FACULTY OF ENGINEERING

SYLLABUS FOR THE
T.E. (PRINTING ENGINEERING AND GRAPHIC COMMUNICATION)

WITH EFFECT FROM
THE YEAR 2010-2011

UNIVERSITY OF PUNE

STRUCTURE OF
T.E. (Printing Engineering) (2008 Course)
(w.e.f. June, 2010)

Part I

Sr. No.	Subject Code	Subject	Teaching Scheme Hrs. / week		Examination Scheme				
			Lect.	Pr / Dwg.	Paper	T/W	Pr.	Oral	Total
1	308281	Offset Machines I	4	2	100	25	50	-	175
2	308282	Printing Network Technology & Opto- Electronics	4	2	100	25	-	25	150
3	308283	Colour Management & Standardization	4	2	100	25	50	-	175
4	308284	Management Information Systems And Cost Estimation	4	-	100	-	-	-	100
5	302285	Design of Printing Machine Components	4	2	100	50	-	-	150
		Total	20	08	500	125	100	25	750

Part II

Sr. No.	Subject Code	Subject	Teaching Scheme Hrs. / week		Examination Scheme				
			Lect.	Pr / Dwg.	Paper	T/W	Pr.	Oral	Total
6	308286	Offset Machines II	4	2	100	25	25	-	150
7	308287	Statistical Process Control	4	2	100	25	-	-	125
8	308288	Digital Workflow and Image Setting	4	2	100	-	50	-	150
9	308289	Technology of Flexography	4	2	100	25	25	-	150
10	302290	Theory of Printing Machines & Machine Design	4	2	100	25	-	-	125
11	308291	Seminar *	-	2	-	50	-	-	50
		Total	20	12	500	150	100	-	750

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

* The Term Work marks for Seminar will be based on the presentation and oral examination The examination will be conducted by the two internal examiners (among the approved teachers only) appointed by the Principal of the concerned college

(308281) Offset Machines – I

Teaching Scheme

Theory: 4 Hours/Week

Practical: 2 hours/ Week

Examination Scheme

Paper: 100 Marks

Term Work: 25 marks

Practical: 50 marks

Unit I: Basics of Offset Workflow

Sheet fed Process Flow diagram, different cylinder configuration, construction of printing unit, plate cylinder, automatic plate changing, blanket cylinder, impression cylinder, and transfer cylinder   [8 hours]

Unit II: Surface Preparation

Surface preparation for Offset, lay outing preparation, P.S. plate-making, CTP –thermal and violet, CTCP and other technologies, Role of Silver halide layer, Digital Plate Surface preparation, thermal plate and Violet plate processing   [8 hours]

Unit III: Inking Systems

Study of different inking systems, different metering systems of ink duct, roller diameters roller materials for conventional and hybrid UV machines, ceramic and duct roller, temperature ranges maintained on machine, type of ink used UV, EB inks. [8 hours]

Unit IV: Dampening Systems

Construction of Dampening System, Developments and modifications in Dampening system construction, Dampening Roller materials, fountain solutions & their characteristics, metering of dampening solution. Role of different constituents used in fountain solutions. [8 hours]

Unit V: Feeders and Delivery Unit

Feeders – study of all parts of feeders, mechanisms sheet transfer, shaft less feeders, blowers, grippers, mechanism in delivery system, IR dryers and UV dryers   [8 hours]

Unit VI: Make ready and Press room Maintenance

Types of Make ready operations, Total press room maintenance. Environmental problems due to waste generated from press room, storage & disposal of ink, Study of Press standards such as GRACoL, SWOP, FOGRA and ISO

[6 hours]

Term work:

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

1) To mount plate on plate cylinder
2) To mount blanket on blanket cylinder
3) Setting of ink duct and tracing ink path on the inking unit
4) Setting of dampening system
5) To set and operate feeder (stream feeder)
6) To set and operate feeder (single sheet feeder)
7) To print single colour job and study registration
8) To print single colour job and study print quality
9) Conventional platemaking, planning layout, plate exposing, development
10) CTP plate making, plate exposing, development

Reference books:

1) GATF, The lithographic manual. GATF
2) Lathrop, Kunst, Photo offset, GATF
3) GATF, Quality & Productivity in the Graphic arts, GATF
4) Ernest Hutching , A surveys of printing process, A. D. Hutchings
5) Durrant, Printing m/c, Focal press, London.
6) Ian Faux, Litho Printing
7) Bulinski, Solving sheet-fed offset press problems, GATF
8) Ian Faux, Modern Lithography- McDonald & Evans Ltd.
9) Porter, A.S., Manual for lithographic press operation, Litho training services Ltd. London
10) Misra C. S., Technology of offset printing, Anupam Prakashan, Delhi.
11) Krisnamurthy, V. S. Basics of Modern printing processes, maxseltype, Madras.
12) Handbook of Print Media
13) GATF's Sheet-fed Offset Press Operating
14) The Thames and Hudson Manual of Advanced Lithography
15) Hugh Speirs, Introduction to Offset Lithographic Printing

(308282) Printing Network Technology & Opto Electronics

Teaching Scheme   **Examination Scheme**

Theory: 4 Hours/Week   Paper: 100 Marks

Practical: 2 hours/ week   Term Work: 25 Marks

                                                       Oral: 25 Marks

Unit 1: Printing Information, Digitization and Transmission :

Necessity of Printing Information, transmission at long distance. Necessity of Modulation and different types of modulation (Block diagram and conceptual treatment only). Pulse modulation and their types (theoretical treatment and simple mathematical approach only), sampling theorem, quantization, Binary coding, compounding and their types, multiplexing techniques. Data Encryption and Decryption techniques, security issues in Printing. Data transfer techniques, Data channels and transmission, various data networks.   [8 hours]

Unit 2: Optical Fibers and Fiber Optic Communication

Types, working principles and characteristics of optical Fiber, Fiber configuration and performance comparison, Fiber connector types and their features. Losses in fibers (to be covered in detail). Basic fiber optic communication system (block diagram treatment only). Applications of optical communications such as paper and currency Note counting security applications, paper thickness measurement and control. (only block diagram treatment with simple mathematical applicable if any) Fiber optic communication set up used in paper industry. (complete end to end set up - block diagram and concept).   [8 hours]

Unit 3: Modern Technologies and applications

Infrared LED application in Plate making. Applications of Laser diode in Printing. Fundamentals of wireless communication. (Frequency ranges, applications and block diagram only). Wi-Fi technology (Block diagram, concept and frequency ranges only) and applications in Printing. RFID i.e. Radio Frequency Identification and its applications in Printing. Concept of Digital library and simple case study.   [8 hours]

Unit 4: Introduction

What is operating system, types of OS, Functions and features of OS, structure of windows, Unix / Linux, MAC, network OS (NT, Novel), design issues of OS.   [8 hours]

Unit 5: Networking

What is networking, advantages & disadvantages of networking, design, issues of networking, topologies, types of network, layered structure, ISO / OSI model, TCP / IP model, intranet & internet, network protocols - ICMP, POP3, SMTP, FTP, TFTP, IMAP.   [8 hours]

Unit 6: Internet working
Leased lines, ISDN, VSAT, and VPN, Internet working devices such as modems, repeaters, hubs, switches, routers, gateways, bridges, and routers.
Applications: study of networking application such as video conferencing, VoIP, VoN
[8 hours]

Term Work

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

1) Verification of sampling theorem. And PAM techniques: Ideal, Natural, flat samples.
2) Study of various pulse modulation techniques PWM, PPM.
3) Study of compounded PCM using a law and u law and differential PCM.
4) Measure the numerical aperture of a fiber with and without visible light source.
5) To measure attenuation of optical fiber (length of fiber should be at least 10 meters)
6) Test simple fiber optic link for transmission for a)Analog signal and b) Digital signal.
7) Study of Linux and MAC
8) Study of LAN.
9) Study of Modem.
10) Study of networking components
11) To stimulate file transfer protocol.
12) Study of TCP/IP or VOIP

Reference Books:

1) A. B. Carlson ``communication system'' McGraw Hill Publication.
2) Taube and schilling ``Principles of communication system'' Tata McGraw Hill Publication.
3) Optical Fiber communication - G. Keiser McGraw Hill Publication.
4) Optical Fiber communication principles & practice - J senior - Prentice Hall publication.
5) Telecommunication switching systems and networks -T. Vishwanathan Prentice Hall Publication.
6) Computer Network by Tanenbaum (P41)
7) MS-DOS by Ray Duncan (BPB Publications)
8) Data Communication and distributed network by Black (P41)
9) IBM PC and clones by Govindarajalu (Tata McGraw Hill)

(308283) Colour Management & Standardization

Teaching Scheme

Theory: 4 Hours/Week

Practical: 2 Hours/ Week

Examination Scheme

Paper: 100 Marks

Term Work: 25 marks

Practical: 50 marks

Unit I: Understanding Colour

Colour Science, Electromagnetic spectrum, Psychological point of view, Color Theory, Additive colour synthesis, substrates colour synthesis

Reflectance properties of process ink   [6 hours]

Unit II: Colour Physics

Colour Perception, Human vision mechanism – trichromancy, opponency

Illuminant – source & illuminant, colour temperature, spectral power distribution, viewing condition ,Object properties – Transmission, Absorption, scattering

Metamerism – metamerism match, spectral match, types of metamerism

[8 hours]

Unit III: Colour Systems

Colour systems & colour spaces, Basic perceptual attributes of colour, Systems based on colour mixing, Colour perception – the munsell colour system, the natural colour system, OSA uniform colour scale system, Colour matching – The CIE system, color matching experiment, Std. CIE, xyY, Luv, Hunter Lab, CIELAB, Standard observer   [8 hours]

Unit IV: Color Measurement

Colour measurement, Basic principles of colour measurement systems, colour charts, colour reference catalogue, densitometer, spectrophotometer, visual colour assessment, Instrumental colour assessment, colour tolerance, Colour difference, Colour processing software MATLAB [8 hours]

Unit V: Color Management

Need for colour management, Concept of colour management, Colour system,

Device dependant (conventional) workflow, device independent (modern) workflow

International colour consortium (ICC), Four c's of colour management, Test charts for different devices, Production of different colour profiles, Rendering indent, perceptual, rendering indent, Relative & Absolute colorimetric intent, saturation intent, gamut mapping, Colourful, Chroma Plus, Logo Classic   [8 hours]

Unit VI: Press Standardisation

Press standardization, need for standardization, Press optimization, variables in printing process such as gravure, flexo, offset, digital, types of test formes for standardization, Proof to Press colour management , Printer calibration, Printer linerisation, maximum ink limit per nozzle   [8 hours]

Term Work:

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

1) Measurement of paper & inks solid densities, trapping, hue error, gray error
2) Prepare a gray balance chart for 10 to 100 GTY Draw a gray balance curve for YMC
3) Calculate tristimulus values X, Y, Z for given patches & find out CIE, xyY, Lab, Lch Values
4) Delta E calculations using five different formulae
5) Color monitor calibrations of MACs & PCS
6) Measurement of test chart using spectrophotometer & calculation of ICC profile using appropriate data
7) Calibration of proofer for a given media.
8) Estimator and Ink Tuner
9) Study of colour processing software like mat lab, colour think
10) Applications of colour processing software.

Reference Books:

1) Phil Green, Understanding Digital Color, GATF press
2) Gray G. Field, Color & its reproduction, GATF press
3) Fred W. Billmeyer, Jr. Max Saltzman, Principles of Color Technology, John Wiley & sons, A Wiley interscience publication
4) Abhay Sharma ,Understanding Color Management
5) Richard M. Adams, Joshua B. Weisberg GATF press, The GATF practical guide to Color Management
6) R.W.G Hunt, The Reproduction of Color, Fountain Press, England
7) E.P. Danger, The Color Handbook, Gower Publication

(308284) Management Information Systems and Cost Estimation

Teaching Scheme
Lectures: 4 Hours/Week

Examination Scheme
Paper: 100 Marks

UNIT 1: Basics of Management
Concept of Management, Functions of Management, MBO, Organization, Types of organizations, Functional departments of organization, Competitive Environment, Elements of competitive environment   [8 hours]

UNIT 2: Basics of MIS
Need, Purpose and objectives, Contemporary approach to MIS, Information as a strategic resource, Use of information for competitive advantage, MIS as an instrument for the organizational change, basics of CIP3 and CIP4   [8 hours]

UNIT 3: Workflow of MIS
Decision support system, Group decision support system, Executive information system, Executive support system, Expert systems and Knowledge based expert systems, workflow of CIP3 and CIP4   [8 hours]

UNIT 4: Requirements of MIS
Data base management system, Data warehousing and data mining, systems analysis and design, Systems Development Life Cycle, Information security and control requirements of CIP3 and CIP4   [7 hours]

UNIT 5: Costing
Elements of cost, product cost and process cost, Marginal cost, standard cost, Direct Material, Direct labor, Factory cost, Administration,   [7 hours]

UNIT 6: Estimation
Definition, Elements of estimation, Standard costing as a tool for estimation, Estimation of substrate, ink and other raw materials used for the print production   [8 hours]

Reference Books:

1. Waman S. Jawadekar, Management Information Systems, Text and Cases, 4th Edition, Tata McGraw Hill
2. Davis and Olson, Management Information Systems, Tata McGraw Hill
3. Sadagopan, Management Information Systems, Prentice Hall
4. Turban and Aronson, Decision Support Systems and Intelligent Systems, Pearson Education Asia
5. Rajaraman, Analysis and Design of Information System, Prentice Hall
6. Pradeep Gupta; Principles of Management
7. B. K. Chatterjee; Cost and Management Accounting
8. B. K. Bhar; Cost Accounting

(302285) Design of Printing Machine Components

Teaching Scheme
Lectures: 4 Hours/Week
Drawing: 2 Hours/Week

Examination Scheme
Paper: 100 Marks
Term work: 50 Marks

Unit 1 : Design Procedure
Machine Design , Traditional design methods, basic procedure of machine design, sources of design data, use of standards in design, selection of preferred sizes, creativity in design.
Mechanical properties of engineering material, B.I.S. system of designation of steels, overseas standards. Limits, Fits, Tolerances, Surface roughness, Geometric tolerance representation (Only use of tabulated data to be considered)   [8 hours]

Unit 2: Design of simple machine parts
Factor of safety, Review of tensile, compressive, bending and direct and torsional shear stresses, eccentric and axial loading, stresses in curved beams. Design of simple machine parts – Cotter Joint, Knuckle Joint and Levers.   [8 hours]

Unit 3: Shafts, keys and couplings
Transmission shaft, A.S.M.E. code for shaft design, Shaft design on torsional rigidity basis. Design of keys – square, saddle and sunk keys. Design of couplings – Flange coupling, Bush pin type flexible couplings.   [8 hours]

Unit 4: Power screws
Forms of threads, multiple threaded screws, torque analysis with square and trapezoidal threads, self locking screw, collar friction torque, stresses in power screws. Design of screw jack, C-clamp and turn buckle. Construction and applications of recirculating ball screws.
[8 hours]

Unit 5: Threaded and welded joints
Basic types of screw fastenings, cap screws, set screws, locking devices, I.S.O. Metric screw threads, bolts under tension, eccentrically loaded joints, dimensions of standard fasteners.
Butt and fillet welds, stresses in butt and fillet welds, strength of butt, parallel and transverse fillet welds, eccentrically loaded welded joints. Advantages and limitations of welded joints, welding symbols.   [8 hours]

Unit 6: Springs

Types, Material and applications of springs, spring stiffness, Wahl's factor, Spring index. Helical compression and tension spring – strength and deflection equation, end types. Helical torsion spring – strength and deflection equation, end types. Springs in series and parallel, concentric helical springs. [8 hours]

Term work

(Record of the following drawings and assignments)

List of Drawings

1. Conventional representation of machine elements like internal and external threads, shafts, bearings, springs. Welded joints, surface roughness etc.
2. Design and drawing of two sub assemblies of the following – Cotter Joint, Knuckle Joint, Flange Coupling, Lever.

Assignment

A journal consisting of report on above subassemblies and at least three assignments on topics based on theory.

Reference books

1. Shigley J.E.,Mechanical Engg. Design, McGraw Hill Publication.
2. Spotts M.F., Design of Mechanical Elements, Prentice Hall International
3. Bhandari V.B., Design of Machine elements, Tata McGraw Hill Publication.
4. Design data – P.S.G. College of Technology, Coimbatore.

(308286) Offset Machines II

Teaching Scheme   **Examination Scheme**

Theory: 4 Hours/Week   Paper: 100 Marks

Practical: 2 Hours/ Week   Term work: 25 Marks

                                                            Practical: 25 Marks

Unit I: Web Press Configuration

Configurations of Web presses, Paper logistics, reel stands, reel handling, reel to web processing, splice preparation, clamp truck transport, and automatic splicers. Plate changing technology, metal backed low gap blanket technology

Unit II: Drive concepts and inking system of web offset machines

Drive concepts in web offset machine, mechanical shaft, shaftless drives, inking system, keyless inking, dampening systems for high speed presses, heat set inks, coldest, ultraviolet (UV) and electron beam (EB) inks used for web offset process.

Unit III: Dryers, Chillers and Folders

Dryers & chill rolls, regeneration thermal oxidizers used on heat set presses, temperature settings of dryers and chillers as per ink coverage and substrate used, Folders used for commercial publication, newspaper industry, continuous stationery, folding techniques, folder maintenance on web offset.

Unit IV: Web Handling

Web tension control, load cells, web handling, factors affecting tension- press related tension and paper related tension, modulus of elasticity of paper, Registration control- auto registration control

Unit V: Auxiliary Equipments

Auxiliary equipments used on web offset- remoisturisers unit, anti-static devices, temperature controlled oscillators, Total productive maintenance of web offset machines.

Unit VI: Press Trouble-shooting

Web Offset troubleshooting, press troubles, paper and ink problems, infeed troubles-splice breaks, web breaks, Printing unit problems- gear streaks, uneven impression, slurring, doubling, inking related problems, dampening related problems, print quality related problems.

Term Work

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

1. Understanding press standardization – plate and blanket settings procedures
2. Understanding press standardization – inking and dampening settings procedures
3. Understanding press standardization – feeder settings procedures
4. Study of Sheet fed and Web offset Press working using Simulator softwares- SHOTS from Sinapse
5. To understand ink limit (contrast and ink density) for maplitho paper
6. To understand ink limit (contrast and ink density) for art gloss paper
7. To understand ink limit (contrast and ink density) for art matt paper
8. To print four colour job on maplitho/art paper.
9. To carry out print analysis of a newspaper printed job and commercial heat set printed job

Reference Books:

1) Edward Kelly, Web offset press operating, by GAFT 1st edition 1974.
2) C. S. Mishra, Technology of Offset Printing, by Anupam Prakashan, 1991
3) W. R. Durrant, Web control, north wood publication 1st 1977
4) H.Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg.

(308287) Statistical Process Control

Teaching Scheme
Theory: 4 Hours/Week
Practical: 2 Hours/Week

Examination Scheme
Paper: 100 Marks
Term Work: 25 marks

Unit 1: Quality, Process and Control
Basic concepts, TQM, Processes and SPC System, Basic tools, Information about process, Process mapping and flowcharting, process analysis   [8 hours]

Unit 2: Data collection
Approach, collection of data, bar charts, histogram, run charts, graphs   [8 hours]

Unit 3: Process Variability
Variation, types and causes of variation, measures of accuracy or centering, measures or precision or spread, normal distribution, sampling   [8 hours]

Unit 4: Process analysis and control
Control charts for variables such as X bar-R chart, X bar-S chart, X-MR, Zone chart; Control charts for attributes such as p-chart, np chart, C-chart, U-chart   [8 hours]

Unit 5: Process Improvement
Process problem solving, Pareto analysis, cause and effect analysis, scatter diagram, use of control charts for managing out of control processes, Process Capability, SPC and management system   [8 hours]

Unit 6: Six Sigma process quality
Defining six sigma, benefits, and problem solving process (DMAIC), six sigma and role of design of experiments, Break through management   [8 hours]

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

1. Analysis of spectral data by histogram
2. Pareto Analysis
3. Analysis of Print Density by X bar- R chart
4. Analysis of Print Density by X bar- S chart
5. Analysis of Colour Difference by X-MR chart
6. Evaluation of printing variables by zone chart
7. Analysis of different print variables by interactive plot
8. Capability analysis of a print process

References:

1) John S. Oakland, (2003), Statistical Process Control, 5th Edition, Butterworth-Heinemann
2) Thomas Pyzdek, (2003), The Six Sigma Handbook: A complete guide for Green Belts, Black Belts and Managers at all levels, McGraw-Hill Companies, Inc.
3) Modi S. M., Statistical Process Control and Related Quality Tools, D. L. Shah Trust
4) Smith G. M., Statistical Process Control and Quality Improvement, 5th Edition.
5) Walpole R., Myers R. H., Myers S. L., Ye K., Probability and Statistics for Engineers and Scientists, 8th Edition, Pearson Education

(308288) Digital Workflow & Image Setting

Teaching Scheme	**Examination Scheme**
Theory: 4 Hours/Week	Paper: 100 Marks
Practical: 2 Hours/Week	Practical: 50 Marks

Unit 1: Introduction to Workflow
Introduction to workflow, Job flow & workflow, digital workflow & its significance, comparison between conventional & digital workflow. [8 hours]

Unit 2: Elements of Workflow and Functions
Elements of workflow, job ticket, pre-flight checking, trapping, proofing, imposition, archiving, corrections, conversion, image replacement, APR, OPI servers, networking.
[8 hours]

Unit 3: Types of workflow modules
Management module, production module, job administration module, job archiving module, imposition workflow, JDF, PDF workflow [8 hours]

Unit 4: File formats
PS, PDF, Raster Image Processor, Image setter types, CTP types, output resolution, Screening – rational & irrational, Font Emulation v/s Replacement, Tagged PDF, JDF, PJTF
[8 hours]

Unit 5: Digital Image Processing
Fundamentals, Digital Image Processing, Image Compression techniques and their application, Anti aliasing and interpolation [8 hours]

Unit 6: Proofing
Digital Proofing, Soft proof, hard proof, proofing technologies viz: inkjet, electro photography, thermography [8 hours]

Term Work:
Note: Term-work shall consist of record of the following experiments presented in the form of journals.
1) Conversion to PS & output, conversion to XPS and output
2) Conversion to PDF & output
3) Study of RIP software
4) Study of Proofing software
5) Output through digital proofer
6) Study of workflow software
7) Comparison of different resolutions & different file formats
8) To prepare file for service bureau

Reference Books:

1) H Kipphan, handbook of Print Media, Springer – Vetag Bzlin Heidelberg, 2001
2) Richard M. Adams II & Frank d – Romano, Computer to Plate Automating the Printing Industry, GATF Press, 2nd edition.
3) Michel L. Kleper, The Hand Book of Digital Publishing (Volume I) PH, PTR Publishing
4) N.N Sarkar, Art and Print Production, Oxford Publication

(308289) Technology of Flexography

Teaching Scheme

Lectures: 4 Hours/ Week

Practical: 2 Hours/ Week

Examination Scheme

Paper: 100 Marks

Term Work: 25 Marks

Practical: 25 Marks

Unit 1: Surface Preparation for Flexo

Flexo artwork, Design considerations, Types of Flexo Plates, Processing of Rubber and Photopolymer plates, Comparison between Rubber and Photopolymer Plates, Processing machines, Safety regulations.   [8 hours]

Unit 2: Requirements of Photopolymer Plates

Layout considerations, Specifications of negative, Distortion, Storage and Handling of raw and used plates, Mounting and De-mounting of plates.   [8 hours]

Unit 3: Conventional Flexo Plates

Purpose and Effects of Back-exposure, Main exposure, Wash-out, Drying, Post-exposure and Finishing, Types of Wash-out Solvents, Standardization of Conventional Flexo Plate, Environmental concerns.   [8 hours]

Unit 4: Digital Flexo Plates

Characteristics of Digital Flexo Plates, Digital Workflow, Types of images, Imaging of CTP, Ablation technique, Digital Engraving, Types of lasers used.   [8 hours]

Unit 5: Flexography Process

Introduction, Types of Flexo Press, Press Configurations, Types of dryers, Efficiency of dryer, Sections of a Flexo Press, Flexo Products and application.   [8 hours]

Unit 6: Ink Metering for Flexography

Fountain and Anilox Roller for Flexography, Purpose of Fountain and Anilox Roller, Fountain roller bases and specifications, Role of anilox in Flexo, Factors affecting anilox selection, Anilox roller construction, Anilox coverings-Chrome and Ceramic, Cell configurations, Anilox cleaning, Storage and Maintenance.   [8 hours]

Term Work:

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

1) Introduction to Flexo Plate processing Machine.
2) Performing Wash-out Test on 2.84 mm photopolymer plate.
3) Performing Back-Exposure Test on 2.84 mm photopolymer plate.
4) Performing Main-Exposure Test on 2.84 mm photopolymer plate.
5) Performing Post –Exposure and Light Finishing Test on 2.84 mm photopolymer plate.
6) Preparation of PP plate with a given negative.
7) Study of Flexo machine principles.
8) To print single color with Conventional PP Plate by a Flexo process on PE substrate.
9) To print single color with Conventional PP Plate by a Flexo process on PE substrate.
10) Analysis of a Flexo printed Image.

Reference Books:

1) D. C. Mulvihill, (1985), Flexo Primer, Foundation of FTA.
2) The Flexography Beginner, Volume VI, FTA
3) Flexography Principles and Practices, 4rth edition, Foundation of FTA
4) Flexography Principles and Practices, 5th edition, Foundation of FTA
5) Tony White, (1998), High Quality Flexography, Pira International.
6) W. R. Durrant, (1989), Printing-A Guide to Systems and their Uses, Heinemann Professional Publishing.
7) P. Laden, Chemistry and Technology of Water based Inks, Blackie.
8) H. Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg.
9) W. R. Durrant, Machine Printing, Heinemann Professional Publishing.

(302290) Theory of Printing Machines & Machine Design

Teaching Scheme
Lectures: 4 Hours/Week
Drawing: 2 Hours/Week

Examination Scheme
Paper: 100 Marks
Term work: 25 Marks

Unit 1: Gears

Classification of gears. Spur gears- Terminology in gears, law of gearing, conjugate action, involute & cycloidal profile, path of contact, interference, undercutting, methods to avoid interference & undercutting, rack shift , effect of centre distance variation . Helical gears – Normal & transverse module. Worm & worm gears. Bevel gears- Terminology, geometrical relationship, applications. Internal gears.   [8 hours]

Unit 2 : Gear trains

Types of gear trains – compound, epicyclic, compound reverted, velocity ratio by tabular method for epicyclic gear train, holding torque.   [8 hours]

Unit 3 : Cam & followers

Types of cams & followers, types of follower motions. Determination of cam profiles for given follower motion, cams with specified contours.   [8 hours]

Unit 4 : Design for fluctuating loads

Stress concentration, causes & remedies, fluctuating stresses, fatigue failure, S-N curve, endurance limit, notch sensitivity. Endurance strength modifying factors, reversed stresses. Cumulative damage in fatigue failure. Fatigue design of components under combined stresses such as shafts, bolts, springs   [8 hours]

Unit 5 : Design of gears

Selection of type of gears: Spur Gears – Types of gear tooth failure, desirable properties & selection of gear material, constructional details of gear wheel. Force analysis – Beam strength (Lewis) equation, velocity factor, service factor, load concentration factor, effective load on gear. Wear strength (Buckingham's) equation – Estimation of module based on beam & wear strength. Estimation of dynamic tooth load by velocity factor, Spott's equation.

Helical gears- Virtual number of teeth. Force analysis – Beam & Wear strengths , effective load on gear tooth, estimation of dynamic load by velocity factor, Spott's equation & Buckingham's equation. Methods of gear lubrication   [8 hours]

Unit 6 : Selection of rolling contact bearing

Types of rolling contact bearing, static & dynamic load carrying capacities, Steinbeck's equation, equivalent bearing load. Load – life relationship, selection of bearing life. Selection of rolling contact bearings from manufacturer's catalogue. Taper roller bearings. Lubrication & mounting of bearings. Selection of oil seals & gaskets. Preloading of rolling contact bearings. Types of failure of rolling contact bearings, causes and remedies.   [8 hours]

Term work   (Record of the following drawings and assignments)

List of Drawings
1) Component drawing and assembly drawing of complete drive for printing machine after measuring on printing machine. Fits, tolerances and part list to be shown on drawing sheet. (Two full imperial size drawing sheets)
2) Construction of various cam profiles.
3) Construction of gear tooth profiles.

Assignment

A journal consisting of report on above subassemblies and at least three assignments on topics based on topics on theory.

.**Reference books**
1) Shigley J.E. - Mechanical Engineering Design, McGraw Hill Publication.
2) Spotts M.F. - Design of Mechanical Elements, Prentice Hall International
3) Bhandari V.B.- Design of Machine elements , Tata McGraw Hill Publication.
4) Design data – P.S.G. College of Technology, Coimbatore.
5) Thomas Bevan – Theory of Machine, CBS Publishers and Distributors, Delhi.
6) Joseph E. Shigley – Theory of Machine and Mechanisms, McGraw Hill International Book Company.

(308291) Seminar

Teaching Scheme   **Examination Scheme**
Practical: 2 Hrs/ Week   Term Work: 50 Marks

The seminar report shall be based on material, mainly collected and analysed from research work in the field of printing published in technical and research journals (national and international). The report shall be about 15 pages of A4 size, including figures. The seminar report shall include a certificate, synopsis and references.

The presentation is expected to be in front of audience which must include two internal examiners one of them being the guide. Both examiners shall be University approved teachers. The distribution of marks shall be equally divided between the report and the oral presentation.