Dear Teachers

This reference book *(Teachers’ Version)* is intended to serve as a transactional aid to facilitate classroom transaction and as a ready reference for teachers of Vocational Higher Secondary Schools. It offers some guidelines for the transaction of the course content and for undertaking the practical work listed in the course content. As the curriculum is activity based, process oriented and rooted in constructivism focusing on the realisation of learning outcomes, it demands higher level proficiency and dedication on the part of teachers for effective transaction.

In the context of the Right-based approach, quality education has to be ensured for all learners. The learner community of Vocational Higher Secondary Education in Kerala should be empowered by providing them with the best education that strengthens their competences to become innovative entrepreneurs who contribute to the knowledge society. The change of course names, modular approach adopted for the organisation of course content, work-based pedagogy and the outcome focused assessment approach paved the way for achieving the vision of Vocational Higher Secondary Education in Kerala. The revised curriculum helps to equip the learners with multiple skills matching technological advancements and to produce skilled workforce for meeting the demands of the emerging industries and service sectors with national and global orientation. The revised curriculum attempts to enhance knowledge, skills and attitudes by giving higher priority and space for the learners to make discussions in small groups, and activities requiring hands-on experience.

The SCERT appreciates the hard work and sincere co-operation of the contributors of this book that includes subject experts, industrialists and the teachers of Vocational Higher Secondary Schools. The development of the teachers’ version of reference books has been a joint venture of the State Council of Educational Research and Training (SCERT) and the Directorate of Vocational Higher Secondary Education.

The SCERT welcomes constructive criticism and creative suggestions for the improvement of the book.

With regards,

Dr. J. Prasad
Director
SCERT, Kerala
ABOUT THE COURSE

Printing is indispensable for the modern man as every product he comes across in his day-to-day life is directly related to it. We can see printing on a tooth paste tube or tooth brush that he uses immediately after waking up. From that moment, almost everything he uses for any purpose bears a printed impression. This course provides in-depth coverage of electronic text generation, desktop publishing, computer-to-plate operations, computer-controlled inking and printing, digital image generation and electronic prepress. Printing has undergone a complete transformation with the application of electronics, computers and microprocessors and advanced science and technology. This technology has developed by incorporating the advancements from other disciplines and adopting the latest technical information from commercial art, photography, applied science, computer, mechanical and electronic engineering, nano technology etc.

The importance of Printing Technology is fast increasing in today's commercial world. It has wide usage and applications. The range of products vary from newspapers, books, labels, business cards, stationery, inserts, catalogues, pamphlets, advertisements, carton & foil printing etc. The related activities associated with printing technology are data imaging, book binding, plate making, prepress services etc.

Firms are finding it time saving and economical to print their own newsletters and reports. Hence on completion of this course, there is a wide scope of wage and self employment.

The information revolution and consumerism create an ever increasing demand for printed materials in every field. Printed material is the main medium of communication and dissemination of knowledge. But more than this, the medium of print is improving its position in today's multimedia society. Day by day, people are becoming more and more quality conscious and this in turn increases the demand for quality printed products. The methods of print production are also changing; in the direction of environment-friendly, highly automated and easily operated printing systems integrated in a digital data environment.

Packaging is an integral part of printing Industry. The printing and packaging industries in India have assumed growing significance during the last decade. This has become a dynamic and key area for manufactures and trading companies all over the country with the element of aesthetics, hygienic and cost effectiveness receiving increasing importance in commercial operations. The exterior looks and present ability of marketable goods leave a lasting impression on the minds of consumers and in this context packaging occupies the centre stage.

Since there is increasing demand for printed products there is always scope for those who are skilled in the operation of printing machines either as workers or entrepreneurs.

The course is designed in four modules of six month each as detailed below.

1. Graphic Designing and DTP
2. Digital Pre-press and Printing
3. Offset and Modern Printing Techniques
4. Binding and Packaging

On completion of every module the student will get a certificate for the skill he acquired. On successful completion of the course two certificates will be issued - a regular higher secondary certificate and a Skill certificate in the level 3 & 4. The students who pass the exams can apply for any engineering, degree or diploma course just like any another student who passed higher secondary exam with the mathematics group.
In the past five years the printing industry has undergone a fundamental restructuring. The entire job classification such as paste-up, striping has been replaced by graphic designing software and for digital workflow. This course is structured in such a way that the learner will get both theory and practical based knowledge so that he will be capable to fulfil the need of the industry for trained manpower in the field of graphic designing and Printing Technology.

This curriculum will enable the students to undertake different job roles in Government as well as Private sector. The production cum Training Centre (PTC) and On the Job Training (OJT) will provide hands on practical experience to the students; which will enable them to have entrepreneurship in the field of Graphic Designing and Printing Technology. This curriculum is suitable for career enhancement by joining various Print Media courses in various parts of the country.

<table>
<thead>
<tr>
<th>Govt/Semi Govt. Sector</th>
<th>Private Sector</th>
<th>Self Employment</th>
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</thead>
<tbody>
<tr>
<td>DTP Operator</td>
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<td>Trade Instructor</td>
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<tr>
<td>Graphic Designer</td>
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<td>Graphic Designer</td>
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<td>Pre Press Operator</td>
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<td>Pre Press Operator</td>
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<td>CTP Machine Operator</td>
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<td>Digital Printer Operator</td>
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<td>Plate maker</td>
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<td>Cutting Machine Operator</td>
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<td>Offset Operator</td>
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<td>Proof Reader</td>
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<td>Binder</td>
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<td>Flexo Machine Operator</td>
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<td>Sales Executive</td>
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<td>Notebook making unit</td>
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<td>Production Assistant</td>
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<td>Packaging Industry</td>
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<td>Store Keeper</td>
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<td>Hologram Printing Unit</td>
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<td>Binder</td>
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<td>Xerox Unit</td>
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</table>

Printing Material Supply
- Printing Chemicals and Ink supply
- Paper supply
- Offset Printing Unit
- Screen Printing Unit
- Binding Unit
- Envelope making unit
- Folding Machine Operator
- Perfect Binding machine Operator
- Store keeper
- Lab Technical Assistant
- Tradesman
MAJOR SKILLS
Identification of different types of paper
Paper calculation
Identification of different types of inks used in the printing industry
Identification of different chemicals used in printing industry
To operate single colour & multi colour offset machine
Work estimation
To operate a web offset press
Identify different problems during printing process
To handle different quality control devices used in printing industry
To prepare a flexographic printing plate
To operate flexo printing machine
To identify different security printing methods
To prepare a stencil for screen printing
To screen print images on various substrates
The use of safety equipments in printing press
Different type of binding, sewing, and covering operations
To operate a Cutting machine
To handle different modern post press machines
Identify different packaging materials
To design and prepare a package for different products
To prepare different carton styles and dies for packaging
To identify Mechanical, Electrical & Pneumatic parts of an offset machine
To get the basic concepts of Engineering drawing
LEARNING OUTCOMES

Module 3

Unit 1

3.1 Printing Materials
   3.1.1 Summarise various steps involved in Paper making process
   3.1.2 Identify the Physical properties of paper
   3.1.3 Classify Paper according to its types, sizes & paper weight
   3.1.4 Estimate the quantity of Paper required for printing a work
   3.1.5 Understand Storage of paper / warehousing
   3.1.6 List the Ingredients of ink, its Properties and the steps in manufacturing of ink
   3.1.7 Categorise the methods of Ink drying
   3.1.8 Categorise different types of Ink
   3.1.9 Identify the chemicals used in Printing

Unit 2

3.2 Sheetfed Offset Press
   3.2.1 Classify presses based on various aspects
   3.2.2 Operate different units of an Offset machine
   3.2.3 Understand the structure and properties of offset blankets

Unit 3

3.3 Offset Press Operations
   3.3.1 Demonstrate the Make ready Procedure
   3.3.2 List the leading manufacturers of Offset machines
   3.3.3 Estimate the cost of production of a printing job in offset printing

Unit 4

3.4 Web Offset Press
   3.4.1 Categorise web offset presses based on its design
   3.4.2 Demonstrate the operation of a web offset machine
   3.4.3 Understand the Inline finishing methods in a web offset machine
   3.4.4 Identify different types of printing papers used in a Web offset press
   3.4.5 Understand the working of a press console

Unit 5

3.5 Press maintenance and Troubleshooting
   3.5.1 Identify Paper problems and suggest remedies
   3.5.2 Identify Ink problems and suggest remedies
   3.5.3 Identify printing problems and suggest remedies
3.5.4 Identify problems due to blanket and rollers and suggest remedies
3.5.5 Identify problems due to incorrect cylinder pressure and suggest remedies
3.5.6 Understand the importance of preventive maintenance
3.5.7 Demonstrate cleaning and caring the press
3.5.8 Understand the importance of Quality Control Devices in quality printing

Unit 6
3.6 Flexo and Gravure
3.6.1 Understand the process of Flexography
3.6.2 List out the advantages of flexography
3.6.3 Identify the Basic units of a flexo printing machine
3.6.4 Classify Flexographic plates
3.6.5 Demonstrate Plate making process in flexography
3.6.6 Categorise different types of flexo Press
3.6.7 List out various types of ink & substrate used in flexography
3.6.8 Understand the process of Gravure Printing
3.6.9 List out the advantages and disadvantages of gravure printing process
3.6.10 Understand the working of the printing unit of a gravure press
3.6.11 Understand the methods of preparation of gravure cylinders
3.6.12 Discuss the different types of Ink and substrates used in gravure process
3.6.13 Understand the importance and advantages of Security Printing

Unit 7
3.7 Screen Printing
3.7.1 Understand the applications of Screen Printing
3.7.2 Demonstrate the Screen Printing Process
3.7.3 Understand various types of Screen frames and Fabrics
3.7.4 Demonstrate the preparation of Stencil for screen printing
3.7.5 List out the substrates for screen printing
3.7.6 Understand the automation in screen printing process
3.7.7 Understand the special applications of screen printing process

Module 4
Unit 1
4.1 Safety and Health

4.1.1 Understand the Safety regulations related to printing industry
4.1.2 Understand the importance of Safety guards in an offset machine
4.1.3 Understand the safety measures for operating a cutting machine
4.1.4 Choose personal protective devices
4.1.5 Classify Fire & choose appropriate fire extinguishers
4.1.6 Understand the importance of Green printing

Unit 2

4.2 Conventional Binding

4.2.1 Understand and define binding
4.2.2 Classify different methods of binding
4.2.3 Understand the styles of binding
4.2.4 List the different steps involved in the binding process
4.2.5 Understand different Covering and finishing operations

Unit 3

4.3 Modern Finishing Operations

4.3.1 Understand and demonstrate the operation of a paper cutting machine
4.3.2 Categorise Folding operations
4.3.3 Understand Other finishing operations
4.3.4 List out various methods of binding

Unit 4

4.4 Packaging

4.4.1 Define and understand the importance of packaging
4.4.3 Understand the fundamentals of Packaging design
4.4.4 List out the different materials used in the packaging industry
4.4.5 Classify Cartons based on its style and construct a Packaging Die

Unit 5

4.5 Basic Engineering

4.5.1 Distinguish between Direct Current and Alternating Current
4.5.2 Understand the working of motors and transformers
Unit 6

4.5.3 Understand a Basic Electronic Circuit
4.5.4 Understand Mechanical components
4.5.5 Understand the principle of hydraulics and pneumatics
4.5.6 Categorise the Mechanical, Electrical, Electronic and Pneumatic parts of a printing machine

4.6 Engineering Graphics

4.6.1 Handle drawing instruments and understand its uses
4.6.2 Distinguish between different types of lines and understand its applications
4.6.3 Do proper lettering and numbering while preparing drawing sheets
4.6.4 Use proper dimensioning method
4.6.6 Understand the projection of points, lines, planes
4.6.8 Draw basic sectional view of an object
4.6.9 Draw auxilliary views
4.6.10 Draw isometric views
4.6.11 Understand machine drawing

Module I : Graphic Designing and DTP (Theory)
Course structure

The course is designed in four modules of six months each as detailed below.

1. Graphic Designing and DTP
2. Digital Pre-press and Printing
3. Offset and Modern Printing Techniques
4. Binding and Packaging

Module 3  Name of Module: Offset and Modern Printing Techniques

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<tr>
<th>Unit No.</th>
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<th>Period</th>
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<tbody>
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<td>3.1</td>
<td>Printing Materials</td>
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<td>3.2</td>
<td>Sheetfed Offset Press</td>
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<td>3.3</td>
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<td>3.6</td>
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<tr>
<td>3.7</td>
<td>Screen Printing</td>
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Module 4  Name of Module: Binding and Packaging

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<td>4.1</td>
<td>Safety and Health</td>
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<td>4.2</td>
<td>Conventional Binding</td>
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<tr>
<td>4.5</td>
<td>Basic Engineering</td>
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</tr>
<tr>
<td>4.6</td>
<td>Engineering Graphics</td>
<td>28</td>
</tr>
</tbody>
</table>
3.1 Printing Materials

3.1.1 Paper - Brief history of Paper
Origin of paper from papyrus
Handmade paper
Machine made paper

3.1.1 Paper making process
Raw materials for paper making
Pulping, Treating the pulp, Manufacturing paper using Fordrinier Paper Machine

3.1.2 Physical properties of paper
Grain, Dimensional stability, fiber strength, finishing, pick resistance, whiteness and brightness, substance weight, flatness, squareness, ink drying, moisture absorbancy, opacity

3.1.3 Paper classification, paper sizes & paper weight
Coated paper, Card, board
Business paper (Bond paper, carbon paper)
Book paper (offset paper - uncoated, coated, text paper)
Cover paper, Bristol paper
Utility paper (Newsprint, label paper, synthetic paper, mineral paper)
ISO/International sizes
Conventional paper sizes

3.1.4 Estimating Paper Quantity
Cancellation method for calculating the greatest no. of sheets that can be cut from a single, full size sheet
Eg: Paper size - 11 X 17
Card size - 5 X 8
Cancellation method
11 X 17 11 X 17
5 X 8 8 X 5
2 X 2 = 4 1 X 3 = 3

3.1.5 Storage of paper / warehousing
Web offset roll storage

3.1.6 Ink - Ingredients, Properties and Manufacturing
Pigment, Vehicle, Additives
Ink body, viscosity, length, tack, opacity, colour strength, ink stability, drying time, abrasion resistance
Mixing, milling

3.1.7 Ink drying methods
Oxidation, evaporation, precipitation, penetration, polymerisation, radiation curing

3.1.8 Types of Ink
Sheetfed ink, rubberbased ink, web offset heatset inks, weboffset coldset inks, news inks,
3.1.9 Chemicals used in Printing

Dampening solution
Water
Acid (measuring pH, conductivity)
Gum arabic
Wetting agents
Corrosion inhibitors
Anti foaming agents
Fungicides and drying stimulators
Alcohol dampening solution
Dampening covers
Other press room chemicals

Unit 2

3.2 Sheetfed Offset Press

3.2.1 Press classification
Duplicators and Presses
Sheetfed Presses
Webfed Presses
Multi colour Presses
Perfecting Presses
Waterless offset Presses
Digital Offset Presses

3.2.2 Working Principle and Operating Units of an Offset machine

Feeder Unit
Successive sheet feeding, Continuous feeding, stream feeding
Parts of feeding unit
(Pile feeder, pile board, pile height governor, blower, sucker, sheet separator)

Registration Unit
Functions of registration unit
Parts
(Double sheet detector, front lay, side lay, conveyor tape, running in wheels, two point guide system, three point guide system, transfer cylinder system)

Printing Unit
Cylinder structure - undercut, bearer, gutter, cylinder body, drive gears, cylinder gap
Cylinders - The plate cylinder - function
Blanket cylinder - function
Impression cylinder - function
Grippers

Inking system
Parts - Ink fountain, fountain tray, fountain roller, fountain blade, form roller, ink agitator, distributing roller, oscillating roller, ink feed control, remote ink control

Dampening system
Parts of dampening unit
Conventional dampening system, continuous dampening system, alcohol dampening system (advantages), roller covers
Waterless offset, Advantages of waterless offset

Delivery Unit
Gravity delivery
Chain delivery
Parts of delivery unit
(Delivery pile, delivery chains, skeleton wheels, joggers, ancillary units - anti set off spray etc.)
Ancillary units

3.2.3 Offset Blanket
Structure of an offset blanket
Convetional blankets
Compressible blankets
Under blankets
Hardness of blanket (shore hardness, shoredurometer)
Types of blanket
a) based on hardness (hard, soft, medium, sandwich, special)
b) 1 Ply, 2 Ply, 3 Ply, 4 Ply blankets
Properties of a blanket
Storage of blanket

Unit 3

3.3 Offset Press Operations
3.3.1 Pre-make ready and Make ready Procedure
Preparing the inking unit
Preparing the dampening unit
Attaching the plate
Semi auto plate loading
Auto plate loading
Preparing the feeding unit and registration unit
(Feeding steps)
Setting the delivery unit
Feeding the test sheets
Checking the test sheets
3.3.2 Cylinder and roller pressure
3.3.3 Multi colour printing
3.3.4 Sequence of printing
3.3.5 Leading Offset machine manufacturers
   International
Heidelberg, Komori, Mitsubish, Ryobi, Fuji, AB Dick
   Indian
HMT, Manugraph, Orient, Optima, Autoprint
3.3.6 Automation in print production
   Automatic wash-up, auto plate loading
3.3.7 Estimation procedure in offset printing
   Calculating Production cost
   Quotations
   Job ticket / work order

Unit 4

3.4 Web Offset Press
3.4.1 Types of web offset press designs
Perfecting / blanket to blanket
Inline presses
Stack / Tower Presses
Common impression cylinder presses (Satellite units)

3.4.2 Web operations
Roll stand, Splicer, Festoon, Tension control, Web guide, Dryer, Chill roller, Flying pasters,
Zero speed pasters, Web break detectors, Image alignment and register, Printing unit, Adjustment, Ink
drying systems, Filtration system, Dampening system

3.4.3 Inline finishing
Combination folding, inline stitching, single knife rotary die cutter, three knife trimmer, numbering
tower, pattern perforators, pattern gluer

3.4.4 Web offset printing papers

3.4.5 Press console

Unit 5

3.5 Press maintenance and Troubleshooting

3.5.1 Paper problems
Electrostatic charge on paper, Crease formation, Picking

3.5.2 Ink problems
Emulsification, Slow ink drying, chalking, Hickies, Piling

3.5.3 Printing problems
Blinding, Ghosting, Mis-registration, Mottling, Plate ware, Scum, Sett-off, Sluring, Tinting

3.5.4 Problems due to blanket and rollers
Glazing, Swelling, Paper sticking,

3.5.6 Preventive maintenance

3.5.7 Cleaning and caring the press

3.5.8 Quality Control in offset
Remote control press console, Plate image scanners, Magnifying glass, Colour viewer, Densitometer, Spectrophotometer, Colourimeter, Colour bar, Dot gain scale, Slur guage, Register marks, Star Target, Gray balance patch

Unit 6

3.6 Flexo and Gravure

3.6.1 Flexography - Introduction

3.6.2 Advantages
Cylinder make ready, packaging application

3.6.3 Basic units
Infeed unit and unwinding unit
Printing unit
Components: Plate, fountain roller, anilox roller, printing and impression cylinder, reverse
angle doctor blade, two roller and three roller inking system
Outfeed unit and rewinding unit

3.6.4 Flexographic plates
Rubber stereo plates
Photopolymer plates (sheet, liquid)

3.6.5 Plate making process
Laser plates

3.6.6 Press types
Stack press
Central impression cylinder
Inline press

3.6.7  Flexographic ink & substrates
3.6.8  Gravure Printing - Introduction
3.6.9  Advantages and disadvantages
3.6.10 Gravure printing units
   Gravure printing cylinder
   Impression cylinder
   Ink duct
   Doctor blade
   Electrostatic assist
3.6.11 Cylinder preparation methods
   Chemical engraving method
   Electromechanical method
   Laser beam engraving
3.6.12 Ink and substrates
3.6.13 Security Printing
   Introduction to security printing -
   definition, goal of security printing, various printing methods used for security
   printing
   Security features
   Watermark, security thread, latent image, micro lettering, see through register
   Security ink, Numbering with MICR ink, Security paper
   Currency printing, Cheque printing
   Holograms
   Hologram types
   Holographic patterned foils
   Three dimensional holograms
   Multiple plane holograms
   Stereograms
   Bar codes, QR codes

Unit 7
3.7  Screen Printing
3.7.1  Applications of Screen Printing
3.7.2  Screen Printing Process
   Squeegee, screen printing inks, solvents, drying system
3.7.3  Screen frames and Fabrics
   Frame materials, print size
   Fabric strength, mesh count, types of fabrics
3.7.4  Stencil preparation
   Hand cut stencils, Tusche and glue stencils, photographic stencils
3.7.5  Substrates for screen printing
3.7.6  Automation in screen printing
   Lever action hand operated presses
   Semi automatic presses
   Fully automatic presses
3.7.7  Special screen printing applications
   Cylindrical screens
   Screen printing on cylindrical surfaces
 MODULE 4
Binding and Packaging

Unit 1

4.1 Safety and Health

4.1.1 Safety regulations
- Mechanical hazards
- Chemical hazards
- Noise hazards
- Fire hazards
- Light hazards

4.1.2 Safety guards in an offset machine
- Mechanisms that cause serious physical injury in a printing machine
  (spinning rollers, rotary chains and sprockets, turning gear, running belt)
- Emergency stop buttons, feeder guards, registration board guard, cylinder guards, delivery guards

4.1.3 Safety measures for operating a cutting machine

4.1.4 Personal protective devices
- Ear protection devices, eye protection devices, respiratory protection devices, skin protective devices

4.1.5 Fire classifications & Fire extinguishers
- Class A, Class B, Class C, Class D

4.1.6 Green printing
- Eco-friendly paper
  - Recycled paper (Steps in recycled paper production)
  - Logos of recyclable and recycled paper
  - Paper made with alternative chemicals (Acid free paper, Alkaline paper, ECF bleaching, TCF bleaching, Oxygen delignification)
  - Wood free paper
- Bio degradable substrates
- Low VOC inks - Vegetable inks (soy ink)
- Re-manufactured cartridges
- Soft proofs
- Use of renewable energy resources in printing

Unit 2

4.2 Conventional binding

4.2.1 Introduction & Definition

4.2.2 Classification of binding
- Letterpress binding
  - Publishers, Library, Miscellaneous binding, Extra letterpress binding
- Stationery binding
  - Office stationery, Manifold, Account book binding, Exercise note book binding

4.2.3 Styles of binding
- Paper board, Cut flesh, Quarter cloth turned in, Half cloth, Full cloth, Quarter leather, Half
leather, Full leather

4.2.4 Materials for Book binding
Board, Adhesives

4.2.5 Steps in Binding
Warehousing
Counting, Jogging, Pressing, Folding (signature), Smashing and Bundling, Gathering, Collating, Stitching, Sewing (types of sewing - Ordinary, Flexible sewing, Machine sewing, Hand sewing, Double flexible sewing- kettle stitch, tape sewing, sawn in sewing) Overcasting Forwarding
End papers, Glueing, Edge cutting, Rounding, Backing, Edge decoration, Head banding and lining the back.

4.2.6 Covering and finishing
Paring leather, Pasting the cover, Drawing on, Turning in, Setting the joints, Setting the caps, Nipping up, Tying up, Opening up, Filling in, Siding, Pasting down open, Library

Unit 3

4.3 Modern Finishing Operations

4.3.1 Cutting (paper cutting machine)
Guillotine cutter, Three knife cutter

4.3.2 Folding operations
Types of foldres

4.3.3 Other finishing operations
Perforation, Slitting, Creasing and scoring, Die cutting, Embossing, Stamping, Numbering, Punching and drilling, Varnishing, Lamination, Foil stamping, Thermography

4.3.4 Binding
Pamphlet binding, Edition binding, Perfect binding, Mechanical binding, Plastic comb binding, Spiral Binding.

Unit 4

4.4 Packaging

4.4.1 Definition and functions of packaging
Packaging for communication
Objectives of packaging

4.4.2 Design fundamentals of Packaging
Packaging design principles
Typography and packaging design
Packaging design and colour
Images for packaging

4.4.3 Materials for packaging
Metal- Aluminium, Tin
Paper- Paper board, Corrugated paper board, Set up box
Plastic- Low density poly ethylene (LDPE), High density poly ethylene (HDPE), Poly ethylene terephthalate (PET), Poly propylene, Poly styrene (PS), Blister packs, Glass, Metal, Cans, Tubes, Flexible packing, Labels, Closures, Stock packaging
Glass
Special Packages- Blister packs, Bubble wrap, Shrink wrap,

4.4.4 Carton styles and Packaging Die
Four pannel style box, Folding cartons, Straight tuck end , Reverse tuck end, Full seal
Die making process

4.4.4 Packaging Die

Unit 5

4.5 Basic Engineering
4.5.1 Direct current and Alternating current
4.5.2 Motors and Transformers
4.5.3 Basic Electronic Circuit
4.5.4 Mechanical components
4.5.5 Hydraulics and Pneumatics
4.5.6 Mechanical, Electrical, Electronic and Pneumatic parts of a printing machine

Unit 6

4.6 Engineering Graphics
4.6.1 Drawing instruments and uses
4.6.2 Lines - Different types and its applications
4.6.3 Lettering and numbering
4.6.4 Dimensioning
4.6.5 Construction of basic shapes - polygon, conic section, spiral curve
4.6.6 Introduction of projection of points, lines, planes
4.6.7 Quadrants and objects in different quadrants
4.6.8 Basic section views
4.6.9 Auxilliary views
4.6.10 Isometric views
4.6.11 Introduction to machine drawing

LEARNING OUTCOMES

Module 3

Unit 1

3.1 Printing Materials
3.1.1 Summarise various steps involved in Paper making process
3.1.2 Identify the Physical properties of paper
3.1.3 Classify Paper according to its types, sizes & paper weight
3.1.4 Estimate the quantity of Paper required for printing a work
3.1.5 Understand Storage of paper / warehousing
3.1.6 List the Ingredients of ink, its Properties and the steps in manufacturing of ink
3.1.7 Categorise the methods of Ink drying
3.1.8 Categorise different types of Ink
3.1.9 Identify the chemicals used in Printing
Unit 2

3.2 Sheetfed Offset Press
3.2.1 Classify presses based on various aspects
3.2.2 Operate different units of an Offset machine
3.2.3 Understand the structure and properties of offset blankets

Unit 3

3.3 Offset Press Operations
3.3.1 Demonstrate the Make ready Procedure
3.3.2 List the leading manufacturers of Offset machines
3.3.3 Estimate the cost of production of a printing job in offset printing

Unit 4

3.4 Web Offset Press
3.4.1 Categorise web offset presses based on its design
3.4.2 Demonstrate the operation of a web offset machine
3.4.3 Understand the Inline finishing methods in a web offset machine
3.4.4 Identify different types of printing papers used in a Web offset press
3.4.5 Understand the working of a press console

Unit 5

3.5 Press maintenance and Troubleshooting
3.5.1 Identify Paper problems and suggest remedies
3.5.2 Identify Ink problems and suggest remedies
3.5.3 Identify printing problems and suggest remedies
3.5.4 Identify problems due to blanket and rollers and suggest remedies
3.5.5 Identify problems due to incorrect cylinder pressure and suggest remedies
3.5.6 Understand the importance of preventive maintenance
3.5.7 Demonstrate cleaning and caring the press
3.5.8 Understand the importance of Quality Control Devices in quality printing

Unit 6

3.6 Flexo and Gravure
3.6.1 Understand the process of Flexography
3.6.2 List out the advantages of flexography
3.6.3 Identify the Basic units of a flexo printing machine
3.6.4 Classify Flexographic plates
3.6.5 Demonstrate Plate making process in flexography
3.6.6 Categorise different types of flexo Press
3.6.7 List out various types of ink & substrate used in flexography
3.6.8 Understand the process of Gravure Printing
3.6.9 List out the advantages and disadvantages of gravure printing process
3.6.10 Understand the working of the printing unit of a gravure press
3.6.11 Understand the methods of preparation of gravure cylinders
3.6.12 Discuss the different types of Ink and substrates used in gravure process
3.6.13 Understand the importance and advantages of Security Printing

Unit 7
3.7 Screen Printing
3.7.1 Understand the applications of Screen Printing
3.7.2 Demonstrate the Screen Printing Process
3.7.3 Understand various types of Screen frames and Fabrics
3.7.4 Demonstrate the preparation of Stencil for screen printing
3.7.5 List out the substrates for screen printing
3.7.6 Understand the automation in screen printing process
3.7.7 Understand the special applications of screen printing process

Module 4
Unit 1
4.1 Safety and Health
4.1.1 Understand the Safety regulations related to printing industry
4.1.2 Understand the importance of Safety guards in an offset machine
4.1.3 Understand the safety measures for operating a cutting machine
4.1.4 Choose personal protective devices
4.1.5 Classify Fire & choose appropriate fire extinguishers
4.1.6 Understand the importance of Green printing

Unit 2
4.2 Conventional Binding
4.2.1 Understand and define binding
4.2.2 Classify different methods of binding
4.2.3 Understand the styles of binding
4.2.4 List the different steps involved in the binding process
4.2.5 Understand different Covering and finishing operations

**Unit 3**

**4.3 Modern Finishing Operations**

4.3.1 Understand and demonstrate the operation of a paper cutting machine
4.3.2 Categorise Folding operations
4.3.3 Understand Other finishing operations
4.3.4 List out various methods of binding

**Unit 4**

**4.4 Packaging**

4.4.1 Define and understand the importance of packaging
4.4.3 Understand the fundamentals of Packaging design
4.4.4 List out the different materials used in the packaging industry
4.4.5 Classify Cartons based on its style and construct a Packaging Die

**Unit 5**

**4.5 Basic Engineering**

4.5.1 Distinguish between Direct Current and Alternating Current
4.5.2 Understand the working of motors and transformers
4.5.3 Understand a Basic Electronic Circuit
4.5.4 Understand Mechanical components
4.5.5 Understand the principle of hydraulics and pneumatics
4.5.6 Categorise the Mechanical, Electrical, Electronic and Pneumatic parts of a printing machine

**Unit 6**

**4.6 Engineering Graphics**

4.6.1 Handle drawing instruments and understand its uses
4.6.2 Distinguish between different types of lines and understand its applications
4.6.3 Do proper lettering and numbering while preparing drawing sheets
4.6.4 Use proper dimensioning method
4.6.6 Understand the projection of points, lines, planes
4.6.8 Draw basic sectional view of an object
4.6.9 Draw auxiliary views
4.6.10 Draw isometric views
# Scheme of Works

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Month</th>
<th>Units Covered in the Month</th>
<th>Periods</th>
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<tbody>
<tr>
<td>1</td>
<td>June</td>
<td>Printing Materials</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>July</td>
<td>Sheetfed Offset Press</td>
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<td>3</td>
<td>August</td>
<td>Offset Press Operations</td>
<td>20</td>
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<tr>
<td>4</td>
<td>September</td>
<td>Web Offset Press</td>
<td>13</td>
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<tr>
<td>5</td>
<td>October</td>
<td>Press maintenance and Troubleshooting</td>
<td>20</td>
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<td>6</td>
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<td>Flexo and Gravure</td>
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<td>7</td>
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## Module I: Graphic Designing and DTP (Practical)

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<td>3</td>
<td>July/August/September</td>
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<td>4</td>
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## Module II: Digital Pre Press and Printing (Theory)

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<td>Safety and Health</td>
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<td>November</td>
<td>Conventional Binding</td>
<td>13</td>
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<td>3</td>
<td>December</td>
<td>Modern Finishing Operations</td>
<td>10</td>
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<td>4</td>
<td>December</td>
<td>Packaging</td>
<td>13</td>
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<td>5</td>
<td>January</td>
<td>Basic Engineering</td>
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<tr>
<td>6</td>
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<td>Engineering Graphics</td>
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<tr>
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### Structure of Module 3
**Name of Module:** Offset and Modern Printing Techniques

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Name of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Printing Materials</td>
</tr>
<tr>
<td>3.2</td>
<td>Sheetfed Offset Press</td>
</tr>
<tr>
<td>3.3</td>
<td>Offset Press Operations</td>
</tr>
<tr>
<td>3.4</td>
<td>Web Offset Press</td>
</tr>
<tr>
<td>3.5</td>
<td>Press maintenance and Troubleshooting</td>
</tr>
<tr>
<td>3.6</td>
<td>Flexo and Gravure</td>
</tr>
<tr>
<td>3.7</td>
<td>Screen Printing</td>
</tr>
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</table>

### Structure of Module 4
**Name of Module:** Binding and Packaging

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Name of Units</th>
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</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Safety and Health</td>
</tr>
<tr>
<td>4.2</td>
<td>Conventional Binding</td>
</tr>
<tr>
<td>4.3</td>
<td>Modern Finishing Operations</td>
</tr>
<tr>
<td>4.4</td>
<td>Packaging</td>
</tr>
<tr>
<td>4.5</td>
<td>Basic Engineering</td>
</tr>
<tr>
<td>4.6</td>
<td>Engineering Graphics</td>
</tr>
</tbody>
</table>
**Classroom Activities**

**Module 3**

1. Student should make a presentation about different press room chemicals and its contents.
2. Prepare a chart showing the list of major paper mills in India and abroad along with the names of their popular bands.
3. Make a drawing of plate, blanket and impression cylinders as well as form rollers ink and dampening system in the practical record. Label these components and add arrows showing the direction of rotation.
4. Draw a schematic diagram of the inking unit of an offset press and label the different rollers in the practical record.
5. Draw a schematic diagram of Conventional dampening unit and mark its parts in the practical record.
6. Calculate the press cost to print 18000 posters of 11’x17” size printed in two colours on one side on 100 GSM art paper which costs Rs. 2500 per ream of 23” x 18” basic sheet size. The print area of the machine is 24” x 18.5”. (Assume cost for one exposed plate is Rs 350 and Printing cost for 1000 impressions for one colour is Rs. 250).
7. Draw a schematic diagram of web-offset machine and mark its parts.
8. Different quality control devices and its applications.
9. Collect samples of plastic bags that have been printed by flexographic process colour method and check the colour register. Write your observation.
10. Select 10 major magazines and determine if any of them are printed by the gravure process.
11. Identify 5 products that have been printed by gravure process.
12. List out and compare the security features provided in different currency notes and bank cheques.
13. Collect different samples of holograms which are used in day-to-day life.
14. In your lab record draw diagrams of flexographic inking system (two roller & three roller) and mark its parts.
15. Prepare a diagramatic representation of different steps in producing a flexographic rubber plate.
16. List out the security presses in India.
17. Assignment on latest developments in screen printing.
18. Project work - single colour and two colour screen printing on various substrates.

**Module 4**

1. Assignment: Prepare a presentation on different classes of fire that is likely to occur in an offset press.
2. Prepare a chart on different personal protective devices used in the printing industry.
3. Collect samples of recycled paper.
4. Prepare a chart showing various renewable energy resources in printing.
5. Prepare a Notebook using flexible sewing method.
7. Prepare a file board and a writing board.
8. Prepare a note pad in A5 size with paper back cover.
9. Prepare a chart showing different types of end papers.
10. Collect samples of printed products processed with
   a) embossing
   b) die cutting
   c) foil stamping
   d) lamination
   e) numbering
   f) slitting
11. Identify male and female dies used for embossing
12. Distinguish between creasing rule and cutting rule.
13. Collect samples for different styles of cartons.
14. Prepare a carton for the given product.
15. Collect samples for special packages like a blister pack, a shrink wrapper, a bubble wrap etc.
16. Prepare a set up box for a Necklace.
17. Collect ten types of packages made of different materials.
18. Collect various electronic components like resistors, capacitors, diodes, transistors, IC chips.
19. Prepare a chart of various kinds of mechanical, electrical, electronic and pneumatic parts of an offset machine.
20. Collect any four types of gears from your old toys.
21. Identify various types of DC and AC motors used in your home or printing lab.
Practical Activity

3.1 Printing Materials

**Paper**
1. Collect different kinds of paper.
2. Find out the GSM of a given paper sample.
3. Collect different size of paper (Conventional and International paper sizes).
4. Collect different types of cover paper.
5. Identify various kinds of paper and boards used for different printing jobs such as notice, cover printing, visiting card, envelope and packaging industry
7. Different paper testing methods
   - Curl test
   - Grain direction test
   - GSM test
   - Moisture content test of paper
   - Paper smoothness test
   - Roughness test
   - Gloss test
8. List out the paper warehousing methods.

**Ink**
1. Use of various types of inks on different types of paper.
2. Ink mixing processes.
3. Ink calculation method.
4. Ink testing methods.

**Chemicals in Printing**
1. Prepare an ideal dampening solution.
2. Measure the pH and conductivity of dampening solution.
3. Use of image removers on a printing plate.
4. Use of blanket lift in press room.

3.1 Printing Materials

1. Functioning of different units of a sheet-fed offset press.
2. Identify different parts of sheet-fed offset printing machine.
3. Dampening cover fixing.
4. Identify different types of blanket.
5. Blanket fixing

3.3 Offset Press Operations

1. Perform paper feeding steps
2. Control the registration
3. Plate loading
4. Setting of Inking and dampening units
5. Setting of delivery unit
3.5 Press maintenance and Troubleshooting
1. Identify different paper problems, printing problems, blanket problems and ink problem and provide the solutions for each.
2. Press maintenance and clean up procedure.
3. Handling of different quality control devices.

3.6 Flexo and Gravure
1. Preparation of flexographic rubber plate in your plate making unit.
2. Distinguish between offset, flexographic and gravure ink from the collected samples.
3. Generate a barcode for a particular item in your computer and list out its features.
4. Generate and read a QR code for an address using smart phone QR code application.

3.7 Screen Printing
1. Stencil preparation using different photographic methods.
2. Prepare an invitation card using screen printing technique.
3. Identify basic shapes of squeegee blades available in your lab.
4. Identify the chemicals used in screen printing.

Module 4
Binding and Packaging

4.1 Safety and Health
1. Identify the different safety guards and safety button on the HMT offset printing machine in your lab.
2. Identify the possible circumstances of fire in your printing lab and take appropriate measures to prevent it.

4.2 Conventional Binding
1. Letterpress binding
2. Stationery binding.
3. Different types of sewing
   a) Cord sewing (Sawn-in-sewing)
   b) Tape sewing
   c) Overcast sewing
   d) Flexible and double flexible sewing
4. Case binding

4.3 Modern Finishing Operations
1. Perforation
2. Numbering
3. Spiral binding
4. Plastic comb binding
5. Case binding
6. Wire stitching
4.4 Packaging
1. Prepare a carton with the given measurements.
   Length - 9 cm  width- 5 cm depth - 5 cm.
2. Prepare the drawing for the carton die of the above project.
3. Draw the picture of a STE/ RTE/ FSE carton and label the various parts of it in your practical record book.

4.5 Basic Engineering
1. List out the different mechanical parts in an offset machine.

4.6 Engineering Graphics
1. Drawing an equilateral triangle (given the length of one side)
2. Draw a triangle with T-square and set-square only
3. Draw a rectangle of given length and breath as per the procedure.
4. Draw a pentagon of a given side (say a 35mm side)
5. Draw an ellipse of major axis 80 mm and minor axis 50mm in concentric circles method
6. Draw the isometric drawing of a rectangular prism
Overview of Module 3

*Offset and Modern Printing Techniques*

Printing industry has seen immense technological growth and changes in the past 20 years. Electronics and computers have completely changed the complexion of the industry. Most manual process has been eliminated in the printing process. The smallest offset duplicators to the largest web offset use computer technology to run, monitor, and adjust everything from ink density to web tension. The advances and improvements, along with the conventional methods, have made offset lithography a mature combination of process and techniques.

There are many career and business opportunities for those who have necessary skills and educational background. This module has been designed and organized to teach you about offset printing materials, offset printing methods and other modern printing methods such as flexography, gravure and security printing. The practical activities of this module integrates the academic concepts with technical applications and work place approach.
### Unit 1 - Printing Materials

#### About the unit

Paper, ink, and various chemicals are the major consumables used in the printing industry. In this unit a detailed study on paper manufacture, physical properties of paper, its classification and uses, ink manufacture, ingredients of ink, ink properties, ink drying methods and properties of various chemicals especially dampening solution are discussed.

<table>
<thead>
<tr>
<th>Ideas/Concepts/ Skill</th>
<th>Learning Outcomes</th>
<th>Suggested Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1.1 Brief history of Paper&lt;br&gt;Paper making process</td>
<td>Summarise various steps involved in Paper making process</td>
<td>Assignment on history and origin of paper. Multi-media presentation on paper making.</td>
<td>Assignment (activity log) Skill in interpretation of multi-presentation. Chart</td>
</tr>
<tr>
<td>3.1.2 Physical properties of paper</td>
<td>Identify the Physical properties of paper</td>
<td>Charting the physical properties of paper.</td>
<td>Chart</td>
</tr>
<tr>
<td>3.1.3 Paper classification, paper sizes &amp; paper weight</td>
<td>Classify Paper according to its types, sizes &amp; paper weight</td>
<td>Data analysis.</td>
<td>Participation, discussion, sample collection</td>
</tr>
<tr>
<td>3.1.6 Ink - Ingredients, Properties and Manufacturing</td>
<td>List the Ingredients of ink, its Properties and the steps in manufacturing of ink</td>
<td>ICT presentation on ink.</td>
<td>Oral assessment</td>
</tr>
<tr>
<td>3.1.7 Ink drying methods</td>
<td>Categorise the methods of Ink drying</td>
<td>Seminar</td>
<td>Seminar report, presentation skill. Chart.</td>
</tr>
<tr>
<td>3.1.8 Types of Ink</td>
<td>Categorise different types of Ink</td>
<td>General discussion on types of ink.</td>
<td>Practical skill.</td>
</tr>
<tr>
<td>3.1.9 Chemicals used in Printing</td>
<td>Identify the chemicals used in Printing</td>
<td>Demonstration of press-room chemicals</td>
<td></td>
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</tbody>
</table>
**Unit 2 - Sheetfed Offset Press**

**About the unit**
A printing press is a machine that transfers an image from some sort of plate or image carrier to a substrate such as paper. Basically the presses are classified as sheet-fed and Web-fed presses. Four units make a printing press. They are feeding unit, registration unit, printing unit, and delivery unit. To print an acceptable finished product, all of the units must be properly adjusted. In this unit we will discuss in detail about different units of sheet-fed offset press and its working.

<table>
<thead>
<tr>
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<th>Suggested Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2.1 Press classification</td>
<td>Classify presses based on various aspects</td>
<td>General discussion</td>
<td>Short notes</td>
</tr>
<tr>
<td>3.2.2 Working Principle and Operating Units of an Offset machine Feeder Unit Registration Unit Printing Unit Inking system Dampening system Delivery Unit</td>
<td>Operate different units of an Offset machine</td>
<td>Demonstration of different units of offset machine, Charts illustrating different units.</td>
<td>Performance assessment, activity log</td>
</tr>
<tr>
<td>3.2.3 Offset Blanket</td>
<td>Understand the structure and properties of offset blankets</td>
<td>Exhibit a sample blanket, General discussion</td>
<td></td>
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</table>
## Unit 3
### Offset Press Operations

**About the unit**

The purpose of this unit is to deal with fundamental understandings that will enable the students to run any offset duplicator or sheet-fed press after a review of manufacturers operating manual. The operating procedure for running a press include mounting the plate, achieving smooth paper feeding and delivery, controlling ink and dampening solution, adjusting the image as needed, and cleaning the press at the end of the run. This unit also provides information about leading press manufacturers. The last section of this unit deals with the factors affecting the cost of a printing job and estimation procedure.

<table>
<thead>
<tr>
<th>Ideas/Concepts/ Skill</th>
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<th>Suggested Activities</th>
<th>Assessment</th>
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<tbody>
<tr>
<td>3.3.1 Pre-make ready and Make ready Procedure Feeding steps</td>
<td>Demonstrate the Make ready Procedure</td>
<td>Chart the operations</td>
<td>Chart</td>
</tr>
<tr>
<td>3.3.2 Cylinder and roller pressure</td>
<td>Identify problems due to incorrect cylinder pressure and suggest remedies</td>
<td>Discussion</td>
<td>Participation</td>
</tr>
<tr>
<td>3.3.3 Multi colour printing</td>
<td>To understand the working of a multi colour sheet fed offset machine</td>
<td>Demonstration</td>
<td>Participation</td>
</tr>
<tr>
<td>3.3.4 Sequence of printing</td>
<td>To understand about sequence of colours in multicolour printing</td>
<td>Discussion</td>
<td>Participation</td>
</tr>
<tr>
<td>3.3.5 Leading Offset machine manufacturers</td>
<td>List the leading manufacturers of Offset machines</td>
<td>Chart preparation</td>
<td>Chart</td>
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<tr>
<td>3.3.6 Automation in print production</td>
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<td>Multi-media presentation</td>
<td>Report and short notes</td>
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<tr>
<td>3.3.7 Estimation procedure in offset printing</td>
<td>Estimate the cost of production of a printing job in offset printing</td>
<td>Problem solving</td>
<td>Numerical problems</td>
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</table>
Unit 4
Web Offset Press

About the unit
Web offset presses feed from roll or web of paper instead of individual sheet. The term webfed is commonly used to distinguish these presses from sheet fed presses. They are extremely fast. For this reason they are typically used for long run works. Large daily newspapers are printed on web press. An advantage of web press is that finishing operations can be performed inline. A variety of finishing operations like folding can be incorporated into the press run. Web presses produce medium run newspapers, magazines, business forms, mail order catalogues, gift wrappings, books, inserts, and all type of commercial printing.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>3.4.1 Types of web offset press designs</td>
<td>Categorise web offset presses based on its design</td>
<td>Group discussion</td>
<td>Participation</td>
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<tr>
<td>3.4.2 Web operations</td>
<td>Demonstrate the operation of a web offset machine</td>
<td>ICT presentation</td>
<td>Activity log</td>
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<tr>
<td>3.4.3 Inline finishing</td>
<td>Understand the Inline finishing methods in a web offset machine</td>
<td>Feild visit</td>
<td>Report</td>
</tr>
<tr>
<td>3.4.4 Web offset printing papers</td>
<td>Identify different types of printing papers used in a Web offset press</td>
<td>Discussion and demonstration</td>
<td>Short note Report</td>
</tr>
<tr>
<td>3.4.5 Press console</td>
<td>Understand the working of a press console</td>
<td>Feild visit</td>
<td>Report</td>
</tr>
</tbody>
</table>
**Unit 5**

**Press maintenance and Troubleshooting**

**About the unit**

During offset press operation, when a problem arise the operators skill set includes the ability to examine the problem and methodically identify the cause-poor paper, excessive dampening solution, inadequate roller pressure, etc. What ever the cause the operator is counted on to systematically isolate and eliminate it. At this point the students learn about basic press maintenance methods and trouble shooting techniques.

<table>
<thead>
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<td>3.5.2 Ink problems</td>
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<td>3.5.3 Printing problems</td>
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<td>3.5.4 Problems due to blanket and rollers</td>
<td>Identify problems due to blanket and rollers and suggest remedies</td>
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<td>3.5.6 Preventive maintenance</td>
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<td>3.5.7 Cleaning and caring the press</td>
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<td>3.5.8 Quality Control in offset</td>
<td>Understand the importance of Quality Control Devices in quality printing</td>
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**Unit 6**  
**Flexo and Gravure**  

**About the unit**  
This unit introduces two printing processes which are being increasingly important in the printing industry. Flexography, the first process we will discuss, has long been a significant relief process used in packaging industry. Gravure, the second process is a intaglio printing process which is widely used for high quality long run jobs and for security printing purposes.

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<td>3.6.2 Advantages</td>
<td>List out the advantages of flexography</td>
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<td>3.6.3 Basic units</td>
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<td>3.6.4 Flexographic plates</td>
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<td>3.6.5 Plate making process</td>
<td>Demonstrate Plate making process in flexography</td>
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<td>3.6.6 Press types</td>
<td>Categorise different types of flexo Press</td>
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<td>3.6.7 Flexographic ink &amp; substrates</td>
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<td>3.6.8 Gravure Printing - Introduction</td>
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<td>3.6.9 Advantages and disadvantages</td>
<td>List out the advantages and disadvantages of gravure printing process</td>
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<tr>
<td>3.6.10 Gravure printing units</td>
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<td>Demonstrate</td>
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<td>3.6.11 Cylinder preparation methods</td>
<td>Understand the methods of preparation of gravure cylinders</td>
<td>Assignment</td>
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<tr>
<td>3.6.12 Ink and substrates</td>
<td>Discuss the different types of Ink and substrates used in gravure process</td>
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<td>3.6.13 Security Printing</td>
<td>Understand the importance and advantages of Security Printing</td>
<td>Sample presentation</td>
<td>Portfolio</td>
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</table>
**Unit 7**  
**Screen Printing**

**About the unit**  
Of the all major printing processes this porous printing process is undoubtably the oldest, simplest and inexpensive. Modern screen printing developed in 1940’s and 50’s. Rapid technological advances continue to improve the process and lead to expanded market. In this unit we will discuss about this process in detail.

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<td>Making short notes</td>
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<td>3.7.2 Screen Printing Process</td>
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<td>3.7.3 Screen frames and Fabrics</td>
<td>Understand various types of Screen frames and Fabrics</td>
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<td>3.7.4 Stencil preparation</td>
<td>Demonstrate the preparation of Stencil for screen printing</td>
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<td>3.7.5 Substrates for screen printing</td>
<td>List out the substrates for screen printing</td>
<td>Sample presentation</td>
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<td>3.7.6 Automation in screen printing</td>
<td>Understand the automation in screen printing process</td>
<td>Model presentations</td>
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<tr>
<td>3.7.7 Special screen printing applications</td>
<td>Understand the special applications of screen printing process</td>
<td>Short notes</td>
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</table>
List of items in portfolio

- Printed ruled sheets for note book
- Printed inner pages for record book
- Multi color printed book cover
- Screen printed visiting cards
- Screen printed envelops
- Screen printed letter heads
- Screen printed carry bags
- Screen printed polythene bags
Assessment activities

- To cut the paper to different sizes
- To find the gsm of a particular paper
- To practice the ink mixing process
- To prepare dampening solution for printing
- To prepare the dampening unit and printing unit of a printing machine for printing
- To load a plate on a plate cylinder and to perform the makeready operations
- To print a given job
- To identify different printing, paper-related, and ink-related problems
- To prepare a flexographic plate
- To prepare a stencil for screen printing and to print the given job
Overview of Module 4

Binding and Packaging

Once a mage has been printed on a substrate, some form of binding and finishing is usually required. Binding is the process of joining together multiple pages of a printed product by various means including sewing, stapling, spiral wire and adhesives. Finishing includes various processes that enhance the final printed product. Some of the most common finishing operations include embossing, die-cutting, foil stamping, padding, lamination etc.

Packaging basically involves wrapping, strapping or boxing of various consumer products. In this module we go through various finishing operations and its application in our day-to-day life and about the importance of safety, health and eco-printing. In this module we have a unit that deal with basic engineering aspects of an offset machine and a unit that gives introduction to basic engineering drawing for the students.

Unit 1

Safety, Health and Green printing

About the Unit

Unsafe machines, work areas, and procedures are the cause of many accidents. Take time to inspect all equipments and work areas. When unsafe conditions exist, take immediate action to correct and eliminate them. Also manufacturers of printing supplies and equipment has to take the responsibility of developing new environmentally friendly technologies and materials. This unit acquaints the student with many issues and practices involved in advancing safety, health and Green printing in the work place.

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<td>Understand the Safety regulations related to printing industry</td>
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<td>4.1.2 Safety guards in an offset machine</td>
<td>Understand the importance of Safety guards in an offset machine</td>
<td>Demonstration</td>
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<td>4.1.3 Safety measures for operating a cutting machine</td>
<td>Understand the safety measures for operating a cutting machine</td>
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<td>4.1.4 Personal protective devices</td>
<td>Choose personal protective devices</td>
<td>Demonstration</td>
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<tr>
<td>4.1.5 Fire classifications &amp; Fire extinguishers</td>
<td>Classify Fire &amp; choose appropriate fire extinguishers</td>
<td>Assignment</td>
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<td>4.1.6 Green printing</td>
<td>Understand the importance of Green printing</td>
<td>Assignment</td>
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</table>
**Unit 2**

**Conventional binding**

**About the Unit**

The process of book binding has been a slow specialised craft until the 18th century. Modern book binding is machanised for the most part. Paper back and threadless binding have suppressed the old fashion. Any way the conventional manual binding method is still relevent in the industry. Also it is important for our students to get a basic knowledge about this manual binding methods. This unit covers all the major aspects in binding that are conventionaly followed.

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<td>Understand and define binding</td>
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<td>4.2.2 Classification of binding</td>
<td>Classify different methods of binding</td>
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<td>4.2.3 Styles of binding</td>
<td>Understand the styles of binding</td>
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<td>4.2.4 Materials for Book binding</td>
<td>Listing of different metials used for binding</td>
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<td>4.2.5 Steps in binding</td>
<td>List the different steps involved in the binding process</td>
<td>Flow chart</td>
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<td>4.2.6 Covering and finishing</td>
<td>Understand different covering and finishing operations</td>
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Unit 3
Modern Finishing Operations
About the Unit
After printing the product needs further operation to be finished. Two cost common type of classification are finishing and binding. In the previous unit we have learnt about the binding operations. In this unit we study about all other operations that enhance the appearance of the printed products.

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<td>4.3.1 Cutting (paper cutting machine)</td>
<td>Understand and demonstrate the operation of a paper cutting machine</td>
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<td>4.3.2 Folding operations</td>
<td>Categorise Folding operations</td>
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<td>4.3.3 Other finishing operations</td>
<td>Understand Other finishing operations</td>
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<td>4.3.4 Binding</td>
<td>List out various methods of binding</td>
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**Unit 4**

**Packaging**

**About the Unit**

Packaging is a branch of printing industry which includes the production of hand made card boxes, machine made cartons manufacturing or flexible bags and craft paper bags, polythene and plastic bags, collapsible tubes for tooth pastes and balms, tin containers for powders and similar materials. The main purpose of packaging is protection of the contents. Packaging plays an important role in advertising. Packaging basically involves wrapping, strapping, or boxing various consumer products for delivery to the customer. This is highly specialised branch of printing profession which requires special equipments and highly skilled technicians. In this unit, you’ll learn about the functions of packaging, including different materials used in the packaging industry.

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<td>4.4.2 Design fundamentals of packaging</td>
<td>Understand the fundamentals of packaging design</td>
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<td>4.4.3 Materials for packaging</td>
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<td>4.4.4 Carton styles</td>
<td>Classify Cartons based on its style</td>
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<td>4.4.5 Packaging Die</td>
<td>Construct a packaging die</td>
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### Unit 5

**Basic Engineering**

#### About the Unit

An understanding of simple electrical, electronic, mechanical and pneumatic components provides the background necessary to explore more complex system of components used in various equipment and machineries used in the printing industry.

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<td>4.5.2 Motors and Transformers</td>
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<td>4.5.4 Mechanical components</td>
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<td>4.5.5 Hydraulics and Pneumatics</td>
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<td>4.5.6 Mechanical, Electrical, Electronic and Pneumatic parts of a printing machine</td>
<td>Categorise the Mechanical, Electrical, Electronic and Pneumatic parts of a printing machine</td>
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**Unit 6**

**Engineering Graphics**

**About the Unit**

It is a graphical language that communicate ideas and information from one mind to another. One of the best way to communicate one’s ideas is through some form of picture or drawing. This is especially true for an engineer. The purpose of this unit is to give you the basics of engineering sketching and drawing. We will treat “sketching” and “drawing” as one. “Sketching” generally means freehand drawing. “Drawing” usually means using drawing instruments from compasses to computers to bring precision to the drawings.

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<td>4.6.2 Lines - Different types and its applications</td>
<td>Distinguish between different types of lines and understand its applications</td>
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<td>4.6.3 Lettering and numbering</td>
<td>Do proper lettering and numbering while preparing drawing sheets</td>
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<td>4.6.4 Dimensioning</td>
<td>Use proper dimensioning method</td>
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<td>4.6.5 Construction of basic shapes - polygon, conic section, spiral curve</td>
<td>Understand the projection of points, lines, planes</td>
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<td>4.6.6 Introduction of projection of points, lines, planes</td>
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<td>4.6.7 Quadrants and objects in different quadrants</td>
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<td>4.6.8 Basic section views</td>
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<td>4.6.9 Auxiliary views</td>
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<td>4.6.10 Isometric views</td>
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<td>Discussion on machine drawing</td>
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**List of items in portfolio**

- Binded paper back note books
- Binded quarter cloth note books
- Binded half cloth record books
- Prepare receipt books with numbering, perforation and stitching binding
- Prepare brochures with different types of folding
- Prepare saddle stitched, side stitched and spiral bound books
- Prepare a die drawing for a paper carton of specific size
- Prepare carton boxes of various styles.

**Assessment activities**

- To bind a note book
- To do quarter cloth, half cloth and full cloth binding
- To do flexible sewing, hand sewing, double flexible sewing, tape sewing and sawn in sewing
- To draw die for a carton with given specifications using CorelDraw software
- To prepare different types of carton boxes
On Job Training

OJT or On the Job Training Programme forms an integral part of the vocational curriculum of VHSE in Kerala. It gives a good platform for students to learn the working condition and work culture. OJT help the learners to identify the skill needs of the industry. It is the place where the students acquire and polish their vocational skill. The students will be able to get familiarized with the administrative background of the institution where they undergo training, which will contribute the managerial skill in feature.

There are eleven govt. press, cooprative presses like KPBS, more than twenty leading newspaper publishers, and a numerous commercial offset printers all arround kerala. VHSE schools with GDPT course can depent on these schools for conducting the OJT program.

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