of pharmaceutical packaging</li> <li>2. Packaging Material &amp; its selection</li> <li>3. Labeling &amp; Regulatory aspects of pharmaceutical packaging</li> </ol>			
Contents:			
		Hrs./unit	Marks
Unit 1	Introduction -Importance of packaging in pharmaceutical industry and its purpose	2	2
Unit-2	Specific containers and packages related to different pharmaceutical dosage forms like oral, parenteral, topical, aerosols, medicinal gases, vaccines , toxoids , biological products, and neutraceuticals.	8	10
Unit -3	Packaging of cosmetics	2	3
Unit-4	Study of different types of packaging materials – glass, plastic, metal, rubber and other polymers as containers and closures – their merits and demerits.	5	5
Unit 5	Sterilizations of packaging – protocols and relevance	4	5
Unit-6	Defects and quality control	4	4
Unit-7	Labeling requirements of pharmaceutical products packaged in different containers	3	4
Unit 8	Regulatory aspects	2	2
	Total	30(Lecturer +Tutorial)	35
Internal assessment Examination and preparation for semester examination		2 weeks (4 Lecture hour)	
Total		34 Lecture hour (17 Weeks)	

Text and Reference Books:
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S.N	Name of the Author	Title of the Book	Name of the Publishers
1		Indian Pharmacopoeia 2010	
2	Lachman & Lieberman	The Theory & Practice of Industrial Pharmacy –	
3	Cooper & Gunn	Dispensing for Pharmaceutical Students	
4	Edward Bauer	Pharmaceutical Packaging Handbook –	
5	D. A. Dean, E. R. Evans, I. H. Hall	Pharmaceutical Packaging Technology -	
6		Hand book of Packaging Technology	Engineers India Research Institute
7	U.K Jain D.C Goupale S.Nayak	Pharmaceutical Packaging Technology	Pharma Med Press