

**STRUCTURE OF  
B.E. ( Printing Engineering ) (2008 Course)  
(w.e.f. June, 2011)**

**Part I**

Sr. No.	Subject Code	Subject	Teaching Scheme		Examination Scheme				
			Hrs. / week		Paper	T/W	Pr.	Oral	Total
Lect.	Pr / Dwg.								
1	408281	Elective I	4	2	100	25	50	-	175
2	408282	Elective II	4	-	100	-	-	-	100
3	408283	Technology of Gravure	3	2	100	25	-	50	175
4	408284	Digital Imaging and Printing	4	2	100	-	50	-	150
5	408285	Advertising and Multimedia	4	2	100	-	50	-	150
6	408286	Project Work	-	2	-	-	-	-	-
<b>Total</b>			<b>19</b>	<b>10</b>	<b>500</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>750</b>

**Part II**

Sr. No.	Subject Code	Subject	Teaching Scheme		Examination Scheme				
			Hrs. / week		Paper	T/W	Pr	Oral	Total
Lect.	Pr / Dwg.								
7	408287	Elective III	4	2	100	25	50	-	175
8	408288	Elective IV	4	-	100	-	-	-	100
9	408289	Package Design and Technology	4	2	100	25	50	-	175
10	408290	Print Production Planning and Control	4	2	100	50	-	-	150
11	408286	Project Work	-	6	-	100	-	50	150
<b>Total</b>			<b>16</b>	<b>12</b>	<b>400</b>	<b>200</b>	<b>100</b>	<b>50</b>	<b>750</b>

Elective I		Elective II	
408281A	Quality Control Techniques in Printing	408282A	Security Printing
408281B	Commercial Graphic Design	408282B	Newspaper Technology
408281C	Screen Printing Techniques	408282C	Open Elective Subject (Self Study) ☐☐

Elective III		Elective IV	
408287A	Electronic Publishing	408288A	Flexible Packaging
408287B	Printing Machine Maintenance	408288B	Entrepreneurship in Printing
408287C	Image Conversion & Modification	408288C	Open Elective Subject

**Note: Practical / Oral Examinations shall be based on the Term Work presented.**

☐☐ **Open Elective Subject-** BOS Printing Engineering & Graphic Communications will declare the list of subjects which can be taken under open elective.

# **(408281A) (Elective I) Quality Control Techniques In Printing**

## **Teaching Scheme**

Lectures: 4 Hours /Week

Practical: 2 Hours/Week

## **Examination Scheme**

Theory: 100 Marks

Term work: 25 Marks

Practical: 50 Marks

### **Unit 1: Fundamentals of Quality**

Fundamental concepts of Quality, Quality Cost, Specification of Quality, Quality inspection, Quality Challenges in printing

### **Unit 2: Introduction to Statistical Process Control – Tools / SQC**

Introduction to SPC, Types of Variation, Control charts for Variable and attribute data, Acceptance sampling for attributes, Acceptance sampling for variables, OC curve, Data analysis using statistical softwares like Minitab, SPSS, SAS

### **Unit3: Production**

Manufacturing process optimization and integration

Types of production, job order, Mass production, Batch production, Flexible manufacturing system, Computer Integrated Manufacturing System, Workflow System, World Class Manufacturing, Lean Manufacturing, Agile Manufacturing

### **Unit 4: Testing of properties of substrate and inks**

Quality Control procedures and practices used in receiving and for inventory management in print house. Substrate testing— surface properties, physical properties and optical properties, Ink testing – Rheology, particle size, press performance testing, dried print performance testing, surface energy of inks.

### **Unit5: Prepress Settings**

Quality of originals, Input Resolution, File-formats, Hardware or equipment used, Linearization, Calibration and Profile creation, Image editing, anti aliasing, trapping, image mixing, Pre-flight Check, Proofing, Raster Image Processing, Simulation of Proof-to-Press, Output/Imaging.

### **Unit6: Press Specifications**

Press Characterization (finger printing) and standardization, various test forms used for standardization- Web test form (Digital), Plate control wedge, media wedge , Types of Standards such as ISO, TAPPI, ASTM, ANSI, CGATS, CIE, ICC, Characterizations of Print Processes using SWOP, SNAP, GRACoL, PRS, FIRST etc.

**Term Work:**

Note: Term-work shall consist of record of the following experiments presented in the form of journals.

- 1) Surface & physical properties testing for substrates.
- 2) Optical properties testing for substrates.
- 3) Ink Rheology testing – Viscosity / Solid content
- 4) Ink performance testing, drying, adhesion.
- 5) Display device calibration
- 6) Inkjet device Calibration
- 7) Output device Calibration
- 8) Individual project using statistical software for data analysis.

**References:**

- 1) J Juran, Handbook of Quality Control, Tata McGraw Hill Publication, 5th edition.
- 2) Handbook of Print Media
- 3) Montgomery, Statistical quality control, Wiley publication
- 4) Apps, Printing Ink Technology
- 5) Dr. Abhay Sharma, Understanding Colour Management, Thomson Delmar Publication
- 6) Holman Richard, The technology of printing inks, Print research association.
- 7) Derek Porter, Print Management (second edition), Pira International Ltd.

## **(408281B) (Elective I) Commercial Graphic Design**

### **Teaching Scheme**

Theory: 4 Hours/Week

Practical: 2 hours/week

### **Examination Scheme**

Paper: 100 Marks

Term Work: 25 marks

Practical: 50 marks

### **Unit I: Advancement in graphic design**

Current trends in graphic design. Typography- Fonts and Typeface-Designing, Page layout and design, interaction of text and image.

### **Unit II: Digital Photography**

Photograph –Camera controls: shutter, aperture, light meter, depth of field control, raw file formats, PNG-DNG file formats, Storage Media, Color Temperature.

### **Unit III: Design for Print Production- Process Limitation**

Layout of Magazine, Brochures, Catalogues, Designing company profiles including logos, Letter papers, Business cards, etc. Marketing and Advertising brochures and other publications, Label design, Posters- film, music etc., Newspaper layout as per ISO standards

### **Unit IV: Package Design**

Label Designing, Design for Flexible package, Design for Rigid package, Standard product rules plus regulations, Security of Package

### **Unit V: Web designing**

Introduction to Web Publishing Concepts, Internet Languages and Tools XML, DHTML etc., Designing a website, Web design and other multimedia. Sound, video and animation in websites, designing and making banners on the Internet, Different website structures and web design approaches, Website publishing and updating. Software used for designing.

### **Unit VI: Costing & estimating**

Costing & estimating, Calculation for the different kind of jobs, cost chargeable per hour, Rework / Proof correction cost.

Client Servicing

### **Term Work:**

Note: Term-work shall consist of record of the following experiments presented in the form of journals.

- 1) Create a Digital Vector Graphic for Clip Arts
- 2) Develop a Design for Package

- 3) Develop a company catalogue/ Magazine by using creative suit.
- 4) Introduction to Adobe Flash
- 5) Develop a 2d animation by using Adobe flash software
- 6) Develop a perceptual view by using 3D S max.
- 7) Introduction to Adobe dream weaver
- 8) Develop a design for web site.

### **Reference Books**

- 1) Braham.B., Collins Graphic Arts Studio Manual
- 2) McCaughey, Graphic Design for Corrugated Packaging, Delmar Publisher
- 3) 3ds max 8 Animation & Visual John Wiley & sons, A Wiley interscience publication
- 4) March. M., Cinnati, Creative Typography, North light Books
- 5) Basic Graphic Tutor – Computer graphic
- 6) Frank J. Romano, Encyclopedia of Graphic Communication, Graphic Arts Technical foundation
- 7) Philip Kent Ruggles, Printing Estimating, Delmar Publisher Inc.

## **(408281C) (Elective I) Screen Printing Techniques**

### **Teaching Scheme**

Lectures: 4 Hours/Week

Practical: 2 Hours/Week

### **Examination Scheme**

Paper: 100Marks

Term Work: 25 Marks

Practical: 50 Marks

### **UNIT I: Introduction**

Introduction to Screen printing technique, Scope, limitations, characteristics and features of the process, various applications, market share, comparison with other printing technologies, certifications, standards and associations in the area of screen printing.

### **UNIT II: Pre press and materials**

Pre press requirements for screen printing for different applications, Halftone printing requirements such as screen ruling; screen angle, requirements of color management in screen printing, Mesh selection, Frame selection, types of inks for different applications, selection of squeegee for different applications.

### **UNIT III: Screen Making**

Various types of emulsions used for screen making, Hand doffing method, Tusche method, Direct photographic method, Direct Indirect photographic method, Indirect photographic method, Digital screen making technique, comparison of various methods

### **UNIT IV: Printing Techniques**

Conventional screen printing set up, printing of round objects by screen, Textile printing, web screen printing, Multi color printing techniques and their requirements.

### **UNIT V: Advanced Machines and Equipments**

Screen stretching equipments, Screen coating equipments, Exposing devices, Single color and multi color printing machines, drying equipments, ancillary equipments

### **UNIT VI: Quality Control**

Quality control at screen coating, screen exposing, screen developing, Quality control aids for screen printing operation, QC at screen decorative applications, Environmental and special working consideration for screen process, Waste disposal

### **Term Work:**

Note: Term-work shall consist of record of the following experiments presented in the form of journals.

- 1) Screen Mounting by manual and pneumatic technique
- 2) Screen Making by Hand Duffing Method
- 3) Screen Making by Direct Photographic Method
- 4) Screen Making by Direct Indirect Photographic Method
- 5) Screen Making by Indirect Photographic Method
- 6) Single color printing operation
- 7) Multi color (loose registered) job printing
- 8) Four color Half tone screen printing
- 9) Preparing the screen for Textile printing
- 10) T-shirt / Textile printing
- 11) Spot coating / Lamination by screen printing
- 12) Screen exposure standardization by Stouffer wedge (21 step sensitivity guide)
- 13) Specialty printing techniques (Raised, velvet, round container, Scratch card etc.)

### **Reference Books**

1. The Fundamentals of Screen Making
2. Hand book of screen printing with process and technology, EIRI Board of Consultants and Engineers.
3. Robert M. Swerdlow, Step – by – Step guide to screen – process printing
4. John Stephens, Screen Process Printing ( Practical guide)
5. Hand book of Printing Technology by NIIR board
6. JI Biegeleisen, Silk screen technique



## **(408282-A) (Elective II) Security Printing**

### **Teaching Scheme**

Theory: 4 Hours/Week

### **Examination Scheme**

Paper: 100 Marks

#### **Unit 1: Introduction**

Introduction to security Printing, Optical document security, importance of security printing of bank note papers and boards, passports and government documents

#### **Unit 2: Printing Processes**

Printing Processes such as offset lithography, silk screen, flexo, gravure and letterpress for Security Printing, Designs of Security Documents, Variable data printing- softwares and digital printing equipments used for variable data printing

#### **Unit 3: Card Products**

Credit Cards, Smart cards, club cards, credit / debit cards, Plastic ID cards, Water mark cards, RFID technology, Bar codes, Printers used for bar codes, Card printers,

#### **Unit 4: Negotiable Instruments**

Cheques and their value documents, MICR/OCR/Cheque printing technology  
Counterfeit, fraud prevention, Cheque fraud prevention, method and arrangement for processing negotiable instruments

#### **Unit 5: Substrates and Inks / Testing**

Substrates, Inks - Invisible inks, Specialist security printers inks; such as thermo chromic, UV fluorescing, water fugitive, solvent sensitive inks, combifuge, photo chromic, Fluorescent Inks, Watermarks, Testing, Deterrent measures

#### **Unit 6: Optical Security / Brand Protection**

First line inspection of documents using optical elements such as Holograms, optical variable graphics, diffraction structures, liquid crystal materials, optical security in laminates etc., invisible document security and Brand protection.

**References:**

- 1) Countering Counterfeiting
- 2) Rudolf von Renesse, Optical Document Security
- 3) Guide to processing & Authenticating products and documents
- 4) Anti counterfeiting technology guide
- 5) Kant Dabholkar, MICR cheques + other document
- 6) Richard D. Warner and Richard M.Adams II, Introduction to security printing, PIA  
GATF Press

## **(408282B) (Elective II) Newspaper Technology**

### **Teaching Scheme**

Theory: 4 Hours/Week

### **Examination Scheme**

Paper: 100 Marks

### **Unit 1: Newspaper Organization**

Study of various departments of newspapers organization, workflow in a newspaper industry, receiving of news, national and international news agencies such as Reuters etc., Concepts of newspaper advertising, advertisement – print ratio in newspapers

### **Unit 2: Newspaper Design and Layout**

Newspaper design and page layout of special pages, grid, types selection, page sizes, illustrations and photographs used in newspaper, placement and pages for advertisement, editorial page, sports page etc...

### **Unit 3: Telecommunication in Newspaper**

Telecommunication systems in Newspaper, digital archiving, keyword search tools, remote printing, networking in newspaper industry

### **Unit 4: Newspaper Production**

Newspaper production, pre-press and CTP in newspaper, web offset and gravure presses used for newspaper production, press configuration, inking and dampening systems, inks and fountain solution used, printing and print quality, testing of printability, drive concepts for newspaper presses

### **Unit 5: Standardization and Automation in Newspaper Workflow**

Automatic workflow systems, Newspaper materials, Different grades of newspaper, inks & their properties, standardization in newspapers, use of quality control and international standards such as IFRA, SWOP, SNAP

### **Unit 6: Newspaper Mailroom System**

Newspaper Mailroom systems, inserters, distribution and circulation techniques, waste management in newspaper industry- controlling print waste and white waste

### **Reference Books**

- 1) Rucker & Williams; Newspaper Organization, Published by Iowa State university press U.S.A.

- 2) International Newspaper colour quality club (1998-2000 special issue, IFRA publication.
- 3) Rolf F. Rehe; Typography & Design for Newspaper special issue, IFRA Publications.
- 4) IFRA Newsprint and Newsink Guide, IFRA Publication, 1993 Edition

## **(408283)Technology of Gravure**

### **Teaching Scheme**

Lectures: 3 Hours/ Week

Practical: 2 Hours/ Week

### **Examination Scheme**

Paper: 100 Marks

Term work: 25 marks

Oral: 50 Marks

### **Unit 1: Surface Preparation for Gravure**

Basic Methods of Gravure Image Production, Chemical Etching, Electronic Engraving and Laser Engraving, Processing Steps, Comparison between Etching and Engraving.

### **Unit 2: Gravure Image Carrier**

Cylinder bases, Functions of Copper, Chrome and Zinc, Variables in Plating, Process Steps from Press to Press, Base copper technique, Ballard Shell, Corrections in Copper and Chrome, Measurement and Testing.

### **Unit 3: Gravure Process**

Introduction, Photogravure, Press Configurations, Press Sections, Hybrid Process, Gravure Products and Applications, Types of Inks used for Gravure and their temperature ranges

### **Unit 4: Inking and Drying System for Gravure**

Types of Inking system, Viscosity Control, Viscosity and Gravure print quality, Doctor Blade and purpose, Doctor blade types, Doctor Blade assembly, Doctor blade loading.

### **Unit 5: Impression System**

Functions of Impression system, types of elastomers used, types of impression system, factors governing pressure, factors governing pressure, impression loading, specifications for impression rollers, testing properties, ESA, Impression shore hardness and gravure print quality.

### **Unit 6: Web Handling**

Splicing Mechanism, Web aligner, Surface treatment, Web tension, Tension Zones, Register control-Manual and Automatic, Web transport roller, Purpose of idle rollers, Requirements of idler rollers, Roller balancing, Electronic Line Shaft.

**Term Work:**

**Note:** Term-work shall consist of record of the following experiments presented in the form of journals.

1. Study of Gravure Machine principles.
2. Gravure cylinder mounting and de-mounting.
3. Analysis of Gravure Cell Structures.
4. To print a single color job with etched cylinder on paper.
5. To print a single color job with etched cylinder with varying viscosity on PE.
6. To print a single color job with etched cylinder on paper with varying speed.
7. To print a single color job with engraved cylinder on PET.
8. To print a single color job with engraved cylinder with varying viscosity on PET.
9. To print a two color job with engraved cylinder with varying pressure on Paper.
10. To print a two color job with engraved cylinder on PE.

**Reference Books:**

- 1) Gravure Process and Technology, (2003), Gravure Education Foundation and Gravure Association of America.
- 2) Basic Gravure Technology, PIRA.
- 3) W. R. Durrant, (1989), Printing-A Guide to Systems and their Uses, Heinemann Professional Publishing.
- 4) P. Laden, Chemistry and Technology of Water based Inks, Blackie
- 5) Harry B. Smith, (1994), Modern Gravure Technology, Pira International,
- 6) W. R. Durrant, Machine Printing, Heinemann Professional Publishing.
- 7) H. Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg.
- 8) Molly J. Joss, (1999), Comparative Guide to Direct-to-Press Technology, 2<sup>nd</sup> edition.
- 9) Ronald E. Todd, (1994), Printing Inks: Formulation Principles, Manufacture and Quality Control, Pira International,
- 10) E. A. Apps, (1958), Printing Ink Technology, Leonard Hill Ltd.

# **(408284) Digital Imaging and Printing**

## **Teaching Scheme**

Theory: 4 Hours/Week

Practical: 2 Hours/Week

## **Examination Scheme**

Paper: 100 Marks

Practical: 50 marks

### **Unit I: Introduction to Digital Technology**

History for development in Digital Printing, Invention of Electro photography, Study of Digital Image concept, Image resolutions: Low, Medium and high resolution images, properties, Pixel aspect ratio, Generation of digital images, Bitmap and Vector format, Applications in Imaging soft wares.

### **Unit II: Capturing devices and file formats**

File Formats, Compressible and non compressible file formats, JPEG, TIFF, DNG, RAW, EPS, Capture and utility of Digital data, Structure of CCD, CMOS and comparison, Color Temperature, Noise, ISO levels, RAW file format

### **Unit III: Digital imaging devices**

Structure and working of Digital camera, Scanners, various digital capturing devices, elements of a SLR camera, OCR, OBR, Digital Storage devices, Understanding of resolution (in terms of actual and interpolated), digital editing processes.

### **Unit IV: Digital Print Technologies**

Study of Various digital printing technologies: Inkjet : Drop on demand and Thermal, Thermal Dye Sublimation process,, Electrostatic Printing process, toner structure and properties,, Ionography and applications, Magnetography, polar toners, application. Applications of digital printing machines and comparison with conventional printing processes

### **Unit V: Advance Application techniques**

Unique applications of Digital Printing: Proofing, Remote proofing, VDP (variable data printing), POD (print on demand) Limitations of digital printing. Color Management in Digital Printing, methodology of handling digital print process, advanced Printers: IGEN3, HP Indigo ( liquid toner technology), hex chrome printing in Digital Printing.

### **Unit VI: Latest trends and future developments**

Advancements in Digital Printing: variety of media, online post press and finishing operations, size factor considerations, Costing of digital print jobs, wastages, toner recycling

substrate variety and limitations, Setup of a digital print house, study of Digital printing as a advantage to conventional Printing business.

### **Term Work**

Note: Term work shall consist of following experiments or assignments presented in the form of journals.

- 1) Study of Digital Camera and Scanner,
- 2) Capture Images at various resolutions
- 3) Capture images of various file formats, RAW
- 4) Editing Raw images
- 5) Study of Inkjet, Electrostatic Printer
- 6) Compare prints on inkjet & electronic
- 7) Variable data printing
- 8) Printing on various media for digital outputs.

### **Reference Books**

- 1) Handbook of Print Media by Hemlut Kiphan, Heidelberg
- 2) Harald Johnson, Mastering Digital Printing
- 3) Andrew Darlow, Inkjet printing tips and techniques



## **(408285) Advertising & Multimedia**

### **Teaching Scheme**

Theory: 4 Hours/Week

Practical: 2 Hours/ Week

### **Examination Scheme**

Paper: 100 Marks

Practical : 50 marks

### **Unit 1: Introduction**

Introduction – Advertising as a tool of communication Role of Advertising in marketing mix. Types of Advertising – Product advertising, Service advertising, Institutional Advertising, Public Relations advertising, Public Service Advertising, Financial Advertising

### **Unit 2: Research – Market & Advertising**

Research – Types / Scope of research, Market Research – Market surveys – Audience surveys Market segmentation Targeting, Advertising Research, Advertising evaluation, ADGMAR approach, Types of Advertising evaluation

### **Unit 3: Research- Media & Product**

Types of media, Media Vehicles, Functions, Audience surveys, TRP, NRS, ABC, Product research meaning & scope, Analyzing & Testing of products, Important of product research, Limits, Product Positioning

### **Unit 4: Campaign Planning**

Three phases of campaign, Campaign planning – these identification, Why to advertise in terms of campaign, Creativity & psychology in advertising, Brand equity – personality, positioning

### **Unit 5: Construction of advertisement**

Construction of effective advertising, Visualization, cope writing, Headlines, slogan, Types of copy, Requisites of an effective layout, Advertising agency structure, Responsibilities of personnel , Advertising Budget, methods of budgeting, Budgeting process.

### **Unit 6: Multimedia**

Multimedia, File formats, Non-linear programs, Collaboration of different media such as video skills, audio & animation, Authoring, Animated advertising Case study

### **Term work**

Note: Term work shall consist of record of the following minimum experiments of assignments presented in the form of journal.

- 1) Campaign planning for selected product/ service/ idea
- 2) Design a full page newspaper advertisement
- 3) Design a half page newspaper advertisement

- 4) Design a full page magazine advertisement
- 5) Design a half page magazine advertisement
- 6) Design a outdoor advertisement for hoarding
- 7) Design a outdoor advertisement for banner
- 8) Design multimedia advertisement in Flash for cable TV (running strip)
- 9) Design multimedia advertisement in Flash for internet viewing

**References :**

- 1) Chunawalla, Sethia foundations, Foundations of advertising theory & practice, Himalaya publishing
- 2) Batra, Myers, Aaker, Advertising Management, Prentice Hall
- 3) Handbook of multimedia

## **(408286) Project Work**

**Teaching Scheme**

Practical : 2 hours/ Week

## **(408287A) (Elective III) Electronic Publishing**

### **Teaching Scheme**

Theory: 4 Hours/Week

Practical: 2 hours/ Week

### **Examination Scheme**

Paper: 100 Marks

Term work: 25 marks

Practical: 50 marks

### **Unit 1: Digital Information Technologies and Architectures**

Structure and history of the Internet / World Wide Web, Digital information storage in common file format on web like JPEG, GIF, PNG, SVG, XML, specification and the aims and uses of its languages. Create and publish web pages on a web server. Use appropriate HTML tags to embed example graphics.

### **Unit 2: Writing and Editing for Electronic Media**

Create and format textual content for electronic publications, textual content in electronic publications including emerging styles such as blogs and wikis facebook editing techniques : Different editing techniques & trends, check for pleasarism.

### **Unit 3: Human Computer Interaction Design and Databases**

Usability and terminology used in human-computer interaction, Knowledge about database systems, representing data, accessing and manipulating data stored in different formats by using specific query languages, use of XML and related technologies as a way of exchanging data between different database systems and applications.

Oracle.. v10-11, *basic information and concept and applications*)

### **Unit 4: Multimedia**

Design and Layout for Electronic Media, understanding of the principles of layout and composition including the use of the grid system, Use web editing packages, HTML mark-up and style sheets(CSS) to compose and layout web pages, understanding of the principles of typography, Indexing, Types of PDFs( editable and non-editable) , teletext.

### **Unit 5: Publication & E-commerce**

Information regarding E-publications formats like e-pubs. Also E-pub readers like Adobe Digital Editions, mobile readers etc in brief (since this is a worldwide used e-publishing solution used on a large scale), rules and regulations for e-publishing use of business models in the development and evaluation of an e-commerce application

**Unit 6 : Web Application Development:**

Use of Flash (Basic concepts), Introduction to dot net technology, Web Applications Development, CMS (content Management System) and ECM suites (Enterprise Content Management), methodology, need and use,

**Note:** Term work shall consist of record of the following minimum 10 experiments or assignments presented in the form of journal.

**List of Practical:**

1. Create a web page
2. Create different types of PDFs
3. Create and format textual & content for electronic publication
4. Create index using software commands
5. use of HTML tags to embed graphics
6. Use of flash for designing
7. Publish an e-newspaper locally
8. Publish an e-book locally

**References:**

- 1) The Handbook of digital Publishing by Michal' L Kleper
- 2) The Columbia guide to digital publishing by William E. Kasdorf
- 3) H. Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1Springer-Verlag Berlin Heidelberg
- 4) Begin.C, I.BaTIS in action, Creating & Manipulating PDF
- 5) Multimedia making it work by Infra Suite.

## **(408287B) (Elective III) Printing Machine Maintenance**

### **Teaching Scheme**

Theory: 4 Hours/Week

Practical: 2 hours

### **Examination Scheme**

Paper: 100 Marks

Term Work: 25 marks

Practical: 50 marks

### **Unit 1: Mechanical Components & their function**

Gears: Spur, Helical, Bevel, worm & worm wheel, non-metallic gears & their advantages, belt drive, flat belt, v-belt, timing belts, chain drive, Hydraulic & pneumatic systems. Cams; special types of cams used in printing machines. Couplings, flexible & universal couplings, Hydraulic & pneumatic systems. Cams; special types of cams used in printing machines. Couplings, flexible & universal couplings, bearing: Ball bearings, journal bearings.

Levers : Different types of levers, Motors : Stepper motor, D. C. Motors, A. C. Motors, speed control & synchros – electrical, mechanical.

### **Unit 2: Assembly and maintenance of Sheet Fed printing machine**

Assembly of different types of drive **systems** used in S.F.P. m/cs. Paper – feed mechanism assembly, Ink rollers and cylinder assembly, plate, blanket cylinder assembly.

### **Unit 3: Maintenance fault, finding techniques**

Common faults & their remedies, replacement or repair decision making, electrical fault finding techniques, Preventive maintenance schedules, breakdown maintenance handling, day to day maintenance to be done by operator, productivity gain by preventive maintenance etc. Modern maintenance used for sheet fed printing machines etc.

### **Unit 4: Breakdown & preventive maintenance**

Modern maintenance management system: Use of operators' manual, requirement of preventive maintenance, Implementation of maintenance management systems.

Different safety codes according to national & international standards etc.

Specification of lubricating oils grease etc.

### **Unit 5: Importance of maintenance needs**

Areas of proper maintenance: Instillation, lubrication, antifriction, bearings, sleeve bearings, one-shot oilers, open gears, closed gear boxes, brakes and clutches, hydraulic cylinders and lines, anilox & fountain rolls. Auxiliary & equipment.

### **Unit 6: Maintenance of Ancillary & Converting Machines**

Cutting, folding & stitching machines, assembly of drives & the cutting mechanism, folding mechanism, & stitching mechanism, Different types of tools used for maintenance of printing machines, different keys, spanners, pullers etc.

### **Term work**

Note: Term work shall consist of record of the following minimum 10 experiments or assignments presented in the form of journal.

- 1) Identification of parts used in printing machines e.g. actually identifying parts like gear, bearing, chain etc.
- 2) Dis-assembly & re-assembly of drive system of sheetfed printing machines.
- 3) Dis-assembly & re-assembly of simple powder spray units.
- 4) Dis-assembly & reassembly of numbering machine.
- 5) Dis-assembly & reassembly of Inking unit.
- 6) Removing & mounting of Blanket.
- 7) Measuring packing of plate cylinder of all machines using packing guage
- 8) Measuring packing of blanket cylinder of all machines using packing guage

### **References**

- 1) Lindley R. Higging; Maintenance Engineering Handbook, McGraw Hill International edition, 4<sup>th</sup> edition.
- 2) Operator's Manual by GATF
- 3) Flexography principles & practice published by FTA, 1997

## **(408287C) (Elective III) Image Conversion & Modification**

### **Teaching Scheme**

Theory: 4 Hours/Week

Practical: 2 Hours/Week

### **Examination Scheme**

Paper: 100 Marks

Term work: 25 marks

Practical: 50 marks

### **Unit 1 Conversion, Image creation**

Conversion - Input: scanner (different types of originals, reflective (bromide), transparency, negative etc. Digital Camera, CDs, Floppies, cartridge etc. Image creation Editing – control software (for scanner, Camera) Image editing software (Photoshop, life picture)

### **Unit 2 Outputting**

Output: Printer (proofing), paper, tracing, films, image setter, platesetter, direct to press, digital printing techniques

### **Unit 3 Multimedia, Animation**

Multimedia – video, audio, Interactivity, Video –softwares like adobe premier, Animation – softwares Director, D studio, X res, Audio - Audio files softwares used, sound edit, Recording – communication with user, Interactivity – communication with user.

### **Unit 4 Morphing, Network & protocols**

Morphing – software used, strata studio pro, Network & protocols – TCP / IP – Transfer control protocol & internet protocol, Ethernet, Infra red, Nub switch concept, router concept, LAN, WAN, concept for networking

### **Unit 5 Internet concepts**

Internet concepts, Internet applications – with pages, website E-mail, information & resource sharing security, Windows XP Macintosh OS

### **Unit 6 Programming languages, Graphic Softwares**

Programming languages HTML, DHMTL, XML and web page creation, Software used for creation of webpage, Creating web pages, using adobe page mill, Adobe Photoshop, adobe PageMaker , adobe illustrator, adobe premier, using all these s/w for web-publishing, introduction to ASP.net for web page development



**Term Work:**

Note: Term work shall consist of record of the following experiments or assignments presented in form of journal.

1. OCR and Image Scanning
2. Capturing images through digital camera and editing on computer
3. Design a web page using software tool
4. Publish a web page on server ( local or any other)
5. Simulation of protocol
6. Use of image grabbing software to make a film
7. To morph an image using software tool
8. To develop 2 D animated film using Flash
9. Use of action script to develop 2 D animated film using Flash

**Reference Books**

1. Miles Southworth & Donna Southworth, Colour separation on the desktop, graphic arts publishing, 1999
2. Adobe Web Publishing & Design Tekmedia
3. Multimedia – the complete guide Dorling Kindersley 1996 Edition.
4. Keyes; Multimedia Handbook, McGraw Hill

## **(408288 A) (Elective IV) Flexible Packaging**

### **Teaching Scheme**

Lectures: 4 Hrs/ Week

### **Examination Scheme**

Paper: 100 Marks

#### **Unit 1: Packaging Materials**

Basic requirements of Packaging, raw materials for Packaging such as Cellophane, Polyethylene, Polypropylene, PET A, PET G, Aluminum Foil, PVC, PS, Properties and applications of the packaging materials.

#### **Unit 2: Printing Processes used for Flexible Packaging**

Gravure, Flexo, Rotary Letter press, Types and Configurations of the press.

#### **Unit 3: Converting Processes**

Extrusion and Co-extrusion technology, Advantages, Limitations, Polymer compatibility for co-extrusion process, applications of co-extrusion, coating techniques, lamination technique such as Dry, Wet, Hot-melt, Thermal and Extrusion, Metallization, Varnishing.

#### **Unit 4: Packaging Techniques**

Bag-in-Box, Retort Packaging, Requirements for Retort, Aseptic Technology, Aseptic packaging for food products in PET Bottles, Lami-tubes, Processing and Advantages.

#### **Unit 5: Wrapping Techniques and Closures**

Shrink wrapping, Process, Stretch wrapping, Process, Comparison between Stretch and Shrink wrapping, Closures, Purpose, Types of Closures, Applications, Flexible Pouches such as Stand-up pouches, two-sided seal, three-sided seal pouches, Pouching machines, FFS machines.

#### **Unit 6: Food Packaging**

Deterioration and Packaging for Dairy products such as Milk, Cheese, Mineral Water, Beverages such as Tea, Coffee, Alcoholic beverages, CSD, Fresh food.

**Reference Books:**

1. A. S. Athayle, (1992), *Plastics in Packaging*, Tata McGraw-Hill Publication.
2. A. S. Athayle, (1992), *Plastics in Flexible Packaging*, Multi-Tech Publishing.
3. Aaron L. Brody, *Modified Atmosphere Food Packaging*, PIRA Publication.
4. Aaron L. Brody, Kenneth S. Marsh, (1997), *Encyclopedia of Packaging Technology*, 2<sup>nd</sup> Edition A Wiley-Interscience Publication.
5. Frank Albert Paine, Heather R. Paine, (1992), *Handbook of Food Packaging*, 2<sup>nd</sup> Edition Institute of Packaging.
6. M. Mahadevian, R. V. Gowramma, (1996), *Food Packaging Materials*, Tata Mc Graw Hill Publication.
7. Stanley Sachavow and Robert Schiffmann, (1992), *Microwave Packaging*, PIRA International.
8. David Shires, *Developments in Barrier Technology*, (1993), PIRA International.
9. J. A. Cairns, C. R. Oswin, (1974), *Packaging for Climatic Protection*, Newness-Butterworth.
10. *Gravure Process and Technology*, (2003), Gravure Education Foundation and Gravure Association of America.
11. *Flexography Principles and Practices*, 5th edition, Foundation of FTA
12. H. Kipphan, (2001), *Handbook of Print Media*, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg.

## **(408288 B) (Elective IV) Entrepreneurship in Printing**

### **Teaching Scheme**

Lectures: 4 Hours/Week

### **Examination Scheme**

Paper: 100 marks

#### **UNIT1: Introduction – Types of organization / ownership**

Concept and need of Entrepreneurship Development, Definition, Invention, Creativity, Business Idea, Entrepreneur and Intrepeneur, Corporate Entrepreneur, Entrepreneur as a style of management, Entrepreneur traits, Reasons of success and failure of entrepreneur

#### **UNIT 2: Theories of Entrepreneurship**

Innovation theory by Schumpeter, Theory of High achievement by McClelland, X Efficiency theory by Liebenstein, Theory of Profit by Knight, Theory of Social change by Everett Hagen

#### **UNIT 3: Production management**

Types of production activities, Plant location selection, Equipment selection, Plant layout, Functions of production management, Technical and economical feasibility of project, project report preparation

#### **UNIT4: Marketing Study and Financial Schemes**

Marketing mix, Product Life Cycle, Market research, Customer relationship management, financial agencies like IDBI, ICICI, SIDBI, SFC/Banks

#### **UNIT 5: Role of Government in Entrepreneur Development**

Role of State and Central government, EXIM policy (IEC code), Role of Government agencies in Entrepreneur Development – DIC, SISI, EDII, NIESBUD, NEDB

#### **UNIT 6: Legal Aspects of Business**

Sale of goods act, Contract act, Negotiable instrument act, Consumer protection act, Right of information act, Minimum wages act, Apprentice act, Other taxes , Basic of accounting, profit & loss, Balance Sheet, Accounting Principles, Shop Act / Factory Act.

**Reference Books:**

- 1) Holt D. H., Entrepreneurship: New venture creation, Prentice Hall of India Pvt. Ltd.
- 2) Shiba Charan Panda, Entrepreneurship Development in Small scale industries, Anmol  
3) Publication Pvt. Ltd.
- 4) Vasant Desai, Dynamics of Entrepreneurship Development
- 5) Dr. P. C. Shejwalkar, Entrepreneurship Development
- 6) N. D. Kapoor, An introduction to Mercantile Law
- 7) Sen & Mitra, Business & commercial Laws
- 8) Gulshan Kapoor, Business Laws

## **(408289) Package Design & Technology**

### **Teaching Scheme**

Lectures: 4 Hours/Week

Practical: 2 Hours/Week

### **Examination Scheme**

Paper: 100Marks

Term work: 25 Marks

Practical: 50 marks

### **Unit 1: Introduction**

Introduction & concept of Packaging, Raw materials in Packaging – Paper & Plastic Properties of paper & Mfg. Process, Duplex boards, Grey back, white back, craft back, LWC, HWC, Low Bursting Craft, High Bursting Craft, LDPE, BOPP, PP, Grey boards, Mill boards, Water based and solvent based adhesives.

### **Unit 2: Paper and Paper Boards**

Duplex, Craft & board paper applications, printability & surface properties, Study of printing processes for Heavy duty boards, rough craft

### **Unit 3: Manufacturing of Cartons**

Manufacturing Process of cartons a) corrugation – single facer and multiply corrugated board, corrugation of paperboard, PVC, HDPE b) punching type cartoons c) universal process d) glueing, machinery involved in manufacturing, flat bed flexo printing machine

### **Unit 4: Die-Making**

Jigged Die – Applications manufacturing & required materials, Laser Die making  
Punching Process

### **Unit 5: Costing and Estimating**

Costing & estimating of cartons, Wastage calculations & remedy, Paper requirements & strength calculations

### **Unit 6: Testing of cartons**

Testing of packages, raw materials- drop test, compression test, bursting strength, pin adhesion, ring crush

### **Term Work:**

Note: Term work shall consist of record of the following minimum 10 experiments or assignments presented in the form of journal.

- 1) Preparing Reverse Tuck end cartons
- 2) Preparing straight tuck end

- 3) Preparing a ring and flap carton
- 4) Testing of GSM & Bursting Strength of board
- 5) Testing of Cobb value of boards
- 6) Preparing Jigged die
- 7) Punching of cartons
- 8) Preparing universal type carton
- 9) Testing of crushing & stacking of cartons

**Reference Books:**

- 1) Encyclopedia of Packaging – IBH Publication
- 2) Aseptic Packaging – Paine
- 3) Packaging Techniques- IPP (Indian Institute of Packaging)

## **(408290) Print Production Planning and Control**

### **Teaching Scheme**

Lectures Paper: 4 Hours/Week

Practical: 2 Hours/Week

### **Examination Scheme**

Paper: 100 Marks

Term Work: 50 Marks

### **UNIT 1: Introduction to Production and Operations Management**

Types of production, Classification of production system, Functions of Production planning and Production control, CIP3, CIP4.

### **UNIT 2: Network Analysis**

PERT, CPM Technique, crashing of activity, Network diagram representation, updating the project, Types of Floats, Slack

### **UNIT 3: Job Sequencing and Scheduling**

Johnson's rule, Sequencing technique, Two machines and Three machines problems

### **UNIT 4: Assignment Model**

Mathematical representation, Hungarian method for Assignment problem, Sensitivity analysis, Traveling salesman problem

### **UNIT 5: Transportation Model & logistics**

Introduction, Assumptions, Matrix technology, formulation and solution of Transportation model by North – West, Least cost, VAM method and test of optimality by MODI method , material handling system.

### **UNIT 6: Linear Programming**

Assumption of Linear Programming model, applications, Theory of simplex method, artificial variable technique, Big M method, special case in simplex method.



**Term Work:**

Note: The practical should consist of assignments pertaining to printing problems of the following

- 1) Sequencing and scheduling of  $m$  jobs  $n$  machines and  $n$  jobs  $n$  machines
- 2) PERT Technique problem: Defining the project and dividing its activities and their duration.
- 3) Finding out the critical path and its duration and crashing of the activity so as to minimize the time duration.
- 4) CPM Technique problem: Defining the project and dividing its activities and their duration.
- 5) Finding out the critical path and its duration and crashing of the activity so as to minimize the time duration.
- 6) The problem based on assigning the job to the machine by Hungarian method.
- 7) Allocation of jobs to several work stations by Transportation model.
- 8) Defining a project in a mathematical way under the constraint and solving it by Linear Programming method.

**Reference Books**

1. Hira Gupta, Operation Research, S. Chand
2. J. K. Sharma, Operation Research, S. Chand
3. S. D. Sharma, Operation Research, S. Chand
4. M. T. Telsang, Production Management, S. Chand
5. Dr. S. K. Basu, Dr. H. Bagchi, Operation Research for Engineers,
6. Manohar Mahajan, Operation Research, Dhanpatrai & Co.

## **(408286) Project Work**

### **Teaching Scheme**

Practical: 2 Hours/Week in Part I

Practical: 6 hours /Week in Part II

### **Examination Scheme**

Term work: 100 Marks

Oral: 50 Marks

Above work to be taken up in groups. Group shall not be more than 4 students.

A detailed report on the work done shall include project specifications, design procedure, drawings, process sheets, assembly procedure, test results, costing etc.

Guidelines:

1. Report shall be typed or printed.
2. Project title and approval sheets shall be attached at the beginning of the report followed by appendices (if any)
3. When a group of students is doing a project, names of all the students shall be included on every certified report copy.
4. Each group of students shall submit two copies of reports to the institute and one copy for each individual student.
5. In case of sponsored projects, the students shall obtain certificate from sponsor and attach it to the report.

**Oral shall be based on the project done by students, jointly conducted by internal and an external examiner appointed by end of part II.**