

UNIVERSITY OF MUMBAI

No.UG/270 of 2009

CIRCULAR :-

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering degree courses vide this office Circular No.UG/301 of 2004, dated 14th July, 2004 and the Principals of the affiliated colleges in Engineering are hereby informed that the recommendation made by the Faculty of Technology at its meeting held on 1st April, 2009 has been accepted by the Academic Council at its meeting held on 27th May, 2009 vide Item No.4.18 and that, in accordance therewith, the syllabus for the Fourth Year Printing and Technology (Sem. VII and VIII) of the B.E. degree course is introduced as per Appendix and that the same has been brought into force with effect from the academic year 2009-2010.

MUMBAI-400 032
13th July, 2009

PRIN K VENKATARAMANI
REGISTRAR

To,

The Principals of the affiliated colleges in Engineering.

A.C./4.18/27.05.2009

No.UG/270 - A of 2009, MUMBAI-400 032 13th July, 2009

Copy forwarded with compliments for information to: -

- 1) The Dean, Faculty of Technology.
- 2) The Controller of Examinations,
- 3) The Co-ordinator, University Computerization Centre.


(D.H. KATE)

DEPUTY REGISTRAR
(U.G./P.G SECTION)

Copy to: -

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri for information.

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Director, Institute of Distance Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO) the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above Circular and that, no separate Action Taken Report will be sent in this connection. the Assistant Registrar Constituent Colleges Unit (2 copies), BUCT(1 copy), the Deputy Account, Unit V(1 copy), the In-charge Director, Centralize Computing Facility (1 copy), the Receptionist (1 copy), the Telephone Operator (1 copy), the

UNIVERSITY OF MUMBAI



Revised Syllabus for the
Fourth Year Printing & Packaging
Technology
(Semester VII & VIII)

(With effect from the academic year 2009-2010)

UNIVERSITY OF MUMBAI
Scheme of instructions & Examination
at
B.E. (Printing & Packaging Technology)

Semester – VII B.E (Printing & Packaging Technology)

S.No	Subjects	No. of periods per week (60 minutes each)			Duration of theory paper (hours)	Marks				
		Lecture	Practical	Tutorial		Theory paper	Term work	Practical	Oral	Total
1.	Product Packaging – II	04	--	02	03	100	25	--	--	125
2.	Printing Technologies – II	03	02	--	03	100	25	--	25	150
3.	Environmental Sciences & Waste Management	04	02	--	03	100	25	--	--	125
4.	Packaging & Printing Machinery & Systems	05	02	--	03	100	25	--	25	150
5.	Elective – I	04	02	--	03	100	25	--	25	150
6.	Project - A	--	02	--	--	--	25	--	25	50
	Total	20	10	02						750

Semester – VIII B.E (Printing & Packaging Technology)

S.No	Subjects	No. of periods per week (60 minutes each)			Duration of theory paper (hours)	Marks				
		Lecture	Practical	Tutorial		Theory paper	Term work	Practical	Oral	Total
1.	Product Preservation & Speciality Packaging	04	02	--	03	100	25	25	25	175
2.	Packaging & Printing Management	04	02	--	03	100	25	--	--	125
3.	Packaging Distribution & Logistics	04	02	--	03	100	25	--	25	150
4.	Elective – II	04	02	--	03	100	25	--	25	150
5.	Project - B	--	06	--	--	--	100	--	50	150
	Total	16	14	--						750

Lecture	04
Practical	--
Tutorial	02
	Hours Marks
Theory Examination	3 100
Practical	-- --
Oral Examination	-- --
Term Work	-- 25

	Detailed Syllabus	Periods	Weightage
UNIT-I	INDUSTRIAL PRODUCTS PACKAGING: Engineering – Light/medium/Heavy Engg. Products (eg. Motors, Pumps, Refrigerators, TV Sets, generators) Electronic Products – spare parts and components (Automotive Components tools/tool sets/etc.) Analysis of Product Packaging requirements – Blister/skin packaging, Carton packaging, Wooden/crate/sheathed crates, pallet boxes etc.	10	18%
UNIT-II	PACKAGING OF DRUGS & PHARMACEUTICALS: Injectables and orals/oointments – Ampules, Vials, strip/blister packaging: Packaging of bulk drugs – reference to IP/BP and significance	10	18%
UNIT-III	PACKAGING OF CHEMICALS: a) Cement b) Fertilizers c) Pesticides/Insecticides d) Petroleum products e) Others Alternate bulk packaging systems and their applications, benefits etc.	08	14%
UNIT-IV	PACKAGING OF HOME CARE/PERSONAL PRODUCTS : Packaging of soaps/detergents, toiletries, and personal care products Alternate packaging choices, selection criteria	10	18%
UNIT-V	PACKAGING OF : Handi crafts, Textiles, Toys, Jewellery and other products, Packaging classification/group of products – packaging for retail/POP and Distribution	08	11%
UNIT-VI	PACKAGING OF READY TO EAT/READY TO COOK FOODS Edible nuts & processed nuts Spices/whole & Ground & Mixed spices Packaging requirements, Evaluation of alternates and selection of optimum ones	10	18%

Term Work

Term work shall comprise of Tutorial and will consist of 8 Assignment reports and class test based on above syllabus.

Term work:

Tutorial Report	- 10 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 marks

Text Books / Reference Books

1. Industrial Products packaging – Friedman W.F. and J.J. Kipness, John Wiley & Sons 1960 (00028)
2. Packaging Design & Engineering, Klimchuck – Wiley 2006
3. Handbook of Package Engineering – Joseph F.L. Robert S Keley, Technomic Publishing – 3rd Edition
4. Fundamentals of Packaging – F.A. Paine, 1991 – BlackieA & P
5. Medical device packaging – Handbook – Mo & Sherman, Max Sherman (00113)

B.E. (Printing & Packaging Technology)		Semester – VII	
Subject : Printing Technologies – II			
Periods per week	Lecture	03	
1 period of 60 min.	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

	Detailed Syllabus	Periods	Weightage
UNIT - I	SCREEN PRINTING Application areas of screen printing – comparison with other printing technologies-construction of screen –frame – mesh materials – light sensitive coatings – machinery-screen stretching – light source – exposure – coating water/gum – machine configuration – squeezes – ink – varnish – drying mechanism – substrates – inline operations – quality control – viscosity & tack of ink and varnish – tone & color reproduction – on/off contact printing Pad Printing: Process – equipments – pad material – cliché preparation inks and inking system – applications & advantages	10	24%
Unit - II	NON-CONTACT PRINTING Basics of digital printing – Introduction, features, digital printing process. Digital colour printing – Introduction & Process Indigo E-print, Electrography, Ionography process, Magnetography – Introduction, advantages, application and future trends Digital proofing : Color laser, thermal transfer, inkjet, dye sublimation – inks/dyes/toners, substrates	08	19%
Unit-III	INK – JET PRINTING Introduction, advantage, types of inkjets – Thermal, continuous / binary continuous, multi – nozzle – fixed/disposable heads, cleaning, cartridges, inks, substrates Wide format printing variable data technology, coding machines, memjet – inkjet in proofing – color management – halftone emulation – 1 bit TIFF – digital workflow	08	19%

Unit - IV	THERMAL TRANSFER PRINTING Introduction, Technology, advantages & systems applications, barcoding – plastic labels, RFID, ribbon materials – hotmelt ink – substrate - - color printers.	07	17%
Unit - V	COMPUTER TO PLATE CTP system, Prototype to plate setting, Press trends, Total process, Plate Technology, Plate exposing system, Imaging system, CTP work flow, plate material, integration with DTP	08	19%

Practicals: List of Experiments

1	Study of types of screen printing materials
2	Stencil preparation – various types.
3	Screen printing on various substrates
4	Label printing
5	Pad printing – exercises
6	Ink jet printing – printing on substrates

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report	- 15 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 marks

Text Books / Reference Books

- 1 Screen Printing – John Stephens- Chapman & Hall
- 2 Non Impact printing – Gerhard A. Nothmann – GATF 1989
- 3 Computer to plate – Automating the printing industry – Dr. Richard M. Adams-GATF 2nd Edition
- 4 Printing Technology – Adams, Faux, Rieber, 3rd Edition, Delmar Publishers

B.F. (Printing & Packaging Technology)		Semester – VII	
Subject : Environmental Sciences & Waste Management			
Periods per week 1 period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	25

	Detailed Syllabus	Periods	Weightage
UNIT-I	Waste Management Definition and types of waste, solid waste management, Industrial wastes, hazardous wastes, functional elements of solid waste management, storage of solid waste, collection of solid waste, transfer and transport, processing and recovery	08	14%
UNIT-II	Waste Water Management : Sources, collection, problems encountered during operating sewage system, treatment methods, sludge treatment, reverse osmosis, ultra filtration techniques	08	14%
UNIT – III	Pollutants from Industry : Polymers and Plastics: Need, classification, characteristics, environmental implications of polymers and plastics Paper Industry : Environmental implications of paper mills, abatement of paper mill pollution Food Industry : Food additives, classification, risk analysis of some specific food additives	08	14%
UNIT-IV	Recycling Issues : Recycling packaging materials: paper, plastic, fibre, metal, glass, ceramics and wood, Cost benefits	08	14%
UNIT-V	Bio-degradable and Photo-degradable packaging materials: Biodegradable packaging for cosmetics, food(sugar waste, TPX, TFPP and MLB), degradation of bio-components in medicine, Bio-degradable plastic materials. Photodegradable polymers in packaging: Mechanisms, Environmental concerns, Principles and applications Advantages and disadvantages of bio-degradable packaging materials	08	14%
UNIT-VI	Environmental restoration : International efforts, sustainable development, United	08	14%

VII-VII	Nations environment programme, Biodiversity, Global Environment facility, Environmental Impact assessment, ISO 14000		
	India's efforts: National committee on environmental planning and co-ordination, The Tiwari committee, Environment protection act, National conservation strategies	08	14%

Practicals: List of Experiments

1.	Determination of COD
2.	Determination of BOD
3.	Estimation of total suspended solids
4.	Estimation of chloride content by Mohr's method
5.	Total organic matter estimation
6.	Conductivity measurement
7.	pH estimation
8.	Turbidity
9.	Zn ⁺² , Cu ⁺² , Cr ⁺³ by EDTA method
10.	Determination of dissolved oxygen by Winkler's method

Term Work:

Term work shall comprise of practical journal report and class test based on above syllabus and also the term work shall include at least one case study (individual basis) and a project on waste management (group activity)

Term work:

Practical Journal Report & Project on case study	- 15 marks
Class test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Environmental Science by G.S.Sodhi, Narosa Publisher
2. Environmental Chemistry by B.K.Sharma, Goel Publishing House, Meerut – 6th Revised and enlarged edition
3. Environmental Bio-Technology by M.H.Fulekar, Oxford & IBH Publishing Co. Pvt. Ltd. Year 2005
4. Urban recycling and search for sustainable Community Development by Adam S Weinberg, David N Fellow, Allan Schnaiberg. Publisher: Princeton University Press. Year : 2000
5. Biodegradable plastics and polymers. Author: NIIR Board, ISBN : 8178330350 Code : N1165, Publisher : Asia Pacific Business Press Inc.

B.E. (Printing & Packaging Technology)

Subject : PACKAGING AND PRINTING MACHINERY & SYSTEMS

Semester – VII

Periods per week
1 period of 60 min.

Evaluation System

Lecture	05
Practical	02
Tutorial	--
	Hours Marks
Theory Examination	3 100
Practical	-- --
Oral Examination	-- 25
Term Work	-- 25

Detailed Syllabus

UNIT-I	PACKAGING/AND PRINTING MACHINERIS TYPES/CLASSIFICATION AND APPLICATION Packaging M/c.-Machinery for conversion, online packaging, systems packaging, Ancillary equipments and Testing & Q.C., Printing M/c. – machinery for printing (Letterpress, offset, flexo, gravure. Screen, Pad, Non contact, digital) and ancillaries including on line inspection and quality inspection	Periods 10	Weightage 15%
UNIT-II	PACKAGING MACHINERIES – CONVERSION M/c for manufacture of Glass, Metal (Tinplate & Aluminium), Drums (MS & GI), Composite, Sack, (Multiwall & Synthetics) folding, cartons, Corrugated Board/Boxes, flexible - laminates , Co-ex film, Plastics-Thermoforms/bottles/jerry cans/drums, Thermoforming, Fibre board drums, Blow/Injection and Injection Blow	15	22%
UNIT-III	PACKAGING MACHINERS-FOR LINE OPERATIONS AND SYSTEMS: M/c. for filling (liquids and solids), VFFS/HFFS (vertical and Horizontal form-fill-seal), Thermoform – fill-seal, Wrapping machines, blister/Strip Cling wrapping machine, shrink and stretch wrapping, cartoning/case packing, bag filling/stitching. lined carton, Aseptic/Retort system	15	22%
UNIT-IV	PRINTING MACHINERIES Introduction and familiarizing and various components of : a) Rotary Screen Printing M/cs. b) Letter press – platen and Rotary c) Flexography d) Gravure e) Offset f) Other	15	22%

UNIT-V	g) Also working principle and maintenance ANCILLARY MACINERY & EQUIPMENTS – FOR ANCILLARY COMPONENTS APPLICATIONS & TESTING & QUALITY INSPECTION Labelling, Capping Plug insertion/Induction sealing/Plug sealing, Taping, shrink sleeving, hot melt application, coding, marking, stapling stenciling, seaming, on line and offline inspection equipments	10	15%
	OTHER ANCILLARIES – EQUIPMENTS Tube/Bag sealing, Slitting, Winding, Taping, strapping etc.	02	3%

Practicals: List of Experiments

1	Application of Hotmet glue
2	Taping of carton / boxes
3	Reinforcement of metal / synthetic straps
4	Heat sealing of various substrate / Induction sealing
5	CFB box – cutting / creasing / stapling
6	Skin & blister packaging

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report	- 15 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Maintaining printing Equipment – GATF 2008
2. Industrial Maintenance – H. P. Garg S.Chand – 3rd edition
3. Fundamentals of Electric Drives – G. K. Dubey. Narosa Publishing house 2002 – 2nd edition
4. Manual for Lithographic operation – First Edition –Litho training Services
5. Theory of M/cs and Mechanisms – Dr. J. S. Rao and Dukhipeti, New Age International

B.E. (Printing & Packaging Technology)		Semester – VII	
Subject : ELECTIVE – I (1) SELF ADHESIVE AND NARROW WEB TECHNOLOGY - I			
Periods per week	Lecture	04	
1 period of 60 min.	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

	Detailed Syllabus	Periods	Weightage
UNIT-I	- SA Label- basics – raw materials – face material, adhesive, release coat and backing materials Qualities of raw material to be considered, optical and mechanical - Barrier properties for special conditions, strength required for machine operations, surface treatments, film type and testing - Silicons for SA labels	08	14%
UNIT-II	- Adhesion Theories, Adhesives used in SA labels, Acrylics, rubber and hotmelt. evaluation of adhesion, Permanent vs Removable adhesive, applying adhesive, treatment of substrate for proper adhesion, curing	08	14%
UNIT-III	- Printing process – selection criteria, specific requirements - Analog and digital; printing methods-offset – letterpress-flexo-gravure-Inkjet- Laser-thermal-thermal transfer - Finishing operations – folding, cutting, perforating, slitting, punching, Hot foil stamping, Hologram	08	14%
UNIT-IV	Production of label stock, printing of labels, slitting & Rewinding or sheeting, die cutting, embossing, Label Application – hand/machine Developments in SA Labels – Flexography-narrow web technology for labels -- Narrow web press components – Unwind – tension & Register control – print stations – Drying & Curing – Diecutting stations – waste removal-laminating varnishing – Product delivery – Die & Die cutting – Bent rule – Rotary tooling – Chemically etched die plates – Laser cutting – cutting modes -- waste removal – product	15	27

	delivery and collection – problem areas-rotary die design – Air assisted dies		
UNIT-V	Flexo printing unit – Printing Plate – cylinders – gears –Plate Mounting & Proofing-Unwind & Infeed section _ printing & drying – Outfeed & Rewind Section – Brakes Clutches & Motors – Web tension Control systems Unwind – General-Single position-Flying splice gears – rewind – Surface winders – center winders – rewind Tension systems	07	12%
UNIT-VI	Web viewers-Stroboscope-Oscillating Mirror – Rotating Mirrors – Video Scanning safety-Housekeeping –Cleanliness – Job Changeover or Makeready-Makeready for Laminating, UV coating, Stackers & Conveyors, Counters, Densitometers – trouble shooting, Anilox Roll – Construction – cell structure-Anilox roll wear Fountain Roll-Roll coverings – Formulating rubber for rolls-Care of covered rolls	10	18%

Practicals: List of Experiments

1	Plate Mounting
2	Substrates – Identification, Evaluation Of Properties
3	Web tension control
4	Single color printing
5	Multicolor printing
6	Registration and Quality control

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report

- 15 marks

Class Test

- 10 marks

~~Attendance~~

- ~~05 marks~~

Total

- 25 Marks

Text Books / Reference Books

- FINAT Educational Handbook – self Adhesive Labelling
- Encyclopedia of Labels and Label Technology – Michael Farley
- Flexography – principles & practices – Foundation of Flexographic technical Association
- High Quality Flexography – Antony White – FIRA, BPIF Publishing

B.E. (Printing & Packaging Technology)		Semester – VII	
ELECTIVE – I (2) FOOD PACKAGING SCIENCE & TECHNOLOGY - I			
Periods per week	Lecture	04	
1 period of 60 min.	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

Detailed Syllabus			
UNIT-I		Periods	Weightage
	Food Packaging system – an overview - Introduction, the science, technology, socio economic needs and packaging functions, packaging systems, labels and forms, preservation, techniques. Packaging Material sciences- chemical, physical properties of packaging materials - Chemical constituents, bonding, Inter molecular forces, thermal, electromagnetic and mechanical properties	14	25%
UNIT –II	Gas and Vapour permeation - Basic concepts and theory of permeation and units - Permeability of packaging polymers and permeability measurement - Food-package compatibility and migration theories and measurement process of migration and migration issues. Testing, migration models and regulatory considerations	14	25%
UNIT –III	- Food packaging media-polymers, glass, metal and cellulosics polymers – types, varieties and processing, Relative merits and applications and new developments, edible coatings and films and recycling	14	25%
UNIT-IV	Food packaging media –polymers glass, metals and cellulosics. Glass-structure, mechanical-thermal-chemical and electromagnetic properties Treatments, decoration and applications Metals-Types, classification and properties, aluminium, tinplate, tinfree steel, stainless	14	25%

	steel, corrosion, corrosion prevention, container types, lacquers and coatings, recent developments and trends Cellulosics- fibre chemistry, papers/boards for foods, cartons, bags, set-up boxes, composites, cartons for liquids		
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Practicals: List of Experiments

1. Haze, gloss, COF of packaging media and relevances
2. Surface and total alkalinity of glass
3. Product package compatibility, permeability determination, gas mixture relevance
4. Specific and overall migration

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above

Term work:

Practical Journal Report	- 15 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Fundamentals of Packaging – F A Paine, 3rd edition-walter soroka Institute of Packaging professionals 1995
2. Flexible food packaging – A Hirsh Publisher-Van Nostrand Reinhold 1991
3. Handbook of Farm, Dairy and Food Machinery – Myer Kurtz
4. Handbook of Packaging Engineering – Joseph & Robert S Kelley-3rd Edition – technomic Publishing
5. Confectionary packaging equipment – Hooper-Aspen Publisher – 1998
6. Handbook of Package engineering – Hanston Institute of packaging – 2nd edition
7. Packaging machinery systems – H.Hughes – Delmar Publisher 1998 Edition
8. Confectionery packaging equipment – Jeffrey H Hooper – Aspen Publisher – 1998
9. Design of Automatic Machinery – Stephen J Derby
10. Modern Packaging encyclopedia – packaging catalog corporation – First edition
11. Food preparation machines/packaging machinery and food cooking & warning equipment in India by Philip M Parker 2006 ICON Group International

B.E. (Printing & Packaging Technology)		Semester – VII	
Subject : ELECTIVE – I (3) INDUSTRIAL PRODUCTS PACKAGING - I			
Periods per week	Lecture	04	
1 period of 60 min.	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

	Detailed Syllabus	Periods	Weightage
UNIT-I	Industrial products – The product group, classification, general and specific properties Scope for industrial products packaging –The concept, fundamentals and significance, difference between consumer and industrial products packaging needs	12	20%
UNIT-II	The Packaging considerations and package design approach, protective requirements and distribution –hazards, their depth and sensitivity influencing packaging design and development criteria	12	20%
UNIT-III	Industrial Products classification – products, product group wise and its nature, classification and packaging requirements Engineering products, small, medium and heavy Engg. goods Electronic products Auto/auto components/spares Others and spare parts	12	20%
UNIT-IV	Industrial products – susceptibility to corrosion Theory of corrosion Corrosion preventive methods-Temporary, permanent Selection criteria and application methods Desiccants-types/varities/properties/selection criteria and quantity determination and mode of application Corrosion inhibitors-types/varities/properties and selection criteria and mode of application	12	20%
UNIT-V	Industrial products- Protective measures a) Theory of cushion and cushion design. Significance of cushion factor	12	20%

	b) Cushioning materials- types/varities/properties/selection criteria and applications c) Evaluation of cushioning as a package equipments and shock measurement systems d) Evolving cushioning system, optimizing needs. Developments of cushion curves e) Barrier materials – in an industrial product package, vacuumising system		
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Practicals: List of Experiments

1	VPI – paper/materials-Lab evaluation for effectiveness
2	Quantity calculation of desiccant required effect of high humidity/temperature – on Industrial
3	Product components-assessment of various coatings/wrappers
4	Develop cushion curve for resilient cushions
5	Assessment of compression set of selected cushioning materials

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report

- 10 marks

Class Test

- 10 marks

~~Attendance~~

- ~~05 marks~~

Total

- 25 Marks

TEXT BOOKS / REFERENCE BOOKS

1. Industrial Products packaging – Friedman W.F. and J.J. Kipness, John Wiley & Sons 1960 (00028)
2. Packaging Design & Engineering, Klimchuck – Wiley 2006
3. Handbook of Package Engineering – Joseph F.L. Robert S Keley, Technomic Publishing – 3rd Edition
4. Fundamentals of Packaging – F.A. Paine, 1991 – BlackieA & P

B.E. (Printing & Packaging Technology)		Semester – VII	
Subject : PROJECT – A		Lecture	--
Periods per week		Practical	02
1 period of 60 min.		Tutorial	--
Evaluation System		Hours	Marks
	Theory Examination	--	--
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

GUIDELINES

1. Project – A examination be conducted by two examiners appointed by university. Students have to give seminar on the Project – A for the term work marks. All the students of the class must attend all the seminars. Seminars should be conducted continuously for couple of days.
2. Project-A should preferably contain abstract, existing system problem definition, scope, proposed system, its design and manufacture if any.
3. Number of students for a Project should be preferably 2 to 4. Single student should be avoided and upto 6 may be allowed only for exceptional and complex projects.
4. Out of total projects, 65% may be allowed as to be industry projects and 35% projects must be in house. Head of the Department and senior staff in the department in consultation with the Principal of the institute/ college will take decision regarding projects.
5. Every student must prepare synopsis in the normal journal format.
6. Internal guide has to interact atleast once in week and maintain the progress and attendance report during both the semesters.
7. Research projects may be encouraged from outstanding students with research aptitude.
8. In case of industry projects, visit by internal guide will be preferred. Industry projects will attract demonstration either at site or in college

PRODUCT PRESERVATION & SPECIALITY PACKAGING

B.E (Printing & Packaging Technology)		Semester - VIII	
Subject: PRODUCT PRESERVATION & SPECIALITY PACKAGING			
Periods per week 1 period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System .		Hours	Marks
	Theory Examination	3	100
	Practical	--	25
	Oral Examination	--	25
	Term Work	--	25

	Detailed syllabus	Periods	Weightage
IT - I	Shelf life / Market Life - The concept and method of evaluation of shelf life (Moisture / oxygen sensitive products). Sensory evaluation and organoleptic assessment Principles to evaluate product keeping quality	08	14%
IT - II	SPECIALITY PACKAGING Vacuum / Gas flush (gaseous mixture) packaging. Controlled Atmosphere / Modified atmosphere Packaging. Principles and technology and Areas of application and benefits.	08	14%
T - III	SPECIALITY PACKAGING Retort and Aseptic packaging – Materials / M / c and system and packaging specialties. Flexible bottles (spouted pouches), Specialty caps and dispensers Barrier Technology – application and Advantages. Concept of Bag - in - Box System.	10	18%
T - IV	SPECIALITY PACKAGING Smart and Intelligent packaging Hologram and security features Including security inks & labels Child resistant and / Elder friendly closures Barcoding and RFID.	10	18%
T - V	SPECIALITY PACKAGING Intermediate Bulk containers a) Flexible FIBCS b) Rigid IBCS Types of FIBCS, Construction / design / tests and Applications. Types of IBCS – Construction / design / tests and Applications.	10	18%
- VI	SPECIALITY PACKAGING Technology of canning. New development in flexible packaging for foods, Packaging of non-carbonated fruit juices & fruit beverages. New developments in thermoform packaging and technology	10	18%

Practicals: List of Experiments	
1	Assessment of food quality in Packaging through sensory Evaluation. (Organoleptic studies).
2	Demonstration of Smart / Intelligent packaging technologies.
3	Experiment on vacuum / gas flush packaging.
4.	Autoclaving assessment of packages.

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report	- 15 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Food Packaging & Preservation – Mathlouthi, M. – Blackie A & P – 1994
2. Modified Atmosphere packaging – Malette, C.P. – 2nd edition – CRC Press
3. Canning – S.C. Bhatia – Small Industry Research Institute 1999
4. Vacuum Packaging – CRC Press – Brody 1996
5. Food Packaging – Lewis, V. – Food Trade Press – 2005
6. Food Packaging Technology – Multon Bureau – Wiley 1995
7. Shelf Life Evaluation – Man & Jones – Aspen Publishers-2nd Edition

B.E (Printing & Packaging Technology)		Semester - VIII	
Subject : PACKAGING AND PRINTING MANAGEMENT			
Periods per week 1 period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	25

Detailed Syllabus			
		Periods	Weightage
UNIT - I	PRINCIPLES OF MANAGEMENT Theory of Management & Management Concept Perspective Management, HRD and organizational structure, Economic Environment of Business, Information Technology for Management, Management Information system, communication Skill. Managerial Economics and accounting.	02	4%
Unit - II	MARKETING MANAGEMENT Product & service Management, Sales and service Management, Consumer & Industrial behavior, Advertising and sales promotion, Marketing Research, Product life cycle, Retail Management.	03	6%
Unit - III	FINANCIAL MANAGEMENT Basics of finance, Financial analysis, pay back period, ROI., cost and Management accounting, Income – Expenditure statement, Balance sheet, costing, principles of product, service, job work, structure of duties, Taxes, levies et. Ratios, significance of ratios, project feasibility analysis.	03	6%

AUTO CAD : Brief review of Updated version
Basics & application in structural design of packages
Auto cad-2D / 3D views etc.

ARTIOSCAD :

Making structural design of a carton / box, Basic commands similar to Autocad but with computer aided drafting aid similar to a drafting table. Major commands are similar to autocad and Adobe illustrator, Creating simple 2 D layout of simple box designs using the basic tools, cutting and scoring lines, the folding sequence, 3 D view and identification for any defects deficiency. Import / export the drawing created in Artioscad to Adobe illustrator and add graphics, Use Adobe illustrator plug in to create ups, trimming marks and registration marks

Basic of Adobe Photoshop.

Editing and enhancing images

Getting images into work area

Working with colour modes

Making colour and tonal adjustments

Editing and retouching images.

Use Adobe Photoshop plug in to edit and enhance the graphics.

UNIT - V	PRINTING MANAGEMENT, COSTING & ESTIMATION PRINTING INDUSTRY ORGANISATION : Printing management, Management principles, Management functions, Organizational criteria, Skills requirement, Types of business, Printing company management team responsibilities, Business, Management styles, Management decisions, Communication, Print marketing and sales. HUMAN RESOUSE MANAGEMENT CONCEPTS : HRM for printing, employment policy, evaluation of skills requirement for printing occupations, recruitment, job evaluation, staff appraisal, motivation training, human resources factors that limit productivity, staff flexibility, Manning and training requirements, States of industry, Analysis and development of human resources strategy, Management of personal skills and development, job satisfaction through involvement. PRINT JOB : Elements of Costing and costing Techniques, and Estimating. INTRODUCTION OF COST ACCOUNTING : Cost accountancy and its subjects, relationship of cost & financial accounting, cost accounting & management accounting, costing as a basis for estimating, the purpose of cost accounting, advantages of cost accounting, installation of costing system, costing system for printing industry & related problems. ESTIMATING : Purpose and functions of estimating from printer point of view & customers point of view. Difference between costing & estimating, Qualification of an estimator, working environment , estimators tools, estimating paper – selection of paper, allowance for waste, allowance for trimming, weights of loose sheets, weight of a reel of paper. Estimating ink – ink consumption formula, ink allowance for spoilage. Estimating binding materials – Board requirement, estimating covering materials, estimating sewing thread, estimating stitching wire, estimating adhesives. Terms and conditions – approved by AIFMD.	15	31%
UNIT-VI	PACKAGING MANAGEMENT, COSTING & ESTIMATION Packaging Industry – production / conversion / packaging (Business type) organizational structure, Management principles, organizational criteria, skill requirement, Management Team Responsibility, Business plan, Management – communications, styles and designs, Sales & Marketing principles. Human Resource concepts, skill development Productivity Concept; Package production – Elements of Costing, costing techniques and Estimating (for different products – cartons, flexible, Metal cans etc.)	10	20%

Practicals: List of Experiments

1	Development of / production / organizational structure for printing unit.
2	Development of / production / organizational structure for a package production unit.
3	Cost estimate for a printing job (eg. 8 colour gravure /flexible printing)
4.	Cost estimate for a package production job (eg. 6 Colour folding board die cut carton)
5.	Preparation of a network – distribution for a printed / converted package.
6.	Use of Auto cad and Artioscad for making simple shapes / carton design.

Term Work

Term work shall comprise of practical journal report and class test based on above syllabus.

Term work:

Practical Journal Report	- 15 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Fundamentals of Financial Management – Prasanna Chandra-6th edition –Tata McGraw-Hill
2. Print Management – Derek Porter – PIRA (1998).
3. Visual Basic – 1st Edition – Wrox press Maniz
4. VB Net – Oreilly media – 1st edition – Paul Lomax
5. Data Storage – Kruse – 2nd Edition – Prentice Hall
6. Marketing Management – Kolter-4th edition - Pearson

B.E (Printing & Packaging Technology)		Semester - VIII	
Subject : PACKAGING DISTRIBUTION & LOGISTICS			
Periods per week 1 period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

Detailed Syllabus		Period	Weightage
Unit - I	UNIT LOAD DEVICES – PALLETISATION Unit load devices – palletisation Materials / types / sizes / construction Designs, treatment and Air / Sea pallets, Selection criteria	10	18%
Unit - II	UNITLOAD DEVICES – CONTAINERSATION Unit load devices – Containerisation (Intermodal and multimodal Containers) History and concept Air and Sea containers, Types of containers – Normal, Refrigerated (Refer) etc. Materials / types / sizes / designs and storing and handling.	10	18%
Unit - III	MATERIAL HANDLING & STORAGE DEVICES Material Handling & storage devices Design of store and Ware Houses. Pallet trucks, Hand trucks, fork lifts, Conveyor and crane system. Transport systems – Trucks & wagons- types. Concept of loading etc.,	10	18%
Unit - IV	Packaging & retailing – Package Design for POP / Shelf display Packaging and Ecological aspects Waste disposal & recycling Technologies (National & International Regulations)	10	18%
Unit - V	Packaging & Distribution of dangerous cargoes Package design & transport systems I A T A - regulations U N (IMDG)– regulations Other regulations – FDA, CIB Agmarks, PFA, Weight & Measure act.	10	18%
Unit - VI	PACKAGING PERFORMANCE & DISTRIBUTIONS : Assessment of package performance For Normal distributions – Physical / Climatic hazards For dangerous goods movement For specific regulatory Conformity	06	10%

Practicals: List of Experiments

- | | |
|----|--|
| 1 | Design of pallets & pallet prototypes |
| 2 | Transport worthiness of Packages. |
| 3 | Evaluation of Drums / Jerry cans - for Hydraulic / pneumatic pressures |
| 4. | Testing for treatment and performance of pallets. |

Term Work

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral examination is based on practical journal report

Term work:

Practical Journal Report	- 10 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Integrated packaging system for Transportation and Distribution – Charles webbling
2. Design and Technology of package Decoration for the consumer Market – Geoff A. Giles.
3. Problems in Packaging – The Environmental Issues – I Boustead / K. Lidgren.
4. Dangerous Goods Regulations – International Air Transport Association (Canada)
5. International Maritime Dangerous Goods code (IMDG Code) – International Maritime organizations (London).

B.E. (Printing & Packaging Technology)		Semester – VIII	
Subject : ELECTIVE – II (1) SELF ADHESIVE AND NARROW WEB TECHNOLOGY - II			
Periods per week Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
		3	100
Evaluation System	Theory Examination		
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

	Detailed Syllabus	Periods	Weightage
UNIT - I	- Pressure sensitive Labels – Evolving future Technology – Infrastructure – markets – growth rate – SA in India – products –growth potential advantages - Design aspects for Labels – Prepress & Platemaking - Typography – Line illustrations – product personality – Aesthetics-Legislation: – Assembly of design elements – step & repeat – traditional & Electronic Organization –CTP and digital press	10	20%
UNIT - II	- Static Electricity –Cause-Remedial measures – Conductivity – Induction-Grounding-Ionization Film heaters-Foil & Conductive substrates-Split Box treater station –Adjustable shoe electrode station-Pressurized Treater station-Blown film treater station - Storage and Transportation of label stock - Troubleshooting-common problems, causes & remedies	10	20%
UNIT - III	- Quality control-variables-statistics-tool for quality control-planning for quality production-machine capability – the job order and master plan control of incoming materials - Process color printing –standardization-fingerprinting –test parameters-test target-calibrating a press –measuring tools-printing quality –dot gain-tonal range-gray balance – proofing-production press-proof press-print evaluation-process control	10	20%

- Health, Safety & environment-Complying Inks - Solvent & Water based inks-Hazardous waste - resource conservation & recovery-matrix - disposal-treatment of SA laminate-Occupational - Safety and health-records & logs -Exposure - limit, material safety data sheets-Chemical - contingency and disaster plan	10	20%
- Emerging trends-combipress- - letterpress/offset/flexo/gravure/screen-hot foil - stamping/embossing/Rfid inseting/varnishing- - need for combination printing-brand recognition - typography & illustrations - Innovations in labels -prevention of - counterfeiting, content safety, visible and - invisible security elements,barcodes and Rfid - no label trends in production-thinning of - substrates, short runs, recyclability of materials	10	20%

Practicals: List of Experiments

Label stock – Tensile Strength, tear Strength, grammage
 Adhesives-Coating Weight, peel Strength, Adhesion to steel
 Label stock as web – core ID, repeat length
 Designing labels and stepping

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report

- 15 marks

Class Test

- 10 marks

~~Final Exam~~

- ~~05 marks~~

Total

- 25 Marks

Text Books / Reference Books

PIRA Educational Handbook-self adhesive labeling
 Encyclopedia labels and label Technology – Michel Fairley 2004 Tarsus Publication
 Flexography – principles & practices – Foundation of Flexographic Technical Association-
 4 edition
 High Quality Flexography-Antony White – PIRA BPIF Publishing-2nd edition

Semester – VIII	
FOOD PACKAGING SCIENCE AND TECHNOLOGY -II	
Lecture	04
Practical	02
Tutorial	--
Hours	Marks
Theory Examination	3 100
Practical	-- --
Oral Examination	-- 25
Term Work	-- 25

Detailed Syllabus		Periods	Weightage
UNIT-I	Food Packaging operations and Technology-machine and systems. Machine and process for filling of liquid and dry products and closure-closing operations. Vertical, horizontal form fills seal systems. Bagging and wrappings, thermoforms, Shrink, stretch, skin and blister packaging Sealing and on line inspection systems	10	20%
UNIT-II	Microwave, vacuum and MAP, thermally processed/preserved systems. Microwave equipments, materials and Interactive microwave food packaging Vacuum & MAP packages – principles, gas and gas mixers, respairing and non-respairing systems Retort, Asceptics, sterilization, process selection in container and asceptic system	10	20%
UNIT-III	Active, Intelligent packaging – absorbing, release and other systems oxygen/moisture/CO ₂ /Ethylene absorbers; CO ₂ emitters, self heating, cooling systems. Intelligent and smart packaging and various types of indicators Legislations	10	20%
UNIT-IV	Shelf life assessment. The concept and factors influencing or affecting shelf life. Food deterioration and environmental factors, evaluation studies and methods to assess shelf life	10	20%
UNIT-V	Food products, characteristics and processing needs. Cereals and bakery products Meat and meat products Dairy and confectionary products, fats, oils, drinks Freshfruits, vegetables/frozen foods Sustainable packages-concept and developments. enviro related issues, solid waste management, biodegradable/photodegradable polymers Legislations, laws, tamper evident packages, labeling, coding, marking	10	20%

Practicals: List of Experiments

1. Field/studies at market place to differentiate packages for similar/ competitive products including labeling regulations
2. Comparison of thermoforms form fill systems with other form/fill seal systems
3. Outline and differentiate the filling technique and method for any selected products demanding different filling technologies
4. Laboratory assessment of shelf life for a selected product – packed under normal , vaccum and gas filled packages

Term Work & Oral Examination

Term work shall comprise of practical journal report and held visit and reports .
Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report	- 10 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

1. Food packaging & preservation – M.Mathlouthi – Backie Academic & Professional
2. Food packaging principles & practice 2nd edition – Gordon L Robertson – Taylor & Francis Group, LLC – 2006
3. Food packaging technology HB-NIIR Board – National Institute of Industrial Research

B.E. (Printing & Packaging Technology)		Semester – VIII	
Subject : ELECTIVE – II(3) INDUSTRIAL PRODUCT PACKAGING - II			
Periods per week	Lecture	04	
1 period of 60 min.	Practical	02	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	25
	Term Work	--	25

	Detailed Syllabus	Periods	Weightage
UNIT – I	Unit/retail packaging system- wrappers (polycoated, bituminized, waxed papers), air bubble film, EPE sheets, EPS moulded packs, folding board/duplex cartons, Efluted cartons, flexible pouches, security/anticounterfeit measures	12	25%
UNIT-II	Transport packaging systems – Corrugated and solid board boxes Types/Varieties /designs Design and development of packs for specific industrial products Structural design concepts – use of software and applications Design and development of internal fitments Other bulk carriers – eg. Sacks with barriers etc.	12	25%
UNIT-III	Transport packaging systems Wood and plywood and combination type boxes Design considerations. Concept of blocking and bracing Palletized boxes/ wooden boxes/crates/wire bound and crested containers sheathed crates Returnable boxes	12	25%
UNIT-IV	Packaging methods and equipments Methods of closures, fastening, reinforcement materials and methods, easy opening devices coding, marking, labeling-materials and methods insitu packaging, dunnages, preservations and treatment methods/process-selection and application	12	25%

Practicals: List of Experiments

1. Evaluate physical/mechanical properties of reinforcement materials
2. Assessment of effectiveness of wood treatment
3. Prepared models – sheathed and wire bound case
4. Static and dynamic compression strength of palletized CFB pack
5. List and evaluate anticounterfeit systems and prepare an analysis report

Term Work & Oral Examination

Term work shall comprise of practical journal report and class test based on above syllabus.

Oral Examination is based on the list of experiments mentioned above.

Term work:

Practical Journal Report	- 10 marks
Class Test	- 10 marks
Attendance	- 05 marks
Total	- 25 Marks

Text Books / Reference Books

TEXT BOOKS / REFERENCE BOOKS

1. Industrial Products packaging – Friedman W.F. and J.J. Kipness, John Wiley & Sons 1960 (00028)
2. Packaging Design & Engineering, Klimchuck – Wiley 2006
3. Handbook of Package Engineering – Joseph F.L. Robert S Keley, Technomic Publishing – 3rd Edition
4. Fundamentals of Packaging – F.A. Paine, 1991 – BlackieA & P
5. Wooden Containers/crates, Corrugated board/boxes, marking.: Specification and Testing as per Indian Standards
6. Military standards – design of wooden containers/crates, US-Military

B.E. (Printing & Packaging Technology)		Semester – VIII	
Subject : PROJECT – B			
Periods per week 1 period of 60 min.	Lecture	--	
	Practical	06	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory Examination	--	--
	Practical	--	--
	Oral Examination	--	50
	Term Work	--	100

GUIDELINES

1. Project – B examination be conducted by two examiners appointed by university. Students have to give demonstration and seminar on the Project – B for the term work marks. All the students of the class must attend all the seminars. Seminars should be conducted continuously for couple of days.
2. Project-B which is continuation of Project-A should preferably contained introduction and motivation, problem statement , requirement analysis , project design, implementation details, technologies used, test cases, project time line, task distribution, references and appendix consisting of various standards/technical reference manual. Every student must prepare well formatted, printed, hardbound report.
3. Internal guide has to interact atleast once in weekt and maintain the progress and attendance report during the term.
4. Convener should make sure that external examiners are appointed from the list as per appropriate technical area.

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