

Model Curriculum for
B. Voc. / D. Voc.
in
Printing and Packaging Technology



**All India Council for Technical
Education
Nelson Mandela Marg, New Delhi**

1. Introduction

All India Council for Technical Education (AICTE) Ministry of HRD, Government of India has introduced Entrepreneurship oriented Skill development courses of B. Voc. / D. Voc. / Skill Diploma. These courses will be run by AICTE approved institutes by using available infrastructure and facilities. In these courses the institute will conduct general education content and sector specific skills will be imparted by Skill Knowledge Providers/ Training Providers/ Industries.

1.1 Key Features:

Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the Diploma, undergraduate level of higher education to enhance employability of the students and meet industry requirements. Such student apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students admitted in such vocational courses.
- The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in Software Development and will be offered by respective affiliating University/Board of Technical Education.
- Students may be awarded Level Certificate/Diploma/Advance Diploma /Degree as outlined in the Table below:

Award	Duration after class X	Corresponding NSQF level
Level 3 Certificate	1 Year	3
Level 4 Certificate	2Years	4
Diploma	3 Year	5
Advance Diploma	4 Years	6
B. Voc. Degree	5 Years	7

2. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant appropriate and adequate technical knowledge together with the professional skills and competencies in the field of printing & packaging technology, so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired: -

A. Understanding of

- (a) The relevant basic concepts and principles in basic science subjects (Physics, Chemistry and Mathematics) so that he/she is able to understand the different vocational subjects.
- (b) The basic concepts in printing and packaging.
- (c) The concepts, principles of working of basic printing processes.
- (d) The concepts, principles of working of basic packaging processes.
- (e) The knowledge of testing procedure of the raw materials and consumables used for the various printing techniques and packaging systems.
- (f) The procedure of making image carriers for the different printing techniques.
- (g) The knowledge of press management and quality control aspects of various printing processes and packaging systems.

B. Adequate Professional Skills and Competencies in

- (a) Preparing image carriers for the various printing techniques.
- (b) Preparation and production of various packages.
- (c) Quality control aspects and management of supply chain.

C. A Healthy and Professional Attitude so that He/She has

- (a) An analytical approach while working on a job.
- (b) An open mind while locating/rectifying faults.
- (c) Respect for working with his/her own hands.
- (d) Respect for honesty, punctuality and truthfulness

D. NSQF compliant skills in Qualification developed by sector skill council in Textile & Supply Chain Management.**3. Course Structure**

The course will consist of combination of practice, theory and hands on skills in the Printing & packaging sector.

Curriculum

The curriculum in each of the years of the programme would be a suitable mix of general education and skill components.

Skill Components:

- The focus of skill components shall be to equip students with appropriate knowledge, practice and attitude, to become work ready. The skill components will be relevant to the industry as per its requirements.

Level	Process required	Professional Knowledge	Professional skill	Core skill	Responsibility
Level 3	Person may carry put a job which may require limited range of activities routine and predictable	Basic facts, process and principle applied in trade of employment	Recall and demonstrate practical skill, routine and repetitive in narrow range of application	Communication written and oral with minimum required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment	Under close supervision some responsibility for own work within defined limit
Level 4	Work in familiar, predictable, routine, situation of clear choice	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools materials and information	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's works and learning

<p>Level 6</p>	<p>Demands wide range of specialized technical skill, clarity of knowledge and practice in broad range of activity involving standard/ non-standard practices</p>	<p>Factual and theoretical knowledge in broad contexts within a field of work or study</p>	<p>A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study</p>	<p>Reasonably good in mathematical calculation, understanding of social, political and reasonably good in data collecting organizing information , and logical communication</p>	<p>Responsibility for own work and learning and full responsibility for other's works and learning</p>
<p>Level 7</p>	<p>Requires a command of wide ranging specialized theoretical and practical skill, involving variable routine and non-routine context</p>	<p>Wide ranging, factual and theoretical knowledge in broad contexts within a field of work or study</p>	<p>Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study</p>	<p>Good logical and mathematical skill understanding of social political and natural environment good in collecting and organizing information , communication and presentation skill</p>	<p>Full responsibility for output of group and development</p>

- The curriculum will necessarily embed within itself, National Occupational Standards (NOSs) of specific job roles within the industry. This would enable the students to meet the learning outcomes specified in the NOSs.
- The overall design of the skill development component along with the job roles selected will be such that it leads to a comprehensive specialization in few domains.
- The curriculum will focus on work-readiness skills in each of the year of training.
- Adequate attention will be given in curriculum design to practical work, on the job training, development of student portfolios and project work.

General Education Component:

- The general education component adhere to the normal senior secondary and university standards. It will emphasize and offer courses which provide holistic development. However, it will not exceed 40% of the total curriculum.
- Adequate emphasis is given to language and communication skills.

The curriculum is designed in a manner that at the end of each year after class Xth students can meet below mentioned level descriptors of NSQF:

CURRICULUM

Level	Code	Educational Component	Credit	Marks
3 Semester I	Theory			
	3.GE.01	Language-I	3	50
	3.GE.02	Applied Chemistry	3	50
	3.GE.03	Applied Physics	3	50
	3.GE.04	Applied Maths - I	3	50
	Lab/Practical			
	3.GP.01	Applied Chemistry Lab	1.5	50
	3.GP.02	Applied Physics Lab	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	Pallet Maker (LSC/Q6102), L2		(Any one)	15
Hand Block Printer (HCS/Q7201), L3				
Packer (HCS/Q9701), L3				
3 Semester II	Theory			
	3.GV.05	IT Tools(795)	3	50
	3.GV.06	Introduction to Printing Technology	3	50
	3.GV.07	Basic Concepts of Packaging Technology	3	50
	3.GE.08	Applied Mathematics -II	3	50
	Lab/Practical			
	3.VP.03	IT Tools Practical	1.5	50
	3.VP.04	Printing Process Laboratory	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
Any one of the QP's can be opted as offered in Semester I		(Any one)	15	200
4 Semester I	Theory			
	4.GE.01	General Foundation Course - I	3	50
	4.GV.02	Computer Applications in Printing & Packaging	3	50
	4.GV.03	Pre-press Technology	3	50
	4.GE.04	Language –II	3	50
	Lab/Practical			
	4.VP.01	Computer Applications in Printing & Packaging Laboratory	1.5	50
	4.VP.02	Pre-press Laboratory	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	Flower Handler — Packaging & Palletising (AGR/Q0704), L4		(Any one)	15
Packer (AMH/Q1407), L3				
Assistant Graphic Designer (MES/Q0602), L3				

Level	Code	Educational Component	Credit	Marks
4 Semester II	Theory			
	4.GV.05	Packaging Processes-I	3	50
	4.GE.06	General Foundation Course - II	3	50
	4.GV.07	Packaging Materials	3	50
	4.GV.08	Offset Printing Technology	3	50
	Lab/Practical			
	4.VP.03	Paper Testing Laboratory	1.5	50
	4.VP.04	Offset Printing Laboratory	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
Any one of the QP's can be opted as offered in Semester I		(Any one)	15	200
5 Semester I	Theory			
	5.GV.01	Rigid Packaging	3	50
	5.GV.02	Planning & Colour Separation Technology	3	50
	5.GV.03	Printing Image Generation	3	50
	5.GV.04	Printing Materials	3	50
	Lab/Practical			
	5.VP.01	Printing Image Generation Laboratory	1.5	50
	5.VP.02	Planning & Colour Separation Technology Laboratory	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	Goods Packaging Machine Operator (LSC/Q2216), L4		(Any one)	15
Printing Machine operator (TSC/Q5204), L4				
Draughtsman – Mechanical (CSC/Q0402), L4				
5 Semester II	Theory			
	5.GV.05	Entrepreneurship Development	3	50
	5.GV.06	Packaging Economics & Value Addition	3	50
	5.GV.07	Technology of Flexography & Gravure Printing	3	50
	5.GV.08	Costing & Estimating	3	50
	Lab/Practical			
	5.VP.03	Flexography Printing	1.5	50
	5.VP.04	Gravure Printing	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	One or more QP to be opted from the QPs mentioned in Level 5 first semester			15

Level	Code	Educational Component	Credit	Marks	
6 Semester I	Theory				
	6.GV.01	Binding & Finishing	3	50	
	6.GV.02	Print & Packaging Quality Control	3	50	
	6.GV.03	Flexible Packaging	3	50	
	6.GV.04	Screen Printing	3	50	
	Lab/Practical				
	6.VP.01	Print Quality Control Laboratory	1.5	50	
	6.VP.02	Screen Printing Laboratory	1.5	50	
	On-Job-Training (OJT)/Qualification Packs				
	Jute Screen Printer (HCS/Q7404), L4		(Any one)	15	200
	Foam Wrapping Operator (RSC/Q1607), L4				
Package Dyeing Machine Operator (TSC/Q5203)					
6 Semester II	Theory				
	6.GV.05	Graphic Design	3	50	
	6.GV.06	Printing & Packaging Machine Maintenance	3	50	
	6.GV.07	Publishing Technology	3	50	
	6.GV.08	Packaging Processes-II	3	50	
	Lab/Practical				
	6.VP.03	Graphic Design Laboratory	1.5	50	
	6.VP.04	Machine Maintenance Laboratory	1.5	50	
	On-Job-Training (OJT)/Qualification Packs				
	One or more QP to be opted from the QPs mentioned in Level 6 first semester		Any one)	15	200
7 Semester I	Theory				
	7.GV.01	Digital Printing Processes	3	50	
	7.GV.02	Packaging of Food Products and Beverages	3	50	
	7.GE.03	Personality Development & Behavioural Sciences	3	50	
	7.GV.04	Packaging of Pharmaceuticals & Cosmetics	3	50	
	Lab/Practical				
	7.VP.01	Minor Project	1.5	50	
7.VP.02	Package Testing Laboratory	1.5	50		

Level	Code	Educational Component	Credit	Marks
	On-Job-Training (OJT)/Qualification Packs			
	Block Print Supervisor (HCS/Q7202), L5	(Any one)	15	200
	Food Products Packaging Technician (FIC/Q7001), L5			
	Advance Pattern Maker (CAD-CAM) (AMH/Q1101), L5			
	Theory			
	7.GV.05	Press Management	3	50
	7.GE.06	Fundamentals of Management Accounting	3	50
	7.GV.07	Eco-friendly Printing & Packaging	3	50
	7.GV.08	Environmental Sciences & Disaster Management	3	50
	Lab/Practical			
	7.VP.03	Major Project	1.5	50
	7.VP.04	Digital Printing Laboratory	1.5	50
	On-Job-Training (OJT)/Qualification Packs			
	One or more QP to be opted from the QPs mentioned in Level 7 first semester	(Any one)	15	200
7				
Semester II				

Detailed Curriculum

Level 3 (Semester I)

(3.GE.01) Language - I

Chapter 1

Reading comprehension (prescribed texts) and functional grammar:

A variety of genres – short stories, expository pieces, biographies, poems, plays, newspaper and magazine excerpts have been included. Teaching of grammar has been integrated with the reading texts. The emphasis is on functional grammar.

The following ten prose texts and five poems have been selected for development of different reading skills.

Prose texts (Prescribed)

1. A warmer or a colder earth (popular science) Arthur – C. Clark
2. The tiger in the tunnel (narrative) – Ruskin Bond.
3. First two or four pages from Sunny Days (autobiographical) – By Sunil Gavaskar
4. Case of suspension (narrative)
5. Big brother (narrative) Shekhar Joshi
6. Father, dear father (news paper article form the Hindu)
7. Face to face (autobiographical) Ved Mehta
8. I must know the truth (narrative) Sigrun Srivastva
9. If I were you (play) Douglas James
10. India, her past and her future (speech) Jawahar Lal Nehru

Poems

1. Leisure – W H Davis
2. The road not taken – Robert Frost
3. Where the mind is without fear- Tagore
4. My grandmother's house – Kamla Das
5. The night of the scorpion – Nissi, Ezekiel

Non-prescribed

In this section learners will be exposed to newspaper, articles, tables, diagrams, advertisements etc. which they have to read carefully and interpret. In the examination similar pieces will be used.

Grammar and usage:

The following points of grammar and usage have been selected from the reading passages.

- Agreement/concord: number – gender etc.
- Tenses: simple past (negatives/interrogatives) present perfect, past perfect continuous, past perfect, expressing future time (will and going to)

- Passive voice (perfect tenses and modals)
- Modals (must, should, ought to, would)
- Linking words (to, like, because, although, instead of, if, as, since, who, which, that, when, however, in spite of)
- Reported speech, statements, questions (yes/no)

Chapter 2

Functional writing and study skills:

This chapter helps the learner to write descriptive and narrative paragraphs, letters, reports, notices etc. and also practice skills of note making.

- Paragraph writing
- Describing objects
- Describing people
- Narrating events, stories
- Letter writing
- Application for leave
- Application for jobs
- Asking for information from various agencies (e.g. Last date for getting prospects; price of items before placing orders etc.)
- Note making
- Ending (punctuation, spelling, appropriate vocabulary, structures)

(3.GE.02) Applied Chemistry

Chapter 1

Structure of Atom:

Rutherford model of the structure of atom, Bohr's theory of electrons, quantum numbers and their significance, de-Broglie equation and uncertainty principle, electronic configuration of 1 to 30 elements.

Chapter 2

Periodic Properties of Elements:

Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity. Division of elements into s, p, d and f blocks.

Chapter 3

Chemical Bonds:

Electrovalent, covalent and coordinate bond and their properties. Metallic bonding (electron cloud mode) and properties (like texture, conductance, luster, ductility and malleability).

Chapter 4

Fuel and their Classification:

Definition, characteristics, classification into solid, liquid and gaseous fuel. Petroleum and brief idea of refining into various fractions and their characteristics and uses. Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas.

Chapter 5

Water:

Impurities in water, methods of their removal, hardness of water, its types, causes and removal, disadvantages of hard water in boilers, pH value and its determination by calorimetric method.

Chapter 6

Corrosion:

Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings.

Chapter 7

Plastic and Polymers:

Plastic-thermo-plastic and thermo-setting. Introduction of Polythene. P.V.C. Nylon, synthetic rubber and phenol-formal-dehyde resin, their application in industry.

(3.GE.03) Applied Physics

Chapter 1

Units & Dimensions: M.K.S. fundamentals & derived units, S.I. base unit's supplementary units and derived units, Dimensions of various physical quantities, uses of dimensional analysis.

Chapter 2

Surface Tension and Viscosity: molecular forces, molecular theory of surface tension, surface energy, capillary action, concept of viscosity, coefficient of viscosity, principle and construction of viscometers.

Chapter 3

Vibrations: Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance. Effects of vibrations on building bridges and machines members.

Chapter 4

Heat: Temperature and its measurement, thermoelectric, platinum resistance thermometers and pyrometers. Conduction through compound media and laws of radiations.

Chapter 5

Ultrasonic: Productions of ultrasonic waves by magneto-striction and piezo-electric effect, application of ultrasonic in industry.

Chapter 6

Optics: Nature of light, reflection and refraction of a wave from a plane surface. Overhead projector and Epidiascope.

(3.GE.04) Applied Mathematics-I

Chapter 1

Sets, Relations and Functions

Sets, Relations and Functions-I, Trigonometric Functions-I, Trigonometric Functions-II
Relation between Sides and Angles of A triangle

Chapter 2

Sequences and Series

Sequences and Series, Some Special Sequences

Chapter 3**Algebra-I**

Complex Numbers, Quadratic Equations and Linear inequalities, Principle of Mathematical Induction, Permutations and Combinations, Binomial Theorem

Chapter 4**Co-ordinate Geometry**

Cartesian System of Rectangular Co-ordinates, Straight Lines, Circles, Conic Sections

Chapter 5**Statistics and Probability**

Measures of Dispersion, Random Experiments and Events, Probability

LAB/PRACTICAL**(3.GP.01) Applied Chemistry – Lab**

1. Proximate analysis of solid fuel.
2. Experiments based on Bomb Calorimeter.
3. Determination of turbidity in a given sample.
4. To determine the flash and fire point of a given lubricating oil.
5. To determine the viscosity of a given lubricating oil by Redwood viscometer.
6. To determine cloud and pour point of a given oil.

(3.GP.02) Applied Physics – Lab

1. To determine the surface tension of a liquid by rise in capillary.
2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a sonometer.
4. To determine the frequency of AC main using sonometer.
5. Time period of a cantilever

Level 3 (Semester II)

(3.GV.05) IT Tools

Chapter 1

Computer Organization & OS: User perspective.

Understanding of Hardware, Basics of Operating System.

Chapter 2

Networking and Internet.

Network Safety concerns, Network Security tools and services, Cyber Security, Safe practices on Social networking.

Chapter 3

Office automation tools

Software Development, Spreadsheet., Word processing, Presentation.

Chapter 4

Multi Media Design: (Open Source Design Tools)

Interface and Drawing Tools in GIMP, Applying Filters, Creating and handling multiple layers, Using Stamping and Smudging tools, Importing pictures.

Chapter 5

Troubleshooting: Hardware, Software and Networking.

Commonly encountered problems, (Monitor: No display, KB/Mouse not responding, monitor giving beeps, printer not responding, check for virus, Delete temporary files if system is slow, adjust mouse speed).

Chapter 6

Work Integrated Learning IT – ISM

Identification of Work Areas, Work Experience.

Reference Books:

1. IT Tools, R.K. Jain, Khanna Publishing House
2. Information Security & Cyber Laws, Sarika Gupta, Khanna Publishing House
3. Mastering PC Hardware & Networking, Ajit Mittal, Khanna Publishing House

(3.GV.06) Introduction to Printing Technology

Chapter-1

Introduction

Brief introduction of History of Printing, chronological developments in Printing, Scenario of Printing industry in India and Global printing scenario. Basic operations in printing: Pre-Press, Press and Post-press operations.

Chapter-2

Introduction to various printing process:

letterpress, lithography, flexography, gravure, screen printing. Digital printing processes. Merits and limitations of different printing processes.

Chapter-3

Letterpress process of printing:

Introduction, Characteristics of letterpress printing, classification of letterpress printing machines, letter press printing substrates, inks & image carrier.

Chapter-4

Lithographic printing process:

Introduction, characteristics of lithographic printing, classification of offset printing, different units of offset machine, introduction of offset plates, inks & substrates.

Chapter-5

Flexography printing process:

Introduction, characteristics of flexography, components of flexo press, flexo plates, flexo presses, introduction to flexo inks & substrates.

Chapter-6

Gravure printing process:

Introduction, characteristics of Gravure, Principles of Gravure printing, basic components of gravure press, brief introduction to image carrier preparation for Gravure printing, Gravure ink & substrate.

Chapter-7

Screen printing process:

Introduction, application of screen printing, tools, equipments & accessories used in screen printing, screen printing process steps, brief introduce to screen inks, substrates & image carriers.

Chapter-8

Digital printing:

Introduction, various, digital printing technologies & Brief introduction to digital inks & substrates.

(3.GV.07) Basic Concepts of Packaging Technology

Chapter 1

Packaging in Perspective:

Definition, Economics impact of packaging. Advantages of packaging- to customer, retailer, distributor, handler, transporters, manufacturer, society, nation. Disadvantages of packaging- cost, resource utilization, energy, toxicity, litter, solid waste, wastage, deception, convenience, enclosure, multiples, sanitation, quality.

Chapter 2

Packaging material suppliers:

Basic raw materials, materials for packaging, converting of packaging materials. Ancillary materials. Packaging equipment suppliers: converting equipment, packaging machinery, packaging materials and filled packages testing machines.

Chapter 3

Packaging – Today and Tomorrow:

Demographic influence on packaging: growing population, shifts in definition of household units, geographic redistribution, increase in number of working women, increase in number of single living alone, increase in number of two earners household.

Chapter 4

Packaging Considerations:

(a) Product Characteristics: Physical characteristics of the product: Physical state, Weight, centre of gravity, fragility, rigidity, surface finish etc.; (b) Physiochemical characteristics of the product: Susceptibility to water, water vapour, gases, odour, heat, light, spoilage, corrosion.

Chapter 5

Warehousing and retail outlet considerations;

Need for warehousing, types of warehouses, Hazards of warehousing- stacking- types, rain, seepage, insects and animals etc., Storage and Display requirements of retail and departmental stores.

Chapter 6

Handling Considerations;

Need for handling, situations of loading and unloading, need for trans-shipments, Methods of handling- manual & mechanical, handling devices.

(3.GE.08) Applied Mathematics – II

Chapter 1

Algebra-II:

Matrices, Determinants, Inverse of a Matrix and its Applications

Chapter 2

Relations and Functions:

Relations and Functions-II, Inverse Trigonometric Functions

Chapter 3

Calculus:

Limits and Continuity, Differentiation, Differentiation of Trigonometric functions

Differentiation of Exponential and Logarithmic functions, Application of Derivatives

Integration, Definite Integrals, Differential Equations

Chapter 4

Vectors and Three Dimensional Geometry:

Introduction to Three Dimensional Geometry, Vectors, Plane, Straight Line

Chapter 5

Linear Programming and Mathematical Reasoning:

Linear Programming, Mathematical Reasoning.

Lab/Practical

(3.VP.03) IT Tools – Lab

- Spreadsheets, Word, Presentation
- Multimedia Design
- Troubleshooting
- Project / Practical File
- Viva Voce

(3.VP.04) Printing Process Laboratory

1. Identification of different tools & equipment used in various printing process.
2. Introduction of different printing process.
3. Schematic diagram of different printing processes.

4. Study of various types of Image carriers for different printing process.
5. Overview pre-make ready & make ready.
6. Study of different printing press.
7. Overview of machine production for multi-colour printing.
8. Study of running & printing faults on different printing process machine.

Level 4 (Semester I)

(4.GE.01) General Foundation Course-I

Chapter 1

General education:

Behavioral and Social Issues, Child Labor, Drug Abuse, Public Health, Early Marriages, Gender Equality, Time Management, Traffic Sense, Human Rights, Corruption In Public Life, Communal Harmony.

Chapter 2

Computer Education:

Evolution of Computer, Characteristics of Computer, Classification Of Computers, Advantages Of Computers, Block Diagram Of Computer, Input And Output Devices, Hardware And Software, Operating System, MS Windows, MS Word, MS Excel.

Chapter 3

Personality Development:

Leadership Qualities, Stress Management, Decision Making.

Chapter 4

Rural Education:

Rural Poverty and Unemployment, Panchayat Raj System, Afforestation, Rural Waste and Recycling, Role of Agencies in Rural Development, Development of Rural Industries, Banks and Ngo's in Rural Development.

(4.GV.02) Computer Applications in Printing & Packaging

Chapter 1

Personal computers:

Labelling standards – software applications, utilities, operating systems. Linking hardware and software, device interfaces, BIOS, device drivers. Memory – Introduction, types, Cache memory, Magnetic Tape, Optical disk, CCD, MBM (Magnetic Bubble Memory).

Chapter 2

Mass storage technology:

Data organization, FD, HD, SCSI, their storage capacity, Compact Disc. Display devices – CRT displays & its types.

Chapter 3

Input/ Output devices:

Keyboard, mouse, scanners, printers (dot matrix, ink jet, laser). Introduction to DTP, usage of computers in printing. DTP in printing technology, Style Sheet, etc.

Chapter 4

Introduction to DTP software:

Use of Text tool Adobe PageMaker, Photoshop, and Corel Draw. Story editing, formatting, and Working with graphics: using different graphic tools, importing graphic working with colour, table editing. Various applications of DTP system. Use of DTP in printing and packaging industry.

(4.GV.03) Pre-press Technology

Chapter 1

Colour Basics:

Definition - Colour, Visible spectrum, Wavelength, Frequency,

Ultraviolet light, Infrared light. Additive & Subtractive colour theory & their applications.

Chapter 2

Original for Graphic Reproduction:

Original - Definition, Classification, Factors governing selection of the graphic original. Required physical and optical properties / characteristics of different types of graphic originals. Magnification and terminology of magnification of originals.

Simple numerical problems based on magnification.

Chapter 3**Equipments used in Reproduction Photography:**

Formulae and relationship between different quantities of lens such as focal length, depth of focus, depth of field, power etc. Simple numerical problems related to image formation using lens. Lens aberrations and flare. Digital Camera - Working principle, Construction, applications, advantages, limitations. Introduction to different photo sensors (CCD, CMOS) used in digital camera. Resolution of digital camera. Comparison between digital photography and conventional photography

Chapter 4**Screening (Half tone Dot Formation) Techniques:**

Resolution, relationship between dpi, ppi and lpi. An introduction to electronic dot generation and its advantages. Screen angles. AM and FM Screening - working principle, advantages and limitations of FM (Frequency modulated) screening technique and AM (amplitude modulation). Characteristics of hybrid screening technique i.e. combination of AM and FM screening.

Chapter 5**Densitometry and dot shapes:**

Need and advantages of densitometry. Definition of opacity and optical density. Densitometer - Working principle, construction, applications, types of densitometers.

(4.GV.02)Language-II**Chapter 1-****Formal Communication:**

Understanding Written Communication, Types Of Written Communication-Reports, Letters, Minutes, Memos, Notices, Note Taking

Types Of Oral Communication: Presentations, Group Discussions, Conversations Interviews Etc.

Chapter 2-**Telephone Skills:**

How To Handle Telephone Calls, Telephone Etiquettes, Making Phone Calls, Taking Incoming Calls

Chapter 3-**Parts Of Speech:**

Common Errors In English. Use Of Capitals And Basic Punctuations- - Comma, Full Stop, Colon, Semi Colon, Hyphen, Inverted Commas, Apostrophe.

Chapter 4-

Format Of Basic Formal Letter:

Placing Order, Cancellation, Enquiry

Chapter 5-

Letter Writing:

Guidelines For Writing & Planning Effective Business Letter

Lab/Practical

(4.VP.01) Computers Applications in Printing & Packaging

Laboratory

- Introduction to various computer terminologies.
- Use of different Hardware devices.
- Word-Processing Software.
- DTP and its features, Software used in Printing.
- Page set-up with different sizes and margins.
- Preparation of Text rich documents.
- Image and Text merging, modifications and Editing of Illustrations and Text.

(4.VP.02) Pre-press Laboratory

1. Introduction to Pre-press.
2. Use of digital camera.
3. Study of AM screening samples
4. Study of FM screening samples
5. Study of resolution, dpi, lpi, ppi
6. Study of lens types, focal length, image formation
7. Study of screening techniques, screen angle, dot shapes
8. Collecting different types of originals
9. Demonstration of Additive and Subtractive colour theory
10. Use of densitometer

Level 4 (Semester II)

(4.GV.05) Packaging Processes-I

CHAPTER – 1

Product Filling :

Introduction to product filling, Type and classifications of product, Techniques of product filling, Rotary filling technique and In- line filing techniques. Filling of liquids & semi liquid products-, Types of liquid fill processes, volumetric filling, constant level filling. Filling of dry products, Types of dry products, Dry product filling techniques, Volumetric filling, Filling by weight, filling by counts.

CHAPTER – 2

Wrapping Overwrapping & Bundling:

Introduction to wrapping, Wrapping methods : Progressive end lock folds, End fold wrappers, Die-fold wrappers, Cigarette fold wrappers, Roll wrappers, Pouch type wrappers, Formed wrappers, Shrink wrapping, Stretch wrapping, Skin wrapping over wrapping, Multi-packing & Bundling.

CHAPTER – 3

Form – Fill – Sealing (FSS):

Introduction to form fill sealing(FSS), FFS machine and its constructional features, controls and mechanism provided for operating the FSS m/c, Pouch Making, Vertical pillow pouches, Horizontally formed pillow pouches, Tetrahedron shaped pouches, Flat bottom bags, Three side sealed pouches, Four side seal pouches, Stand up pouches, Selection of pouches type for particular application.

CHAPTER - 4

Blister Packaging & Thermoform-Fill-Sealing (TFFS):

Introduction to blister packaging and Thermo-form-fill-sealing (TFFS), Principle of blister formation, Basic methods of blister formation, Blister forming – from unsupported web, Form supported web, Product loading, Vacuum packaging, flexible material and sealing with rigid materials.

CHAPTER - 5

Bag Making:

PLASTIC Film Bags- Introduction to bag making, Types of plastic bags, Sandwich film bags, Bread bags, Grocery bags, Trash bag, Sack liner bag etc. Paper bags- Types of paper bags and envelopes, flat bags, square bottom flat bags, Satchel Bottom bags, Multi walled paper bags, Applications and suitability of paper bags and multi walled paper sacks in packaging of products.

(4.GV.06) General Foundation Course – II

Chapter 1

Business Management and Entrepreneurship:

Management of Business, Elementary treatment/exposure to basic conceptual frame work of the topic listed below: (a) Basic Function (b) Marketing Management (c) Financial Management (d) Production Management (e) Personnel Management

Chapter 2

Computational Skills:

1. (a) Solution of linear equations and their application to problem of commercial mathematics.
(b) System of linear equations and in equation in two variables. Applications in formation of simple linear programming problems.
2. Statistics: Raw data, bar charts and Histogram; Frequency Tables; Frequency Polygon; Ogive; Menu, Median and Mode of ungrouped and grouped data; Standard Deviation; Introduction to Mortality tables; Price Index etc. Introduction to Computers.

Chapter 3

Environmental Education & Rural Development Environmental Education:

- a. Modernization of agriculture and environment, irrigation, water logging, use of fertilizers, pesticides, soil erosion, land degradation (desertification and deforestation), silting and drying of water resources.
- b. Rational utilization, conservation and regeneration of environmental resources (soil, air, water, plant, energy, minerals).

Chapter 4

Rural Development:

Principles and goals of rural development, major problems/constraints in rural development in India.

Reference Books:

1. Environmental Studies, M.P. Poonia & S.C. Sharma, Khanna Publishing House
 2. A Textbook of Environmental Sciences, Rimpi Mehani Ne' Chopra, Khanna Publishing House
- (4.GV.02) IT Tools I. Comput

(4.GV.07) Packaging Materials

Chapter 1

Natural Polymers:

Properties of paper & paper board, nomenclature of paper products. Main packaging papers, unconverted paper wrapping, interleaving. Stiffening and supporting, shock absorption & space filling. Papers for conversion, Types of wrapping materials available, and storage of materials.

Chapter 2

Paper board:

Terminology, structure and general properties definitions. Physical characteristics, Mechanical properties, surface properties & optical properties. Board making machines. Fourdrinier m/c cylinder, mould vat m/c roll former. Multi-ply board m/c finishing processes and other surface treatments.

Chapter 3

Corrugated and solid fibre board boxes:

Corrugated boxes raw materials, types of corrugated boards, types of flutes, plies, manufacturing processes & machines. Styles of corrugated boxes. Creasing & cutting printing & slotting, stitching, gluing or taping, closing and sealing, advantages & disadvantages, applications and uses. Solid fibreboard boxes, honeycomb boards. Hessian laminated board, moulded corrugated pulp, cross fluted board. Case quality and quality control

Chapter 4

Folding cartons & set up boxes using paper & paper board:

Folding cartons- Raw materials, Types of boxes: reverse tuck carton, sealed end cartons, shell & slide carton, lid and tray type designing, manufacturing processes & machines. Setup boxes- Raw materials, types of boxes full telescope, hinged cover, tray style, neck & shoulder style, manufacturing of above.

Chapter 5

Metallic packaging materials:

Packaging metals, black plate, tin free steel, recycling, aluminium foil, corrosion of tin plate, polarization, stress corrosion, presence of inhibitors, passivity, corrosion testing, lacquer coating. Metal cans: historical background, construction, types of seam & joints, type of closures, types and methods of manufacturing of cans, aluminium cans. Advantages, disadvantages & uses of steel & aluminium cans. Metal drums. Aluminium collapsible tubes: advantages, disadvantages and use, outline of manufacturing process, specification & terminology.

Chapter 6**Glass containers:**

Historical background, raw materials, types of glass, outline of manufacturing process, types of container, container making process, defects in glass containers, testing & quality control, seals, general requirements of a good seal, closures.

Chapter 7**Wood:**

The nature of wood, defects in wood, wood for box making, plywood, application of wood as packaging material, wooden casks & plywood kegs – wet and dry cooperages, production method types and styles of container, plywood barrels, cases and crates, sill and skid base cases and crates.

(4.GV.08) Offset Printing Technology**Chapter: 1****History of lithography:**

Print media and Classification of Printing Organizations. Recent trends in offset press technology. Basic principles of sheet fed offset printing. Construction and categories of sheet fed offset press. Safe handling of tools, equipment and materials in offset press.

Chapter:2**Feeding unit:**

Functions of the feeding section, sheet feeding types, feeding cycle, components of feeder, sheet conveying mechanisms, sheet detectors, sheet register, front lay and side lay, sheet insertion systems, grippers. Inking unit: role and function of inking system, different parts of inking system, split duct techniques, types of rollers in the inking system, setting of the rollers, care and maintenance of rollers, different inking systems, shore durometer.

Chapter: 3**Dampening system:**

Role and function of the dampening system, fountain solution, pH and conductivity of the fountain solutions, role of water in fountain solution, role of alcohol or alcohol substitutes in fountain solution, different rollers in the dampening system, roller coverings, doctor dwell, desensitizing

the metal rollers, different dampening systems, care and maintenance of the dampening system. Printing unit; different cylinders and their construction, cylinder gears, cylinder gap, bearers, undercut, cylinder packing, patching, printing pressures, cylinder setting theories, cylinder balancing. Pre-make ready and make ready. Progressive print out.

Chapter 4

Delivery section:

Role and function of delivery section, transfer cylinder, sheet transfer, sheet delivery, short and extended delivery systems, sheet control devices, anti setoff spray powder unit. Machine production & Trouble shooting.

Lab/Practical

(4.VP.03) Paper Testing Laboratory

- Study of grain direction of the substrate.
- Study of the machine direction of the substrate.
- Study of GSM of the substrate.
- Study of bursting strength of the substrate.
- Study of testing strength of the substrate.
- Study of Light fastness of the substrate.
- Study of Water absorbance of the substrate.
- Study of Ash content of the substrate.

(4.VP.04) Sheet Fed Offset Laboratory

- Study of various controls and operations.
- Study of the various mechanisms.
- Study of the lubrication system.
- Setting the feeder, feed board, lays and delivery.
- Setting the water and ink rollers and fixing the plate.
- Single colour printing.
- Two colour printing.
- Four colour printing.

Level 5 (Semester I)

(5.VP.01) Rigid Packaging

Chapter-1

Introduction

a) Packaging Functions – Primary - Preserve, Protect, Present

Secondary - Inform, Identify, Sell, Marketing

b) Challenges in packaging – Storage, Transportation, Chemical, Climatic, Biological.

c) Classifications–Primary/Secondary/Tertiary, Unit/Intermediate/ Bulk

Chapter-2

Paper and Board used in packaging

2.1 Boards - Type of Boards, properties and applications, Multi ply boards, food grade boards, corrugated boards

2.2 Corrugated board - Corrugated board manufacturing process, types of flutes

2.3 Carton - Functions, types, applications, international standards for cartons such as FEFCO, ECMA. Carton making – Carton designing – consideration while designing, information on carton

Chapter-3

Metals used in Packaging

3.1 Metals used in packaging, advantages, applications, characteristics of – Aluminum, Stainless Steel, Galvanized Steel

3.2 Conversion of Metal –Cans - Three piece & Two piece Cans, Walled iron Cans - Welded & Seamless Cans. Tubes – Collapsible tube manufacturing process, Design, Advantages & Disadvantages of Metal Collapsible tubes specifications, problems.

Chapter-4

Glass used in Packaging

Types of Glass bottle, making process, Raw materials, Properties, Advantages, Disadvantages, Applications

Manufacturing Process - Bottle manufacturing and post manufacturing Treatments. Quality control and Specifications

(5.Vp.02) Planning and Colour Separation Technology

Chapter 1

Light and Colour:

Electromagnetic waves, Visual appreciation., Properties of colour, colour perception., Additive & Subtractive principles of colour synthesis.

Chapter 2**Equipment's and Materials:**

Camera essentials, Filters, filter factor, filter ratio, Halftone screen, special purpose, screens screen angle.

Chapter 3**Quality Control Aids:**

Copy preparation and evaluation., one and colour control, Grey scale, register marks, register punch, Colour Patches.

Chapter 4**Colour Separation:**

Principles of colour reproduction, Methods of colour separation: Direct colour separation and indirect colour separation, Exposure control system, Evaluation of colour separations.

Chapter 5**Colour Correction:**

Basic principles of color correction.

Color correction methods: Manual color correction, Photographic color correction, single overlay, Two overlay, High light, Premask, Camera back masking, Quality control mask, Under control removal.

Chapter 6**Electronic Colour Scanner:**

Principles of scanning, Principles of colour, Electronic colour scanner: Working principles and functions of a colour scanner., Electronic colour separation: Scanner programming, Scanner operation and evaluation of separations through scanner.

(5.VP.03) Printing Image Generation**Chapter 1****Introduction:**

Introduction to printing surfaces for different processes.

Relief printing surfaces: Type-set-forms, Photomechanical plates, Stereo plates – their purpose, suitability and limitations.

Chapter 2**Offset plate making:**

Introduction to offset plate processes.

Substrates for offset plates – merits, limitations and suitability.

Offset plate making equipment, materials and accessories.

Plate grains, Graining and anodizing.

Surface plate process.

Deep etch plate process.

Wipe on plate process.

Chapter 3**Image carrier Flexography:**

Design consideration for flexographic reproduction, spectral requirements for flexography.

Photopolymer plate. Parts of flexographic plate - face, floor, shoulder, base, back, floor-depth
 A) Varieties of photopolymer - physical and chemical properties, shore hardness
 B) Plate Exposing and Developing unit - types of UV and types of exposure, Developing chemicals

Chapter 4

Image carrier Gravure:

Electroplating - chemical and electrical variables such as electrolytes, immersion, current, voltage, temperature, distance,

Cylinder base - sleeve, integral shaft, specifications of cylinder. Copper - properties, finishing, cutting, removal, testing, corrections, nickel plating. Chromium - plating, finishing, degreasing, polishing & testing. Cylinder balancing methods.

(5.VP.04) Printing Materials

Chapter 1

Paper Making

Cellulose fibers, different sources of cellulose fibers, fiber structure.

Introduction to paper manufacturing. Study of stock preparation -beating and refining of the pulp.

Types of pulp and different methods. Study of different non fibrous additives added to the

Pulp during different stages, Imparting watermark.

Study of working principle and construction of paper manufacturing process;

Chapter 2

Paper properties

Appearance Properties - Brightness, Whiteness, Gloss, Opacity.

Chemical composition related properties - Moisture contents and RH, Light fastness, pH: Acidity, Alkalinity

Structural Properties - Dimensional stability, Grain direction, Basis weight & grammage, Caliper and bulk

Surface properties - Ink absorbency, Printability, Smoothness.

Mechanical Properties - Bursting strength, Folding Endurance, Tearing strength

Chapter 3

Specialty paper

General Properties of Food grade paper, tissue paper, cigarette paper, security paper, writing paper, calcium based paper, blotting paper.

Factors affecting cost of paper

Chapter 4

Basics of Printing Inks.

Ingredients of Ink, Pigment - Function, properties and types (Organic, Inorganic, White, Black pigment)

Vehicles - Function, properties and types (Drying vehicles, Non Drying vehicles)

Resins - Function, properties and types (Natural resins, Synthetic Resins)

Solvents - Hydrocarbons, Aliphatic, Alcohols, Additives - Plasticizers, Waxes, wetting agents, Anti set off compounds, Reducers, Driers - Liquid driers, Paste driers, Inhibitors, Accelerators.

Chapter 5

Inks used for different printing process and Ink drying methods

Offset inks - General formulation, properties

Gravure inks - General formulation, properties

Flexographic inks - General formulation, properties

Screen Inks - General formulation, properties

Lab/Practical

(5.VP.01) Printing Image Generation Laboratory

1. Introduction and Practice of Drawing of layout and preparation of pasting for exposing.
2. Study of Tools, materials and equipments used in Offset Image generation Lab.
3. Study of Tools, materials and equipments used in Flexographic Image Generation Lab.
4. Study of tools, materials and equipments used in Gravure Image Generation Lab.
5. Preparation of various Types of Offset Plates.
6. Preparation of various Types of Flexo-graphic Plates.
7. Preparation of various Types of Gravure Image Cylinder
8. Quality Control equipments and their use in Image carrier department for various processes.

(5.VP.02) Planning and colour separation technology laboratory

1. Re-screening from printing halftone.
2. Line and halftone combination negative making.
3. Screen tint preparation from contact screen.
4. Preparation of spreads and chokes for multi color printing.
5. Manual retouching exercises.
6. Direct/indirect separation from reflection copy.

Level 5 (Semester II)

(5.GV.05) Entrepreneurship Development

Chapter 1

Introduction

Definitions and characteristics of an entrepreneur, Entrepreneurial qualities and functions, importance of entrepreneur.

Chapter 2

Entrepreneurship

Starting a small- scale industry: objectives, feasibility, report, project feasibility analysis, licenses, registration of small scale industries, and enlistment as suppliers.

Chapter 3

Project report

Meaning, scope, feasibility reports setting. Contents of a project report., Performa of a project profile on a small printing press.

Chapter 4

Finance

Scheme of assistance- financial assistance to small scale units, medium scale scale unit, modernization assistance to small and medium scale units, rehabilitation assistance to small and medium scale units, Proposal for bank loan establishing a press / studio and its extension.

Chapter 5

Location and layout of press / studio

Choice of site, factors influencing product and process layout, plant layout criteria for a good layout, good materials handling system.

Chapter 6

Material management

Purchase importance, functions, methods and procedure control, stock levels - re- ordering and economic ordering quality. Stores: classification and codification of materials, physical stock verification, methods, inventory control function, Sales and marketing
Special reference to printing / printed materials various scheme of central and state government.

(5.GV.06) Packaging Economics And Value Addition

Chapter – 1

Introduction of Value Engineering, Value Engineering: Introduction, Concept, Utility and benefits of value engineering

Chapter – 2

Value Engineering, Technique: alue engineering, technique, and value engineering procedures, various phases of value engineering techniques, creative phase, Brainstorming and other techniques of creativity

Chapter – 3

- Value Engineering Organization:
Organizational aspect of value engineering, value engineering exercise

Chapter – 4

- Economics in Production:
Packaging Economics: Introduction, Importance of economy in production role of packaging in national economy.

Chapter – 5

- Packaging Material Cost
Uses of different packaging materials, packaging material cost, Relation of packaging cost and percentage lost in packaging materials.

Chapter – 6

- Packaging In Economics:
Packaging in general economy, total packaging cost, transport cost, functional or protective packaging, effect of improvement in packaging design, substitute of resources, recycling resources.

Chapter – 7

- Costing Introduction:
Importance of costing, different types of costs direct cost, indirect cost (overhead) Prime cost, factory cost of production, total cost, cost verses price, steps in costing procedure.

Chapter – 8

- Costing of Various packages:
Computation of cost for different packages like CFB aluminium cans, containers etc., Bottles, Closures, Rigid Carton, Folding Carton, etc.

(5.GV.07) Technology of Flexography & Gravure Technology**Chapter 1****Introduction to Flexography**

Flexographic Printing Process - Characteristics, Working principle, advantages, limitations and applications, Comparison with other printing processes.

Chapter 2**Printing Machines**

Principle types of printing machines - construction, application, advantages and limitations, problems in printing on different machines - Inline, Stack, Common impression cylinder (CIC)

Plate cylinder- construction, types - integral, demountable, sleeves and magnetic, Impression cylinder - construction, loading method - pneumatic or hydraulic, Tympan bar, Hybrid presses, sheet fed presses & their application, drying systems.

Chapter 3**Introduction to Gravure**

Gravure - working principle, applications, advantages and limitations; Comparison with other printing processes, Image processing for Gravure process - Different types of originals, films for Gravure, need for screen, special colors, Doctor blade -

a) Assembly - angle, force, deflection, causes of wear

b) Materials used for Doctor Blade: Holder configurations - wiping and contact angles, pressure control, Doctor Blade Setting, Troubleshooting, Impression roller: functions, materials and hardness. Electrostatic Assist - construction, working principle

(5.GV.08) Estimating and Costing**Chapter- 1****Introduction-**

Brief introduction to Indian and Federation costing system. Importance of costing and estimating in printing and publishing trade, definition of cost, price and profit.

Chapter- 2**Estimating-**

Estimating and its inter-relationship with purchasing sales and management. Importance of accurate estimating, Requirements, qualifications and tools of an estimator. Estimating errors and their rectification, estimating on the basis of price lists, reprint work, charge back system, standard catalogues, etc.

Calculation of paper, board, ink covering and other finishing materials, wastage formulas. Estimating of the warehouse operations. Estimating for letter assembly, camera work, processing and planning, various methods of image carrier preparation, machine hours for various processes of printing. Operational times and current market rates.

Chapter- 3**Costing-**

Definition, Purposes and functions, aims and objects of costing, elements of cost, principles of a scientific costing system. Foundations of costing system, classes of departments, allocation and apportionment of expenses, basis of apportionment.

Direct and indirect cost, hourly rates, recovery of elements of cost distribution of expenses. Calculation of machine hour rates. Fixed cost and variable cost, total cost and unit cost, break-even analysis determination and graphical representation. Principles, stages, forms and specimens, costing routine.

Chapter- 4**Job Estimates-**

Making of estimates of complete jobs from designing to binding and finishing, original and reprint jobs, estimation and consideration for filler works, repeat works, rush works, charity works, work for new customer and contract works.

Lab/Practical

(5.VP.03) Flexography Printing Laboratory

1. Making of line and tone sheet photopolymer plate for flexo press printing.
2. Making of half tone liquid photopolymer plate
3. Demonstration of printing on flat bed cylinder machines.
4. Setting up of unwinder and rewinder units of web fed flexographic printing machine.
5. Setting up inking unit of web fed flexographic printing machine.
6. Setting up printing unit of web fed flexographic printing machine.
7. Single and multi color line or half-tone printing.

(5.VP.04) Gravure Printing Laboratory

1. Introduction to different parts of Gravure machine and their working
2. Setting of feeding unit
3. Setting of printing unit - doctor blade assembly, impression roller, registration control
4. Setting of delivery unit
5. Preparation of Gravure cylinder (various methods) - demonstrations
6. Study of Gravure cylinder proofing machine

Level 6 (Semester I)

(6.GV.01) Binding & Finishing

Chapter 1

Introduction

'Binding ' and 'Finishing' - Definition, Purpose, Applications, Binder's aids/marks.

Chapter 2

Materials

Paper- British standard and ISO paper sizes. Multiples and subdivisions of a given size. Advantages and Limitations of different measurement standards.

Adhesives - Types and their working - Animal glue, Starch and dextrin, Emulsions, Hot melt, Polyurethane Reactive (PUR) Hot melt. Principles of adhesion - Mechanical, Chemical.

Terms related to Adhesives - Adhesive, Recyclability, Coating weight, Cure, Heat seal, Heat set, Paste, Peel, Plasticizer, Pressure sensitive, PUR, Radio frequency or High frequency, Solid content, Thermoplastic / Thermoset, Thixotropic. Choice of correct adhesive

Study of different properties and applications of board,

Study of properties and applications of different types of Securing Materials-Thread, wire; Selection based on application, gauge of wire, thread strength and cost

Chapter 3**Cutting Machines**

Single knife guillotine machine- Construction and working., Three Knife Trimmer- Construction and working.

Chapter 4**Folding and Gathering Operations**

Knife folding; Buckle folding, Combination folding- Principle, Construction & Working, Gathering machines - Construction and working.

Chapter 5**Adhesive / Perfect Binding Machine, Book Binding**

Major parts & their functions, safety devices, application, Evaluation of Adhesive bound books, Page-pull and flex test and International standards, Book sewing machine, Case making machine - Construction and working

Chapter 6**Finishing operations**

Purpose, Application, Construction and working of machines for following operations - Lamination - cold/hot. Die cutting (Punching) - Half cut, Full/Through cut, Punch Out Line, Types of dies - Flat/Rotary, Base material for punches and types of blade Foil stamping - Foil Structure Inline Finishing - Slitting, Trimming, Tipping, Perforation, Creasing, Varnishing / Coating.

(6.GV.02) Print & Packaging Quality Control

Chapter 1**Introduction:**

Definition of Quality, Quality control, its meaning and purpose setting up a Quality Control Programme, and establishing necessary System and procedures, economic consideration.

Management Consideration: Quality Control as an attitude and management tool, management's responsibility, organization and personnel functions, getting everybody involved. Total Quality Control. Quality Control procedures and methods. Different shapes of quality control.

Chapter: 2

Materials Control: Establishing clear specifications and standardization of materials to be purchased particularly Packaging substrates, Inspection and testing of incoming materials as part of quality control; importance of proper handling and maintaining records of performance of materials Sampling and sampling plans. Establishing Quality control programme in different departments of Packaging Plant.

Chapter 3

Quality Control Instrumentation : Paper and paper board testing instruments for testing printability, print quality and end-use requirements, Ink testing instruments for testing optical and working properties and end-use requirements Process control instruments, devices and aids used in the galley and dark-room, striping department, plate room and press room for specific processes and for general purposes Press sheet control devices used for production of multi-colour printing jobs Basic principles of these instruments and devices how they function and what they measure, minimum instrumentation necessary to produce a product consistent with the appropriate quality level. Introduction to ISO:9000 and ISO:14000 series.

(6.GV.03) Flexible Packaging

Chapter 1

Introduction:

Introduction to Flexible packaging, Area of Applications, Introduction to polymer, classification, type of polymerisation - Addition, Condensation; Thermoset/ Thermoplastic. Additive in plastics antislip, antistatic, colorants, fillers, plasticizers.

General Properties, Applications of following polymers related to Packaging - Polyethylene (PE), Polypropylene (PP), Polyvinyl Chloride (PVC), Polycarbonate (PC), Polyamide (PA), Polystyrene (PS), Polycarbonate (PC), Polyurethane.

Chapter 2

Plastic converting Technology:

Plastic extrusion technology – Blown film extrusion – single layer and multi-layer film manufacturing process, die blow mouldings – split die, sheet extrusion process control, Injection moulding – Meaning, bottle manufacturing, Lamination Technology – Dry Lamination, Wet Lamination, sealing technology – heat sealing methods, Types of sealers – wire, rod, band, conductive etc. Blister Pack Technology – use of materials, manufacturing process, backing material for Blister,

Label application – label pasting; Closures, liners of closures

Chapter 3

Special packaging:

Lami-tubes - Structure of lami-tube, Layers in laminate, plastic properties, manufacturing process, printing on lami-tubes, Aseptic packaging – concept, process, and sterilization processes, requirements of films, Tetra pack – lamination processes, sterilization processes, pack forming on HFF and VFF machines, Bag in Box – process, Retort packaging, Packaging Requirements, Pouch forming machines, filling machine, stand up pouches – materials used for pouches, Shrink wrapping and Stretch wrapping machines, films for shrink /stretch wrapping, Applications.

(6.GV.04) Screen Printing

Chapter 1

History of Screening Printing, Stencils –

Knife cut stencils, photo stencils – Indirect stencil systems, direct photo stencil systems, capillary systems, and direct/indirect photo stencil systems. Screening materials, Screens – multifilament, mono filaments, selecting mesh material, stretching screen fabric to frame, screen preparation, screen reclamation – Trouble shooting clogged screens. Care and storage of screens.

Chapter 2

Image transfer –

The squeegee, Squeegee considerations, squeegee preparation, hardness categories of squeegee blades, Variety of blade shape and application. On contact printing, off contact printing. Screen ink uniqueness – U.V. inks. Manual Printing Process, Semi automatic Screen Printing m/c. Automatic Screen Printing m/c. Screen Printing machines- flat bed, hinged frame, flat bed vertical lift, Cylinder-bed presses, Container printing m/c, Rotary Screen Printing m/c, Carousel m/c. Special Machine configurations. Basic registration techniques.

Chapter 3

Drying methods –

Evaporation, Oxidation, Penetration, and Polymerization. Drying Equipments – Drying racks, wicket dryers. Jet dryers, Infrared dryers, Ultraviolet dryers. Flocking process. Introduction, Paper and Paper board, wood, Textiles, Plastics, Metals, Ceramics and glass.

Chapter 4

Specialized Areas –

Printed circuit boards of screen printing. Screen printing process; introduction, applications of screen printing, tools, equipments & accessories used in screen printing, screen printing machines, printing operational steps, screen printing inks. Screen printing cycle, job suitability, merits and limitations of screen printing.

LAB/PRACTICAL

(6.VP.01) Print Quality Control Laboratory

1. Tensile strength, burst strength, Substance, caliper, porosity test, Cobb sizing value test.
2. Tearing, brightness, gloss test, G.S.M. testing, Weight, folding endurance and other related tests.
3. Moisture contents test, ash contents test.
4. Hot air oven tester, absorbing test.
5. Pick strength, humidity control test, room temp testing.
6. Ink film thickness test.
7. Investigation of pigment properties.
8. Investigation of solvent properties.

(6.VP.02) Screen Printing Laboratory

- Study of various types of screen materials.
- Screen stretching techniques
- Operating of automatic machine.
- Stencil preparation – Direct, indirect, Direct/indirect, Capillary stencil preparation.
- Multi-color printing of visiting cards, greeting cards, letter heads, certificates, invitations, folders, cover pages, photographs.
- Printing on various substrates – wood, leather, textile, acrylic, metal, paper & paper products, plastics.
- Screen printing on Irregular Surfaces – Bottles, Ceramics, glass.
- Screen printing on printed circuit boards (PCB). Screen Reclamation.

LEVEL 6 (Semester II)

(6.GV.05) Graphic Design

Chapter 1

Various kinds of printed products, their format, and design factors:

Leaflets, pamphlets, booklets, catalogues, manuals, books, Magazines, journals, and newspapers
Business forms and commercial stationery, Labels, cartons, point of sale display etc, Factors to be considered in print planning

Chapter 2

Design and typographic Elements:

Design terms: point, line, space, shape, mass, size and scale, colour, tone, texture pattern balance and contrast, Typographic elements, copy preparation, including printing style, Type fundamentals, main groups of type face designs, type families, choosing type face suitable to the subject or product, relation between type face and printing processes, type face and paper surfaces
Legibility and readability

2.6 Monograms, trade mark, motif and logotypes

Chapter 3

Colour Elements:

Colour theory, terms used to describe colours: primary colour, Secondary colours, Tertiary colours, warm and cold colours; hue, shade and tint

Colour wheel; terms used to describe relationships between colours: Complementary, analogous, split, three or four colour jobs. Attributes and emotional appeal of colours.

Chapter 4**Illustrative Elements:**

Types of originals for illustrations and reproduction, continuous tone copy, line drawing, black and white and colour originals, Requirements of art work and originals for reproduction, treatment of photographs; photo mechanical transfer material and their use, Black and white photographs; high contrast and low contrast; improving quality of photographic prints, marking, scaling, cropping of illustration, reduction care and protection, air brush and its use.

(6.GV.06) Printing & packaging machine maintenance**Chapter 1**

Mechanism of Printing and Allied Machines, detailed technical specification of machines, mechanism of power transmission.

Chapter 2

Tools, Equipment and Materials required of maintenance of printing and allied machines, maintenance kit.

Chapter 3

Lubrications system and lubricants used in printing machines, kinds grades, periodicity, colour coding.

Chapter 4

Maintenances concept, status of machine, maintenance instructions and understandings of machine drawings and manuals.

Chapter 5

System of maintenance, planned, scheduled, preventive, repair, corrective and breakdown maintenance, application of a system in a plant.

Chapter 6

Installation of machine, repair techniques overhaul, AMC, materials of construction, tracing fault, potential areas of machine wear and tear.

(6.GV.07) Publishing Technology**Chapter 1**

Introduction to Publishing Technology- Meaning, concept and scope and Importance

Chapter 2**Kinds of Publications:**

Books for children, Scientific Technical and Medical Books, textbooks, Journals and Manuals, Newspapers and Magazines

Chapter 3**Process of Publishing**

Meaning and concept of Manuscripts, CRCs, and Typesetting, Concept of Proof Reading in composed pages, Parts in a book, Pre-press activities, Production and Emerging Technologies in Publishing, An overview different binding technique for publications along with Laminations

Chapter 4

Costing and estimation for publications, Marketing Promotion and Distribution of published books

Chapter 5

Govt. certifications and licenses required for bringing publication- As Police and RNI Authorities Copy Right Act, Quality Standard for Publications- Bars-coding and ISBN etc.

Chapter 6

E-Publishing – Concept and importance in today’s world, Technical requirements for e-publishing Role of internet.

(6.GV.08) Packaging Process-II

Chapter 1

Cartooning: Introduction of cartooning, Cartons and its types, Constructional features of various types of cartons, Carton shapes, Specialty cartons and its designing, Applications of specially cartons and their suitability, Blank design and blank preparation, Blank lay outing, Carton materials, Paper board carton, Plastic cartons. Cartooning processes – Product filling, Inserting, cartooning lining, Carton closing, Case studies of applications of die cut self locking cartons in various packaging fields.

Chapter 2

Box making: Introduction to box making, Difference between cartons and boxes, CFB and SFB BOXES, Strength and load parameters, Factors to be considered in designing of fibre board boxes, Flute types and flute specifications, Box materials, Blank design and blank layout, Single piece blank and two piece blank, Calculation decal size, Material calculations for particular size of boxes with specified quantity, Complete set up of Corrugator plant, Constructional details of single face corrugator unit.

Chapter 3

Case packing: Introduction to casing, Different types of cases, Top loading cases, Side and End loading cases, Case rejection and Case forming, Case positioning, Case loading methods, Horizontal case loading and Vertical case loading, Straight position case loading and Inverted position case loading, Case unloading, Case closing and case sealing, Different methods case sealing.

Chapter 4

Palletizing & de palletising: Introduction to Palletizing & De palletizing, Methods of palletizing & de palletizing, Unit loads and unitization, Advantages of unitization and unit loading, Elements of palletisation/ de palletising system, Pallet dispenser’s stackers, Tier sheet dispensers & stackers. Palletising – High level case palletizing, low level case palletizing, bag palletizing, Pail & drum palletizing.

Chapter 5

Labels & Labelling: introduction to labelling, Necessity of labels, Types of labels, Label – form & shapes, Styles of labelling, Materials of labels, Selection of label material, Factors to be considered while selecting label materials, Comparative study of different materials of label and economics involved. Label description and standard norms for description of labelling of import/export cases, Label adhesives, Factors to be considered for the selection of label adhesives.

LAB/PRACTICAL

(6.VP.03) Graphic Design laboratory

1. Collection and studies of varieties of printed products.
2. Classifications and identifications through lettering block letters, Venetian, old face, transitional, modern and decorative types.
3. Layout preparation: interpretation of copy and layout, preparing composite layouts rough and finished layouts.
4. Layout of title page, letter heads, visiting cards, envelopes, greetings cards, invitations, certificates.
5. Designing monograms, trade mark and logos.
6. Study of colour mixing and matching.
7. Preparation of dummies for various class of work books, display, news, magazines, cartons and other kinds of packaging materials.

(6.VP.04) Machine maintenance Laboratory

1. Study of functions of different printing and packaging machines through machine drawings.
2. Study of registration system and paper feeding systems including their mechanisms.
3. Study and chalking out of different lubrication points in printing and packaging machines with the help of machine drawings.
4. Preparation of maintenance schedules for different categories of machines.
5. Tools required for maintenance.
6. Preparation of preventive and repair maintenance procedure for different machines.
7. Lubrication and lubricants.
8. Checking up and repair of graphic art equipments.

LEVEL 7 (Semester I)

(7.GV.01) Digital Printing Process

Chapter 1

Introduction to Digital Printing Technology:

Definition, advantages, limitations of digital printing technologies, Comparison of conventional and digital printing technologies, Introduction to application areas of digital printing technology in

graphic arts industry such as computer-to-film, computer-to-plate, computer-to-print, customization and direct marketing,

Print-On-Demand (POD), variable data printing (VDP), distribute-and-print, remote publishing (Web2Print), wide-format printing, specialty applications (particularly of inkjet) like 3D printing, printing on microscopic items.

Chapter 2

Toner Based Digital Printing System:

Study of working principle, types and examples of selenium material, organic photo conductors, charge generation materials and charge transport materials, Study of working principle, types, requirements and general composition of developing medium i.e. liquid and dry toner used in electro photographic digital printing system, Study of working principles, major stages of Electrophotography, Study of characteristics and applications of ion deposition, electrostatic and magneto graphic toner based digital printing system.

Chapter 3

Non Toner Based digital printing system:

Study of working principle, types and applications of ink jet and thermal transfer digital printing systems, Requirements of colouring medium (ink) and general composition used in inkjet digital printing system.

Chapter 4

Large Format Printing:

List of digital printing technologies used in a large i.e. wide format digital printing, Applications. Construction of general wide format printer and its technical specifications, Inline operations Names and required properties of substrates used in large format digital printing systems, Troubles and remedies related to use of such substrates.

(7.GV.02) Packaging Of Food Products And Beverages

Chapter-1

Classification of foods-

Terminology of the following, perishable and non-perishable foods, Classification- Fresh foods, produce, partially processed food products, fish, dairy products, products processed to extend their shelf life, fully processed food, canned foods, frozen foods, dry foods, fats & oils, snacks, spreads (jams & jellies), beverages.

Chapter- 2

Food spoilage & deterioration considerations-

Bio-deterioration- effect of temperature on Preservation. Microbial growth, food spoilage & food poisoning, moulds & yeasts, preventing growth of bacteria & moulds, Abiotic spoilage- The role of water in foods, sorption isotherms.

Chapter- 3

Frozen foods-

Principle of freezing, types of freezing, effect of freezing (physical & chemical) on fish, poultry, meat, fruit and vegetables, types of packages. Other frozen products- ice cream, and other milk product

Chapter- 4**Dried & moisture sensitive food-**

Reduction of available water- methods of drying, moisture level of dried and moisture sensitive foods, general spoilage consideration of dehydrated foods, oxygen scavengers. Active packaging systems- packaging requirements for different moisture levels.

Chapter- 5**Fresh & chilled foods-**

Meat- chilling & chilling storage, deterioration of fresh & chilled meat, chilled transport to retail outlet, wholesale packaging, retailing, vacuum packaging of meat, Fish & Shellfish- factory ships, ships, fish processors, handling & transport, chilling, fish farming, retailing, vacuum packaging of meat. Milk- Quality & composition, effect of temperature on bacterial growth, pasteurization, characteristics spoilage of pasteurized milk, packaging, returnable bottles.

Chapter- 6**Fresh fruits & vegetables (including herbs, spices & nuts)-**

Fruits & vegetables- variability, the growing process, respiration & ripening, temperature, composition of the atmosphere, bacteriological considerations, handling, transport, packaging, pre-packed fruits & vegetables, modified atmosphere packaging, prepared vegetables & salads. Fresh herbs & spices. Nuts & seeds.

Chapter- 7**Juices, soft drinks & alcoholic beverages-**

Fruit juices, tea, coffee, beer and wine. Characteristics, spoilage & its preventions, packaging requirements.

(7.GV.03) Personality Development & Behavioural Sciences

Chapter 1**Objectives and Pre-requisites:**

Students should have studied subjects such as General languages, social studies and Moral education at school level. The objective of this subject is to prepare the students to become a good citizen and a professional useful to the society.

Chapter 2**Learning Outcomes:**

The knowledge of this subject will give the student a value system which will help him in taking decisions in professional and social life for the benefit of society at large.

Chapter 3**Definition and Basics of Personality,**

Understanding Traits and Types of Personality, Analyzing strength and weakness (SW), Body Language

Chapter 4**Business Etiquettes and Public Speaking:**

Business Manners. Body Language Gestures, Email and Net Etiquettes, Etiquette of the Written Word, Etiquettes on the Telephone, Handling Business Meetings; Introducing Characteristic, Model Speeches, Role Play on Selected Topics with Case Analysis and Real Life Experiences.

Chapter 5**How to Make a Presentation**

The Various Presentation Tools, along with Guidelines of Effective Presentation, Boredom Factors in Presentation and How to Overcome them, Interactive Presentation & Presentation as Part of a Job Interview, Art of Effective Listening. Resume Writing Skills, Guidelines for a Good Resume, how to Face an Interview Board, Proper Body Posture, Importance of Gestures and Steps to Succeed in Interviews. Practice Mock Interview in Classrooms with Presentations on Self; Self Introduction – Highlighting Positive and Negative Traits and Dealing with People with Face to Face

Chapter 6**Coping Management, working on Attitudes:**

Aggressive, Assertive and Submissive Coping with Emotions, Coping with Stress

Text Books:

[T1] McGraw, S. J., (2008), “Basic Managerial Skills for All, Eighth Edition”, Prentice Hall of India. [T2] The Results-Driven Manager (2005). Business Etiquette for the New Workplace: The Results-Driven Manager Series (Harvard Results Driven Manager)

Reference Books:

[R1] Pease, A. & Pease, B. (2006)., “The Definitive Book of Body Language”, Bantam Books.
[R2] Scannell, E. & Rickenbacher, C. (2010)., “The Big Book of People Skills Games: Quick, Effective Activities for Making Great Impressions, Boosting Problem-Solving Skills and Improving Customer Service”, Mcgraw Hill Education

(7.GV.04) Packaging of pharmaceutical and cosmetics**Chapter- 1****Introduction to pharmaceuticals-**

Definition of pharmaceuticals, Drug Compendia, Drugs and Pharmaceuticals act classification of pharmaceuticals.

Chapter- 2**Solid products-**

Types, classification, packaging consideration, packaging materials, forms of containers, dispensers, modern trends, packaging laws & regulations, evaluation of packages.

Chapter- 3**Liquid products-**

Types, classification, packaging consideration, packaging materials, forms of containers, closures, dispensers, modern trends, packaging laws & regulations, evaluation of packages.

Chapter- 4**Pastes-**

Types, classification, packaging consideration, packaging materials, forms of containers, closures, dispensers, modern trends, packaging laws & regulations, evaluation of packages.

Chapter -5**Injectable-**

Types, classification, packaging consideration, packaging materials, forms of containers, closures & dispensers, sterilization methods, comparison and application, modern trends, packaging laws & regulations, evaluation of packages.

Chapter- 6**Cosmetics-**

Definition of cosmetics, classification, various examples, packaging considerations, packaging materials, forms of containers. Closures, dispensers, design considerations, modern trends, packaging laws & regulations, evaluation of packages.

LAB/PRACTICAL

(7.VP.01) Minor Project

The student is required to do literature review on a particular area, so that a platform can be established for the project work which can be continued for the realization of major project. The concept has to be based on the printing and packaging applications.

(7.VP.02) Package Testing Laboratory

1. Determination of Burst strength of various packaging materials
2. Determination of Crush strength of various packaging materials
3. Determination of Ply bond strength of various packaging materials
4. Determination of Stiffness of various packaging materials
5. Determination of Scuff resistance of various packaging materials
6. Determination of Heat sealability of various packaging materials
7. Determination of gloss & haze of various packaging materials
8. Measure the color of a packaging material and compute colour differences between different batches

LEVEL 7 (Semester II)

(7.GV.05) Press Management

Chapter 1

Management

Objectives and functions such as planning, organizing, directing, coordinating, motivating and controlling.

Chapter 2

Structure of Organization

Structure of large scale printing press, Functions of sales, marketing, production, administration, stores departments, Different forms of business organizations- single owner, partner, joint stock and co-operative.

Chapter 3

Demand and Supply, Inventory

Laws of demand, supply, diminishing utility, elasticity and equilibrium, Inventory – Meaning, Types of Inventories, Inventory Control system

Chapter 4

Legal Aspects

Industrial acts- factories act, Printer's act- copyright act, Trade unionism and leadership.

Chapter 5

Print Production Management

Objectives of Production Management, Functions of print production department, Types of Production, Classification of Production systems, Production planning and control, Shop floor Management, Quality Management –

A) Fundamental concepts of Quality, Quality Cost, Specification of Quality, Quality Assurance

B) Concepts of Six Sigma, Kaizen, 5S

C) ISO standards for Printing processes, Paper, Ink – Objectives.

(7.GV.06) Fundamentals of Management Accounting

Chapter 1

Management: Introduction –

Meaning, nature and characteristics of Management - Scope and functional areas of management - Management as a science art or profession - Management & Administration - Principles of management - Social responsibility of management. - Contributions of F.W.Taylor and Henry Fayol.

Chapter 2

Planning-

Nature, importance and purpose of planning - Planning process, Objectives - Types of plans MBO-Features-steps.

Chapter 3**Organising:**

Nature and purpose of organisation, Principles of organisation - Types of organization
 Organisation Chart- Organisation manual-Departmentation, Committees Authority Delegation of
 Authority -Responsibility and accountability-Centralisation Vs decentralisation of authority –

Chapter 4**Staffing:**

Nature and importance of staffing - Process of selection & recruitment.

Chapter 5

Directing and Controlling: Meaning and nature of directing – Motivation –meaning –
 importance -Theories of motivation (Maslow's, Herzberg, McGregor s, X & Y theory) -
 Controlling: Meaning and steps in controlling - Essentials of a sound control system – Methods of
 establishing control-Control by Exception.

Books Recommended

1. Koontz & O Donnell, Management.
2. Appaniah & Reddy, Essentials of Management.
3. L M Prasad, Principles of management.
4. Rustom & Davan, Principles and practice of Management.
5. Srinivasan & Chunawalla, Management Principles and Practice.
6. S V S Murthy, Essentials of Management.
7. B.S. Moshal, Principles of Management

(7.GV.07) Eco-Friendly Printing & Packaging**Chapter 1**

Environment, ecology and sustainable development concept. Printing and Packaging
 environmental aspects; environmental impacts of printing and packaging operations.

Chapter 2

Packaging wastes, effluent treatment and waste minimization. To study reuse, reduce, recycle
 concept related with printing and packaging.

Chapter 3

To study degradable and non degradable printing and packaging materials. Environmental impact
 including risk assessment, environmental legislation, Packaging effluent and its treatment.

Chapter 4

Deming Cycle, Problem Solving, Auditing i.e. Quality safety, environmental integration quality
 assurance practices into a production stream or packaging line. Supply/ storage/ vaporization,
 Awareness on-site generation, pressure swing/ membrane/ cryogenic methods, Health and Safety.
 Energy conservation mechanisms with printing and packaging.

(7.GV.08) Environmental Science & Disaster Management

Chapter 1

Nature of Environmental Studies

Define the terms related to Environmental Studies. State importance of awareness about environment in general public, Definition, Scope and Importance of the environmental studies

Chapter 2

Natural Resources and Associated Problems

Define natural resources and identify problems associated with them, Identify uses and their over exploitation, Identify alternate resources and their importance for environment, Renewable and Non-renewable resources - Definition, Associated problems

Chapter 3

Ecosystems

Concept of Ecosystem, Structure and functions of ecosystem, Energy flow in ecosystem, Major ecosystems in the world

Chapter 4

Biodiversity and Its Conservation

Biodiversity - Definition, Levels, Value, Threats & Conservation

Chapter 5

Environmental Pollution

Definition, Classification, sources, effects and prevention related to pollution of: Air, Water, Soil, Noise.

Chapter 6

Disaster Management

Disasters - Nature and Classification of Disasters, Hazards related to Earthquakes, Tsunami, Volcanic eruption, Cyclones, Floods, Drought, Landslides, Forest fires, Avalanches and Pest infestation. Disaster Management cycle, vulnerability and risk analysis, Role of Governments, Media, and NGOs, prevention and precautionary measures.

Lab/Practical

(7.VP.03) Major Project

Making presentation of the project work well before the execution – Listing stages / operations in project along with time required, Selection of the text and image editing DTP software and decision of the finishing processes for the project. Selection of the printing process, Understanding the basic concepts and rationale behind the selection of the printing and packaging process. Selection of the range of substrates and inks and other variables. Costing of the raw materials required. Selection of the project having single and multi colour printing & packaging constituting an output that resembles job works carried out in an industry.

Project Report should be in the form of CD and well bound hard Copy.