3.1 PRINTING PROCESSES

L T P
4 - 4

RATIONALE

A technician in printing industry has to deal with different machines, processes and materials. For this an in depth knowledge and relevant skills is necessary for a diploma holders of printing technology. Through this subject principles of different processes, equipment/machine – their defects and papers/raw materials required in printing industry shall be dealt in order to develop necessary understanding of the subject amongst the students.

DETAILED CONTENTS

1. Brief history of printing in the western countries and in India. A brief survey of the evaluation of printing processes and methods from the craft to the present day technology (6 hrs)

2. Introduction to printing processes, basic principles, characteristics, identification and applications of letter press, flexography, offset, gravure, screen and Electrostatic printing etc. Suitability and limitations of various processes of printing (6 hrs)

3. Equipment and tools used for relief printing processes (6 hrs)

4. Letterpress machines: Classification, types of platen, cylinder and Rotary presses their working principles, inking common printing defects, causes and their remedies (6 hrs)

5. Screen Printing: Basic concept, classification of stencils, screen fabrics, its selection according to job, frame preparation, Febric treatment, briefly outline the steps necessary for printing with cut stencils, Tuscheand glue method and photographic stencils (8 hrs)

6. Imposition: General rules, Classification imposing schemes upto 16 pages, Imposition for centre stitching jobs, factors determing the imposition scheme. (10 hrs)

7. Trouble shooting clogged screens, care and storage of screens, screen ink-its kinds and uses for different substrates and drying methods (12 hrs)

8. Paper: kinds of papers, sizes, gsm and their suitability for different printing processes. Metric papers and conventional papers (10 hrs)

LIST OF PRACTIALS

1. Introduction to machine room equipment, tools and materials

2. Locking-up procedure: Locking-up text page and blocks

3. Handling, make-ready and operation of platen and cylinder machines

4. Printing single and two colour jobs

5. Printing single and multi-colour by silk screen process

6. Preparation of album of papers, their specifications and paper identification

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	6	10
2.	6	10
3.	6	10
4.	6	10
5.	8	12
6.	10	16
7.	12	18
8.	10	14
Total	**64**	**100**

3.2 GRAPHIC DESIGN

L T P
3 - 4

RATIONALE

Every printed product should be well designed before it is sent to the printer for executing the work. The print technician should have a clear perspective of the design principles involved in designing a product.

The main aim of this subject is to introduce the study of design as a decision making discipline which controls all the production process and covers aspects of printing techniques. The course contains introduction to variety of products, introduction to types and typography design methods, design organization, visual studies, techniques of copy preparation, layouts and dummy for all kinds of job with an aim to examine detailed design considerations and incorporate design planning to different types of products for enabling students to apply this knowledge in their professional career.

DETAILED CONTENTS

1. Various kinds of printed products, their format, and design factors (6 hrs)

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

2. Design and Typographic Elements (6 hrs)

    2.1 Design terms: point, line, space, shape, mass, size and scale, colour, tone, texture pattern, balance and contract
    2.2 Typographic elements, copy preparation, including printing style
    2.3 Type fundamentals, main groups of type face designs, type families
    2.4 Choosing type face suitable to the subject or product, relation between type face and printing processes, type face and paper surfaces
    2.5 Legibility and readability
    2.6 Monograms, trade mark, motif and logotypes

3. Colour Elements (8 hrs)

    3.1 Colour theory, terms used to describe colours: primary colour, Secondary colours, Tertiary colours, warm and cold colours; hue, shade and tint
    3.2 Colour wheel; terms used to describe relationships between colours- Complementary, analogous, split, three or four colour jobs. Attributes and emotional appeal of colours

4. Illustrative Elements (6 hrs)

4.1 Types of originals for illustration and reproduction, continuous tone copy, line drawing, black and white and colour originals
4.2 Requirements of art work and originals for reproduction, treatment of photographs; photo mechanical transfer material and their use
4.3 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

5. Layout Preparation (8 hrs)

5.1 Materials, equipment and techniques used in the preparation of layout and art work
5.2 Basic geometric shapes, disposition used of elements and space principles of symmetrical and asymmetrical arrangements, distinction between geometric and optical centers
5.3 Preparation of the layout, brief analysis of stages and house style

6. Planning for Production (10 hrs)

6.1 Selection and coordination of production processes within the economic terms of jobs specifications; consideration and limitations of binding, finishing and ancillary processes as they affect design considerations
6.2 Preparation of page layouts for different parts of the book and preparation of dummies and graphic softwares

7. Advertising (4 hrs)

Advertising, advertising agency and its working. Campaign and its execution. National and international campaign

LIST OF PRACTIALS

1. Collection and study 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 pages, letter heads, visiting cards, envelopes, greeting cards, invitations, certificates,
5. Designing of 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.

RECOMMENDED BOOKS

1. Photo offset by Irvbin T Lathrop, Robert J Knnot

2. Composing and Typography Today by B.D. Mendiratta, HPT Pusa Polytechnic, New Delhi

3. Production for the Graphic Designer

4. Print Design

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	6	12
2.	6	12
3.	8	18
4.	6	12
5.	8	16
6.	10	20
7.	4	10
Total	**48**	**100**

3.3 PRE-PRESS TECHNOLOGY-1

L T P
3 - 4

RATIONALE

Every printed product consist of texts portion and illustrations, with the former occupying a predominant portion. Knowledge of text setting methods and equipment used for setting text, which is broadly termed as "letter assembly", is therefore, very essential.

The aim of this subject is to study letter assembly as an important part of print-production techniques to enable the students to make judgment about various aspects of printing, particularly in relation to the requirements of designing the printed products.

This will cover development of type setting methods, preparation for type-setting, type-setting inputs and outputs, page assembly, proofing, imposition and planning.

The aim is to further develop the student's understanding and knowledge of letter assembly equipment, particularity in the areas of on-line integrated system, image generation system, editing and corrections, electronic page assembly, introduction to digital storage and outputs.

DETAILED CONTENTS

1. Introduction (4 hrs)

1.1 Historical development of various type-setting system from Gutenberg to present
1.2 Review of various systems and their relationship with current production methods

2. Preparation for Typesetting (6 hrs)

2.1 Typographical units of measurement, Anglo-American point system, and Didot point system
2.2 Units of set, measurement of length, comparison with point system
2.3 Preparation of copy, house style,
2.4 Proof-reading, standard proof reading marks, study of BIS specifications

3. Letter Assembly System (6 hrs)

3.1 Manual, mechanical, photo type and computerized type-setting
3.2 Display composition by various systems
3.3 Editing, correction and page make-up

4. Type-setting Routines (6 hrs)

4.1 Different kinds of setting solid, poetry, table, tabular, mathematical , scientific work etc
4.2 Handling of each kind of job, tools, accessories, precision aids used in the letter assembly

5. Introduction to Photo-type-setting (6 hrs)

Principles of first to present generation, photo-type-setting machines, their performance and usage

6. Type-setting Inputs (4 hrs)

Counting and non-counting keyboards, keyboard layout and ergonomics

7. Desk Top Publishing: (4 hrs)

7.1 Application, Configuration, scope and limitations of image setter, scanner and type of scanners used in printing industry
7.2 Hard wares and softwares used

8. Page Assembling and proofing (6 hrs)

8.1 Make-up for book work, magazine, newspaper and general printing
8.2 Equipment and materials used
8.3 Proofing techniques: Dot matrix printer, Laser Printer, Digital Printer, Inkjet Printer

9. Imposition and Planning (6 hrs)

9.1 Page shapes, margins, and size in relation to paper size
9.2 Imposition upto 32 pages: sheet work and half-sheet work, gripper edge, side lay, signature and register marks

LIST OF PRACTICALS

1. Practicing for keyboard operations for photo-type-setting
2. Type Setting Routines: Setting various kinds of work like: text, poetry, table abulation and display work
3. Make-up of pages: Procedure for making-up for different kinds of text pages which Includes various components such notes, tables, illustration with legends etc. Make up of preliminary pages and supplementary pages of books.
4. Display Composition: Setting up of display job as per the layouts, using suitable type setting system for different kinds of jobs
5. Practical work with different proofing techniques
6. Imposition: Imposition upto 32 pages for upright and oblong pages, half sheet and sheet work. Imposition for centre stitching job

RECOMMENDED BOOKS

1. Composing and Typography Today by BD Mendiratta, Okhla, New Delhi
2. A Handbook for Printing and Packaging Technology by Bishwanath Chakravarty.
3. Copy preparation and Proof-reading for Authors and Printers, By R Krishnamurthy. Northern Book Centre, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	4	10
2.	6	12
3.	6	12
4.	6	12
5.	6	12
6.	4	10
7.	4	10
8.	6	12
9.	6	10
Total	**48**	**100**

3.4 PRINTING SCIENCE- I

L T P
3 - 4

RATIONALE

The students will learn the scientific approach to test the materials for quality printing. Subjects involve various stages or reproduction photography, surface plate and press work etc.

DETAILED CONTENTS

1. Polymers (12 hrs)

1.1 Monomers and polymers, nomenclatures
1.2 Photopolymers and copolymers
1.3 Type of polymerization reactions – addition and condensation, Mechanism
1.4 Types of polymers-plastic, rubber and fibres, Mechanical Properties, Chemical Properties, Vulcanization of rubber.
1.5 Composition and characteristic of polymers-printing ink, resin, vehicles, adhesive, film base, cellulose and gelatin

2. Colloids and Surface Characteristics (12 hrs)

2.1 Kinds, characteristics and properties
2.2 Application in printing industry
2.3 Surface tension, Contact angles, capillary action

3. Substrate (12 hrs)

3.1 Fibrous and non-fibrous raw material used in paper and Board, their relative properties
3.2 Varieties of paper and boar, characteristic, classification and testing-mechanical, optical
3.3 Other substrates-metal foil, plastic, cellulose, synthetics
3.4 Brief description of machine, Steps of pulping process, sizing, improvement of properties, Calendaring, coating – materials required.

4. Metals and Alloys (12 hrs)

Steel, Nickel, Chromium, Aluminum Electroplating, Galvanizing Alloys. Heat Treatment of steel

LIST OF PRACTICALS

1. Tensile strength of paper
2. Bursting strength of paper
3. Folding endurance of paper
4. Surface Oil Absorption Test (SOAT)
5. Grain and cross direction test of paper
6. Tearing test of paper
7. Opacity test on paper

8. Measurement of GSM
9. Gloss test and brightness test
10. Moisture Absorption

RECOMMENDED BOOKS

1. Materials in Printing Processes by L.C. Young published by Focal Press, London
2. Printing Science by L.C. Young published by Focal Press, London
3. Advance Science for Learning published by In-Tech Workshop, Leipzig, Germany

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	12	24
2.	12	24
3.	12	24
4.	12	28
Total	**48**	**100**

3.5 GENERAL ENGINEERING FOR PRINTING TECHNOLOGY

L	T	P
5	-	2

RATIONALE

A diploma holder has to assist in activities of civil construction, installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of civil, electrical and mechanical engineering. The subject of General Engineering has been included to impart basic knowledge of civil, electrical, mechanical and electronics engineering to the students.

DETAILED CONTENTS

PART-A (MECHANICAL ENGINEERING) (16 hrs)

Theory

1. Transmission of Power (4 hrs)

   1.1 Transmission of power through belt, rope drives and pulleys, gears and chains
   1.2 Different type of pulleys and their application
   1.3 Chain drives and its comparison with belt drive
   1.4 Gear drives, types of gears, simple gear trains and velocity ratio

2. Internal combustion Engines (7 hrs)

   2.1 Classification and application of IC Engines commonly used: spark ignition and compression ignition engines.
   2.2 Working principles of two stroke and four stroke petrol and diesel engines
   2.3 Ignition system in petrol engines i.e. spark ignition, magneto ignition
   2.4 Spark plug
   2.5 Carburetor
   2.6 Cooling system of IC Engines: Lubrication of IC Engines
   2.7 General maintenance of engines

3. Air Conditioning System (4 hrs)

   3.1 Basic principle of refrigeration and air conditioning
   3.2 Working of centralized air conditioner
   3.3 Concept of split air conditioner and its applications

4. Pumps: Types and their uses (1 hr)

PRACTICAL EXERCISES IN MECHANICAL ENGINEERING

1. Study of main parts of 4 stroke petrol and diesel engines by actually dismantling them (The idea is to acquaint the students with the most common troubles occurring in the engines)

2. Study of main parts of 2 stroke petrol engine by actually dismantling it. (The idea is to acquaint the students with the most common trouble occurring in the engines)
3. Study of ignition system of petrol engines
4. Study of fuel and air circuit of a petrol engine
5. Study of fuel injection system and air circuit of a diesel engine
6. Study of cooling system and lubricating (including greasing) of an IC Engine
7. Study of friction clutch
8. Study of hydraulic brake
9. Study of various drives for transmission of powers and models of belts, pulleys, gears, chains and clutches
10. Study of centralized air conditioning system in a building

NOTE: Study will include dismantling and reassembling of actual parts

PART-B (ELECTRICAL ENGINEERING) (16 hrs)

Theory

5. Application and Advantages of Electricity: (2 hrs)

   5.1 Difference between AC and DC
   5.2 Various applications of electricity
   5.3 Advantages of electrical energy over other types of energy

6. Basic Quantities of Electricity: (2 hrs)

   6.1 Definition of voltage, current, power and energy with their units
   6.2 Name of the instruments used for measurement of quantities given in 5.1
   6.3 Connection of the instruments in 5.2 in electric circuit

7. Various Types of Power Plants: (2 hrs)

   7.1 Elementary block diagram of thermal, hydro and nuclear power stations
   7.2 Brief explanation of the principle of power generation in above power stations

8. Elements of Transmission Line: (2 hrs)

   8.1 Pictorial diagram of a three-phase transmission and distribution system showing transformers, supports, conductors, insulators and earth wire etc.
   8.2 Brief function of accessories of transmission lines
   8.3 Earthing of lines, substation and power station - need and practices adopted

9. Distribution System: (2 hrs)

   9.1 Distinction between high and low voltage distribution system
   9.2 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system
   9.3 Identification of the voltage between phases and between one phase and neutral
   9.4 Distinction between three phase and single phase supply

10. Supply from the Poles to the Distribution Board: (2 hrs)

    10.1 Arrangement of supply system from pole to the distribution board
    10.2 Function of service line, energy meter, main switch, distribution board

11. Domestic Installation: (2 hrs)

    11.1 Distinction between light and fan circuits and single phase power circuit, sub circuits
    11.2 Various accessories and parts of installation, identification of wiring systems
    11.3 Common safety measures and earthing
    11.4 Introduction to BIS code of safety and wiring installation

12. Electric Motors and Pumps: (2 hrs)

    12.1 Definition and various application of single phase and three phase motors
    12.2 Connection and starting of three phase motors by star delta starter
    12.3 Conversion of horse power in watts or kilowatts
    12.4 Type of pumps and their applications

PRACTICAL EXERCISES IN ELECTRICAL ENGINEERING:

1. Use of Megger:

   Objective: To make the students familiar with different uses of megger

2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.

   Objective: Students may be made familiar with the equipment needed to control a three-phase motor

   The students must experience that by changing any two phases, the direction of rotation is reversed.

3. Connection of a lamp, ceiling fan, socket outlet, geyser, floor grinder, voltage stabilizer etc.

   Objective: Students may be made familiar with the different types of equipment and circuits used in the domestic installations

4. Trouble shooting in a three-phase motor

Note: The teacher may create anyone of the following faults

(a) Loose connections
(b) Blown fuse
(c) Tripped overload protection
(d) Incorrect direction of rotation
(e) Single phasing
(f) Burnt winding to be simulated by a loose connection behind a terminal box.

Objective: The students must be able to detect the most common faults, which may occur in a three-phase motor, using meggar wherever necessary

5. Trouble shooting in a domestic wiring system.

Note: The teacher may introduce a fault in the existing wiring system of a classroom or workshop like

(a) blown fuse
(b) loose connection
(c) faulty components/accessories etc.

Objective: Students must be able to detect common faults which may occur in a domestic wiring system

6. Treatment of electric shock

Note: The teacher may give a demonstration how an electric shock must be treated.

Objective: Students must be trained to treat the persons suffering from an electric shock

7. Study of a distribution Board

Note: Students may be asked to study the distribution board in the institution and note down all accessories.

Objective: Students must be made familiar with the distribution board

8. Connections and reading down an energy meter

Objective: Students may be asked to connect an energy meter to a load and calibrate reading

9. Demonstration in electrical machine laboratory

Objective: Students may be shown different types of electrical machines and their starters and should be told that the three phase induction motors are most commonly used.

10. Study of submersible motor pump set:

Objective: To tell use of the set in water supply and irrigation works.

PART-C (CIVIL ENGINEERING) (16 hrs)

Theory

13. Construction Materials (3 hrs)

Basics of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry.

14. Foundations (6 hrs)

Bearing capacity of soil and its importance

Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines

15. Concrete (4 hrs)

Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete

16. RCC (3 hrs)

Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building

PRACTICAL EXERCISES IN CIVIL ENGINEERING

1. Testing of bricks

a) Shape and size
b) Soundness test
c) Water absorption
d) Crushing strength

2. Testing of concrete

a) Slump test
b) Compressive Strength of concrete cube

3. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works

Note: While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted in the laboratories and organized demonstrations for explaining various concepts and principles.

PART-D (ELECTRONICS ENGINEERING) (32 hrs)

Theory

17. Passive & Active Circuit Elements (6 hrs)

Familiarity with the following components:-

RESISTORS: Fixed and variable – Carbon & wire wound – Metal film & metal oxide – Thermistors – LDR and VDR (colour coding, power rating, accuracy and effect on temperatures, uses of resistors)

FUSES: Ordinary fuses (specifications)

CAPACITORS: Mica – Ceramic – Paper – Electrolytic – Tantalum – Silvered mica & power factor improving capacitors – Variable capacitors – Colour coding – Rating and uses of capacitors

INDUCTOR: Ferrite core – Pot core – Air core – Fixed, tapped and variable inductors – Factors affecting inductance and uses of inductors

Voltage source and current source

AC and DC signals

18. ELECTRONIC TRANSFORMERS (2 hrs)

Elementary idea of transformer — Features and specifications of wideband transformer — RF and AF transformer

19. RELAYS, SWITCHES, CABLES AND CONNECTORS (4 hrs)

Familiarity with following components**:** —

19.1 RELAY**:** Reed relay & solid state relays – Their characteristics, specifications and applications

19.2 CABLES**:** RF cables – High temperature cables – Low impedance cables – TV and telephone line cables – Their characteristics and specifications

19.3 MANUALLY OPERATED SWITCHES**:** Toggle switch – Keyboard switch – Push-button switch – Rotary switch – Thumb-wheel switch – Cross-bar multi switch – Their features and applications

19.4 CONNECTORS**:** Plugs and sockets – RF connectors – Edge connectors for PCB – Rating and specifications of connectors – Factors affecting choice of connectors – Choice of connectors for different applications

20. ZENER DIODE (3 hrs)

BREAKDOWN**:** Zener and avalanche – Construction of Zener diode and operation of Zener diode in reverse biased condition – Characteristics and equivalent circuits, specifications – Simple voltage regulator circuit

21. BIPOLAR TRANSISTOR (4 hrs)

21.1 Construction and operation of NPN and PNP transistors-V-I characteristics, transistor in active, saturation and cut-off-CE, CB, CC configuration and their differences, definitions of current gains and their relationship
21.2 Transistor as simple amplifier & oscillator and their simple application

22. FIELD EFFECT TRANSISTOR (3 hrs)

22.1 Construction, operation and VI characteristics of JFET, pinch-off voltage, drain résistance, transconductance, amplification factor and their relationship
22.2 Enhancement and depletion type MOSFET- concepts of CMOS
22.3 Differences between BJT and JFET

23. UNIJUNCTION TRANSISTOR (2 hrs)

Construction, operation and characteristics of UJT – Equivalent circuit – UJT as relaxation oscillator – Field of applications

24. THYRISTOR (3 hrs)

Construction, operation and characteristics of SCR – Turn on and turn off mechanism – SCS, DIAC, TRIAC and their uses

25. OPTOELECTRONICS (3 hrs)

Elementary ideas of LED, LCD, photodiode, phototransistor and solar cell and their applications

26. INTEGRATED CIRCUITS (2 hrs)

Basic idea of Ics – Classifications: linear and digital Ics, SSI, MSI, LSI and VLSI – field of applications

PRACTICAL EXERCISES IN ELECTRONICS ENGINEERING

1. Familiarization with operation of following instruments
   Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant electrical quantities with their help
2. Plot V-1 characteristics for PN junction diode
3. Plot V-1 characteristics of Zenor diode
4. Observe the wave shape of following rectifier circuit

   a). Half wave rectifier
   b) Full wave rectifier
   c) Bridge rectifier
5. Plot the wave shape of full wave rectifier with

   a) Shunt capacitor filter
   b) Series inductor filter
   c) Filter

6. Plot input and output characteristics and calculate parameters of transistors in CE configuration
7. Plot input and output characteristics and calculate parameters of transistors in CB configuration
8. Plot V-I characteristics of FET amplifier

RECOMMENDED BOOKS

A. Mechanical Engineering

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi
4. Refrigeration and Air Conditioning by RK Rajput; SK Kataria and sons; Ludhiana
5. Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi

B. Electrical Engineering

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi
2. Principles of Electrical Engineering by Gupta BR, S Chand and Company, New Delhi
3. Basic Electrical Engineering by Mehta VK; S Chand and Company, New Delhi
4. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi
5. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi
6. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
7. Basic Electricity by BR Sharma; Satya Parkashan, New Delhi

C. Civil Engineering

1. Textbook of Concrete Technology 2nd Edition by Kulkarni, PD Ghosh RK and Phull, YR; New Age International (P) Ltd., Publishers, New Delhi
2. Materials of Construction by Ghose; Tata McGraw Hill Publishing Co., Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by Gambhir; Tata McGraw Hill Publishing Co., Ltd., New Delhi
5. Building Construction by J Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vazirani and Chandola; Khanna Publishers, Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, Delhi
8. Soil Mechanics and foundation Engineering by SK Garg; Khanna Publishers, Delhi

D. Electronics Engineering

1. Electronic Principle / A.P. Malvino / Tata McGraw-Hill
2. Electronic Devices & Circuits / Millman & Halkias / Tata McGraw-Hill
3. Basic Electronics & Linear Circuits / Bhargava / Tata McGraw-Hill
4. Electronic devices & Circuit Theory / Boylestad & Nashalsky / Prentice Hall of India, New Delhi
5. Electronic Fundamentals & Applications / D. Chattopadhyay & P.C. Rakhshit / New Age International
6. Electronic Components and Materials / Madhuri A Joshi / Wheeler Publishers
7. Electronic Component / Padmanaban
8. Electronic Component / Ramchander
9. Electronic Measurement and system / R.G. Gupta / Tata McGraw-Hill

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	16	20
2.	16	20
3.	16	20
4.	32	40
Total	**80**	**100**

4.1 PACKAGING TECHNOLOGY

L	T	P
4	-	-

RATIONALE

Packaging is an important tool in modern business. A bulk printing is done for packaging in the printing industry. Printing for packaging has emerged as an area of specialization. Hence this course has been included in the curriculum to impart basic knowledge of packaging technology to enable the student to apply the same in his professional career.

DETAILED CONTENTS

1. Basics of Packaging (8 hrs)

1.1 Definition and historical back ground, purposes and functions of packaging
1.2 Packaging media
1.3 Mechanical, chemical and biological protective functions of packaging
1.4 Odour and flavor contamination, shelf life
1.5 Interaction between package and its contents
1.6 Types of packaging

2. Packaging Design (10 hrs)

2.1 Consumer research and sales promotion through package design
2.2 Factors influencing design
2.3 Surface design to suit production limitations
2.4 Consideration of design and marketing

3. Packaging Technology (10 hrs)

3.1 Paper based packaging; applications, advantages and limitations
3.2 Glass and plastic based packaging; applications; advantages and limitations
3.3 Wood, jute and textile based packaging; applications, advantages and limitations

4. Packaging Materials (14 hrs)

4.1 Paper and board; Characteristics and uses performance requirements - grammage, caliper, stiffness, bursting strength, brightness, surface finish etc
4.2 Different kinds of fiber boards: Solid boards, corrugated boards, conversion properties, advantages and limitations
4.3 Cellulose film: properties, manufacturing, applications and limitations
4.4 Plastic based packaging materials: kinds, properties, applications and limitations
4.5 Flexible packaging materials: Different materials used, flexible laminates, various combinations and applications, characteristics and limitations
4.6 Metal bases packaging materials; kind's applications, advantages and limitations

5. Ancillary Materials (14 hrs)

5.1 Adhesives: kinds and selection factors
5.2 Cushioning materials: functions, kinds and selection factors
5.3 Sealing tapes: kinds, applications, storage and compatibility
5.4 Strapping and stapling: purpose and kinds of strapping; stapling; advantages and methods used for sealing corrugated board boxes, rigid boxes etc
5.5 Labels and labeling;: kinds of labels and their uses, label forms and shapes, label materials (Paper, foil laminates and plastics), labeling faults
5.6 Closures and dispensing devices: functions, materials, metal caps, plastic molded caps, liners and materials used
5.7 Quality Control (from venling stage) to finished product.

6. Special Packages (8 hrs)

6.1 Aerosols
6.2 Strip packaging: blister packaging; shrink packaging
6.3 Skin packaging and stretch wrapping
6.4 Limited cartons: Systems packaging

Note: Students may be taken to relevant industries and extension lectures may be arranged

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	8	12
2.	10	16
3.	10	16
4.	14	20
5.	14	20
6.	8	16
Total	**64**	**100**

4.2 PRE-PRESS TECHNOLOGY-II

L T P
4 – 4

RATIONALE

Every Printed product consists of text portion and illustrations, with the former occupying a predominate portion. Knowledge of text setting methods and equipment used for setting text, which is broadly termed as letter assembly. Currently pre-press technology uses various digital pre-press equipment which are very essential for each students to know.

The aim of this subject is to study emerging equipment as an important part of print production techniques to enable the students to make judgment about the aspect of printing, particularly in relation to the requirements of designing of the printed products.

This will cover inputs and outputs, page assembly, desktop publishing, proofing, imposition and planning.

The main aim of the subject is to further develop the student's understanding and knowledge of digital equipment, particularly in the areas of on-line integrated system, image generation system, editing and corrections, electronic page assembly, digital storage and outputs etc.

DETAILED CONTENTS

1. Input System (8 hrs)

Role and function of processor; Basic components of a processor, automatic justification, hyphenation, spell check and stored dictionary; editing and correction techniques.

2. Image Display System (8 hrs)

Principle of cathode ray tubes both in monochrome and colour, pixels, resolution colour depth, digital system, LCD

3. Alternate input system (8 hrs)

Flat bed Scanner, internet, digital camera; their value and application.
Gray Scale, True colour scanning, OCR Technique.

4. Output system (8 hrs)

Dot matrix printer, Monochrome and colour laser printers, ink jet printer; their principle and operational features, Image setter, plate setter

5. Storage System (8 hrs)

Digital storage of processed information purposes, HD, floppy. CD, DVD, External HDD, USB Flash Drive; Performance Criteria.

6. D.T.P. System (8 hrs)

Word Processing S/W, Pixel and Vector based, Page-make up software. graphic software, Post Script and RIP, Different file format.

7. On demand printing (6 hrs)

Basic concept, Digital Press

8. Colour Management (6 hrs)

Basic concept of colour management.

9. Safety and Handling (4 hrs)

Care of the system including proper electrical setup, protection from dust, moisture and radiation.

LIST OF PRACTICALS

1. Production of text, table and tabular matter.
2. Creating pages on the DTP system, Text Flow (Auto flow), Combining Graphics etc. using Page Maker, Quark Xpress.
3. Using different software for graphics-coral draw, Adobe Photoshop, Scanning of photograph etc.
4. Handling and care of laser printers, inkjet printers and processing equipment

RECOMMENDED BOOKS

1. Printing in a Digital World by David Bergsland published by M/S Thomson Delmar Learning, USA
2. Professional Prepress, Printing and Publishing by Frank J. Romano published by Prentice Hall Press, .New Jersey, USA.
3. Digital Colour Printing Technology by V. Chakravorty published by M/S Asian Book Centre, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	8	12
2.	8	12
3.	8	12
4.	8	12
5.	8	12
6.	8	12
7.	6	10
8.	6	10
9.	4	8
Total	**64**	**100**

4.3 PRESS WORK-I

L T P
4 – 4

RATIONALE

Technician Engineers working in printing industry are required to deal with different printing machines and various processes. These machines have different operational units. The diploma holders in printing technology are required to have a good knowledge and skill of operating these machines. The subject deals with the sheet fed offset printing machines and their operational units.

DETAILED CONTENTS

1. Sheet fed offset machines (8 hrs)

Classifications, purpose, sizes, speed; suitability of single colour, multicolour and perfecting machines, their mechanical and operational feature.

2. Feeding Systems (6 hrs)

Different kinds of feeding system and their advantages and disadvanges.

3. Printing cylinder (6 hrs)

Blanket cylinder, impression cylinder, their construction setting and clamping of plate and blanket.

4. Rubber blankets (6 hrs)

Kinds, Grades, structure and properties of a good blanket; storage, care and maintenance of rubber blanket.

5. Inking system (6 hrs)

Dampening system, delivery system, their kinds, setting and operational features.

6. Registration (6 hrs)

Registration devices for single colour and multicolour printing, electronic register control.

7. Rollers (6 hrs)

Kinds and composition of rollers, their function, merits and limitations; care and storage of inking and damping rollers, setting of rollers.

8. Make ready and printing single colour and multicolour jobs on sheet-fed off-set machines, colour sequence its effects; colour mixing and colour matching. (8 hrs)

9. **Running defects,** their identification, causes and remedies, dry offset, security printing, map printing (4 hrs)

10. **Modern Developments and Automation**, Adjustment and preparation of two colours and four colour, sheet fed machine for printing. (4 hrs)

11. **Printing of two colours** and four colours jobs on sheet fed two colours and four colours printing machine. (4 hrs)

LIST OF PRACTICALS

1. Adjustments of plate on cylinder; fitting of offset blanket, preparing it for printings, various types of papers
2. Preparation of fountain/dampening roller solution.
3. Setting of inking and dampening rollers.
4. Colour mixing and colour matching.
5. Make-ready and printing of line and halftone; single multicolour job work.
6. Ink roller wash-up, damper cleaning and storing plates.

RECOMMENDED BOOKS

1. Offset press operating; GATF USA published by Graphic Arts Technical Fndtn Publication, USA
2. Faux 1; Lithography GATF USA. published by Graphic Arts Technical Fndtn Publication, USA
3. Lithographer's manual GATF USA. published by Graphic Arts Technical Fndtn Publication, USA
4. Machines Printing by Durraut W.R., Focal Press London.
5. Technology of offset Printing by C.S. Mishra; Anupam Prakashan Allahabad.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	8	12
2.	6	10
3.	6	10
4.	6	10
5.	6	10
6.	6	10
7.	6	10
8.	8	10
9.	4	6
10.	4	6
11.	4	6
Total	**64**	**100**

4.4 PRINTING SCIENCE- II

L T P
3 - 4

RATIONALE

The students will learn the scientific approach to test the materials for quality printing. Subject involves various stages off print reproduction, photography, surface plate and press work etc.

DETAILED CONTENTS

1. Printing Ink (12 hrs.)

1.1 Constituents of printing ink, general characteristic and requirement of printing ink for various printing processes, rehology, concept in ink manufacturing

1.2 Basic drying methods and their suitability for printing processes

1.3 Three and four colour process inks for different, printing process

1.4 Special inks-heat set, quick set, fugitive metallic, gloss, moisture set, magnetic, inks for ultra violet and infrared, florescent and their suitability to different applications.

1.5 Improvement of various properties, Testing and measurement of properties

2. Acid, Alkalis and pH (10 hrs.)

2.1 Definition of pH, PH scales and testing of pH, Concentration and pH value, Buffer solution

2.2 Significance of pH control in various paper and printing

2.3 Measurement of pH using indicator, comparator and meters etc Principle and concentration of Digital pH meter, (Principle and construction of Digital pH meter)

3. Eco-Friendly Material and Pollution Control (8 hrs)

3.1 Bio-degradable materials

3.2 Toxic materials

3.3 Recycling and waste treatment

3.4 Cleaning agent

4. Adhesive and Coatings (8 hrs)

Physical and Chemical Factors Classification

5. Organic Compounds (10 hrs)

Introduction Carbon compounds Dia 20 compounds, Aromatic Compounds, Organic Cratings, Varnish

LIST OF PRACTICALS

1. Dispersion
2. Tack Measurement
3. Viscosity measurement
4. Gloss measurement
5. Printability Test for colour printing
6. pH measurement
7. Light fastness test
8. Measurement of Hal, Saturation of colour ink

RECOMMENDED BOOKS

1. Material for printing process by Focal publishers
2. Printing Science by LC Young
3. Advance Science for Learning Printing

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	12	24
2.	10	20
3.	8	18
4.	8	18
5.	10	20
Total	**48**	**100**

4.5 PRINT REPRODUCTION TECHNOLOGY

L T P
5 - 4

RATIONALE

Photo mechanical transfer of images and electronic image generation are the areas of much importance for a student to develop himself/herself, in making printing surfaces. The subject mainly deals with operation and handling of different equipment machinery etc used for reproduction photography

DETAILED CONTENTS

1. Definitions and functions of reproduction technology (6 hrs)

2. Optical System (6 hrs)

   Lenses, lens aberrations, process lens and its kinds, aperture diaphragm, its functions, lens stop.

3. Cameras (8 hrs)

   Different type of process cameras and accessories e.g. gallery camera, horizontal dark room vertical, vertical enlarger type camera, roll film camera, computerized cameras, valuation of modern cameras

4. Illuminants (8 hrs)

   Classification, requirements, colour, temperature, carbon arc lamps, mercury vapors lamp, halogen lamps, xenon lamps, metal halides etc

5. Emulsions for Graphic Reproduction Photography (8 hrs)

   Ingredients, brief description of manufacture of emulsions, types of emulsions, emulsions structure, requirements of emulsions, study of sensitometer waves-characteristic and gamma curves, latent image theory

6. Line and Half tone photography (8 hrs)

   Basic line exposure, magnification factor, line photography, from black and white and colour line originals; Brief study of half tone screens, their kinds and uses; halftone theories, screen distance calculation, inverse system, ratio system; calculation of half tone exposure single and multiple exposure system, flash, no screen exposure, factors multiple exposure system, flash, no screen exposure, factors governing exposure, making of line and half tone negative densitometry, principles of dot formation, chemical reversal system, determining the correct exposure, hard and soft dots.

7. Processing (6 hrs)

Developers, ingredients and their function; different developers their suitability, factors affecting development, methods of development, stop bath, fixing bath their functions, retouching and precautions to be observed, film process.

8. Evaluation of line and halftone negatives/positives (4 hrs)

Evaluation methods, defects in line negatives/positives and their remedies, defects in halftone negatives/positives and their remedies

9. Light and colour (8 hrs)

Electromagnetic waves, visual appreciation, properties of colour, additive colour principle, subtractive colour principle.

10. Colour separation and colour correction (10 hrs)

Principles of colour reproduction, methods of colours separation, direct colour separation, indirect colour separation, colour scanner, exposure control system, light integration meter and its use, use of filter, filter factor, filter ratio, screen angles for multi-colour, under colour removal and black printer, evaluation of colour separations. Masking various camera techniques.

11. Quality Control Aids (8 hrs)

Evaluation of originals, tone and colour control, grey scale, register marks, register punch system, colour patches.

LIST OF PRACTICALS

1. Introduction to different process room equipments-study of their different working parts
2. Making line negative and positives
3. After treatments: Development, fixing, reduction, intensification
4. Halftone-making of halftone negatives and positives
5. Calculation of screen distance, use of v-ratio
6. Use of grey scale and densitometer
7. Defects in line and halftone negative/positives and their remedies
8. Colour separation from reflection copy and transmission copy. Making of positive by contact method.
9. Retouching.
10. Pre-press proofing.

RECOMMENDED BOOKS

1. Halftone photography GATF, USA
2. Reproduction photography by W.H. Burden
3. Photo offset by Robert J. Kunst and Irvin T, Lattirop
4. Graphic Reproduction Photography by JW Burden; Focal Press, London
5. Colour Separation Photography; GATF, USA.
6. Photographic Colour Printing-Theory and Technique; lira current.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	6	8
2.	6	8
3.	8	10
4.	8	10
5.	8	10
6.	8	10
7.	6	8
8.	4	6
9.	8	10
10.	10	12
11.	8	8
Total	**80**	**100**

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview; Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene

INDUSTRIAL TRAINING OF STUDENTS

(during summer vacation after IV Semester)

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

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

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

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.