# CURRICULUM FROM III & IV SEMESTERS FOR B.E. PRINTING TECHNOLOGY

## SEMESTER – III

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## SEMESTER – IV

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1. FOURIER SERIES


2. PARTIAL DIFFERENTIAL EQUATIONS

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions - Lagrange’s Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

3. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Method of separation of Variables – Solutions of one dimensional wave equation, - One-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

4. FOURIER TRANSFORM


5. Z – TRANSFORM AND DIFFERENCE EQUATION

Z-transform-Elementary properties-Inverse z transform – Convolution theorem-Formation of difference equation-Solution of difference equation using z transform.

Total: 45+15=60

TEXT BOOK

REFERENCES
OBJECTIVES:

1. To understand the principles in the formation of mechanisms and their kinematics.
2. To understand the effect of friction in different machine elements.
3. To analyse the forces and toques acting on simple mechanical systems
4. To understand the importance of balancing and vibration.

1. KINEMATIC OF MECHANICS


2. GEARS and GEAR TRAINS


3. FRICTION


4. FORCE ANALYSIS


5. BALANCING AND VIBRATION


Total: 45
TEXT BOOK


REFERENCES


STANDARDS

CE9213 STRENGTH OF MATERIALS


2. TRANVERSE LOADING ON BEAMS AND STRESSES IN BEAMS


3. TORSION

Stresses and deformation in circular and hollows shafts – Stepped shafts – Shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.

4. DEFLECTION OF BEAMS

Double Integration method – Macaulay’s method – Area moment theorems for computation of slopes and deflections in beams – Conjugate beam and energy method – Maxwell’s reciprocal theorems.

5. THIN CYLINDERS, SPHERES AND THICK CYLINDERS

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses – deformation in thin cylinders – spherical shells subjected to internal pressure – deformations in spherical shells - Lame’s theory – application of theories of failure

TEXTBOOKS

REFERENCES
AIM
To provide knowledge in the area of electrical drives and their control techniques

PREREQUISITE
Basic Electrical Engineering

OBJECTIVE
To impart knowledge on
I. Basics of electric drives
II. Different speed control methods
III. Various motor starters and controllers
IV. Applications

1. INTROUDCTION

2. SPEED CONTROL OF DC MACHINES

3. SPEED CONTROL OF AC MACHINES
Induction motor – Speed torque Characteristics – pole changing, stator frequency variation - slip-ring induction motor – stator voltage variation - Rotor resistance variation, slip power recovery – basic inverter circuits- variable voltage frequency control.

4. MOTOR STARTERS AND CONTROLLERS

5. HEATING AND POWER RATING OF DRIVE MOTORS
Load diagram, over load capacity, insulating materials, heating and cooling of motors, service condition of electric drive – continuous, intermittent and short time – industrial application.

Total=45

TEXT BOOKS

REFERENCES
OBJECTIVE

To impart knowledge on various printing processes, designing, layout and planning for print production. This introductory course will provide an overview to printing.

1. INTRODUCTION TO PRINTING PROCESSES
   Types of process – Letterpress, Offset, Gravure, Flexography, Screen printing and Non-impact printing processes; Introduction to image carrier preparation for different types of printing process.

2. PRINCIPLES OF DESIGN
   Basic concepts of designing, Creativity, steps in creativity; Typography; Visual ingredients of graphic design; Design consideration; Symbols and logos.

3. DESIGN LAYOUT
   Layout – purpose & advantages; layout styles; layout components; stages in preparing a layout; marking-up; Dummy, Case studies.

4. DESIGNING FOR MEDIA

5. DESIGN MANAGEMENT & PRODUCTION PLANNING
   Relationship between designer, customer and printer; selection and co-ordination of production process; Limitation of printing process, binding, finishing and ancillary processes on design; selection and specification of ink, paper and other materials; production strategy.

Total: 45

TEXT BOOKS:

REFERENCE BOOKS:
OBJECTIVE
To impart knowledge on laser typesetters, film processing, scanners, imagesetters, also give elaborate study of typographic parameters.

1. INTRODUCTION TO TEXT COMPOSING

2. LASER TYPESETTERS

3. ORIGINALS AND FILM PROCESSING

4. IMAGE ACQUISITION

5. IMAGESETTER AND PRINTERS
Imagesetters –Types – Capstan, internal, external and virtual drum, light sources, Raster image processors, Screening Technologies. Non-Impact printing – Inkjet, dye-sub, thermal wax, electro photography.

TOTAL 45

TEXTBOOKS

REFERENCES
3. “Handbook of Modern Halftone Photography”, Perfect Graphic arts, Demarset, U.S.A.
OBJECTIVE

To acquire skills on,
  o Designing using paint and brush
  o Sketching using pencil
  o Collage Art

1. Basic Design

To create Thumbnails and Rough sketches of logos, advertisements, lettering, etc., freehand using pencil

2. Types of Layouts

To prepare the various types of layouts using different themes, with poster colours and pencil

To develop artworks and design print products using collage and paint

3. Colour Drawing

To draw what is seen using colour, texture and thereby create portrait and figures

To develop a drawing folio and keep a sketch book as a record of ideas
To study the properties of materials when subjected to different types of Loading.

i. Tension test on mild steel rod.
ii. Double shear test on metals.
iii. Torsion test on mild steel rod.
iv. Impact test on metal specimen.
v. Hardness test on metals.
vi. Compression test on helical spring.
vii. Deflection test on carriage spring.
AIM

To provide the practical knowledge and control methods of electrical machines

OBJECTIVE

To impart practical knowledge on
I. Characteristic of different machines
II. Method of speed control of machines
III. Measurement of various electrical parameters

1. Study of DC & AC Starters
2. Study of Transducers
3. Wheatstone Bridge and Schering Bridge
4. ADC and DAC Converters
5. Speed Control of DC Shunt Motor
6. Load Test on DC Shunt Motor
7. OCC & Load Characteristics of DC Shunt Generator
8. Load Test on Single-Phase Transformer
9. Load Test on Three-Phase Induction Motor
10. Load Test on Single-Phase Induction Motor.
OBJECTIVE

To give hands on training on typesetting parameters in page layout using page making software also familiarization of scanner and graphic software.

1. Word Processing Software
   a. Basic typesetting formats

2. Pagemaking Software
   a. Basic non-illustrated document preparation
   b. Multiple Column Work
   c. Tabular column & Table editing
   d. Integration of text and Graphics
   e. Tag/style formatting
   f. Page Imposition

3. Scanner
   a. Introduction to scanner – scanning

4. Graphics software
   a. Free hand Drawing

TOTAL 45
1. SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 10 +3

2. INTERPOLATION AND APPROXIMATION 8 + 3
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

3. NUMERICAL DIFFERENTIATION AND INTEGRATION 9 + 3

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9 + 3

5. BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9 + 3
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank Nicholson) methods - One dimensional wave equation by explicit method.

TEXT BOOKS

REFERENCE BOOKS

ME9261 DESIGN OF MACHINE ELEMENTS
L T P C
3 1 0 4
OBJECTIVE
To familiarize the various steps involved in the Design Process
To understand the principles involved in evaluating the shape and dimensions of a
component to satisfy functional and strength requirements.
To learn to use standard practices and standard data.
To learn to use catalogues and standard machine components

1. STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS  9
Introduction to the design process – factor influencing machine design, selection of
materials based on mechanical properties – Preferred numbers, fits and tolerances –
Direct, Bending and torsional stress equations – impact and shock loading – calculation
of principle stresses for various load combinations, eccentric loading – Design of curved
beams – crane hook and ‘C’ frame – Factor of safety – theories of failure – stress
concentration – design for variable loading – Soderberg, Goodman and Gerber relations.

2. DESIGN OF SHAFTS AND COUPLINGS  10
Design of solid and hollow shafts based on strength, rigidity and critical speed – Design
of keys, key ways and splines – Design of crankshafts – Design of rigid and flexible
couplings.

3. DESIGN OF TEMPORARY AND PERMANENT JOINTS  9
Threaded fastners – Design of bolted joints including eccentric loading, Knuckle joints,
Cotter joints – Design of Welded joints, riveted joints for structures – theory of bonded
joints.

4. DESIGN OF ENERGY STORING ELEMENTS  8
Design of various types of springs, optimization of helical spings – rubber springs –
Design of flywheels considering stresses in rims and arms, for engines and punching
machines.

5. DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS  9
Sliding contact and rolling contact bearings – Design of hydrodynamic journal bearings,
McKee’s Eqn., Sommerfield Number, Raimondi & Boyd – Selection of Rolling Contact
bearings – Design of Seals and Gaskets – Design of Connecting Rod.

TUTORIAL 15

TOTAL: 60

NOTE: (Use of P S G Design Data Book is permitted in the University examination)
TEXT BOOKS


REFERENCES


STANDARDS

OBJECTIVE: To make students to understand the sheet fed offset printing process. To make them understand the various mechanisms and settings involved in a sheet fed offset printing machine.

1. PRINCIPLES OF OFFSET AND SHEET FEEDING 10
Principles of lithography, wetting of a solid surface by a liquid, emulsification of ink and fountain solution, fluid behaviour in a nip. Basic configuration of offset machine. Sheet feeding and controls: Types of feeders, sheet control, drives, suction head mechanism, double sheet and no sheet detectors, side lays and front lays. Non-stop feeders. Sheet insertion and transfer systems, working principle, relative merits.

2. PRINTING UNIT CONFIGURATION 12
Cylinders: Various configurations, design, requirements, plate and blanket clamping mechanisms, pressure setting, packing, print length variation, equal diameter, true rolling principles. Cylinder drives. Sheet transfer and reversal systems, perfecting, delivery grippers, settings, quick delivery mechanisms. Anti set-off spray device. Feeders, delivery and other system components for metal printing.

3. BLANKETS, ROLLERS 10
Blanket types, requirements, manufacture, performance attributes. Rollers, types, properties, behavior. Basic inking and dampening system configuration. Fountain solution requirements, composition, re-circulation system and dosing units, Ink/water balance.

4. PRINTING AND INLINE OPERATIONS 7

5. DIGITAL PRESSES 6
Direct imaging printing systems- once imageable, re-imageable masters, imaging principles, relative merits and emerging trends.

Total No. of Periods: 45

TEXT BOOKS

REFERENCES
1. INTRODUCTION
Origin, development – printing plates and presses, art and plate preparation, plate mounting, ink, substrates, dryer; basics of flexo – mechanical principles, tools.

2. IMAGE CARRIER PREPARATION
Moulded rubber plates – negatives, exposure, etching, finishing, thermosetting mould, printing plate compounds, rubber plate moulding, types; Photopolymer plate – Sheet photopolymer, liquid photopolymer, plate compensation calculations.

3. PRINTING PRESS
Press types; printing stations – roller & cylinders, fountain rollers, anilox rollers, doctor blades, plate cylinders, impression rollers, roll mechanics, unwind equipment, infeed, corona treatment, web-tension control, rewind equipment, gears, bearings, inking systems, drying systems, cooling rolls, inline laminating, rotary die cutting/sheeting.

4. MOUNTING AND PROOFING
Mounting – unbacked plate, sticky back rubber plate, precurved plate, metal-backed plate, photopolymer plate; plate staggering, release agents; proofing – procedure, pre-press makeready; wrapping; tools.

5. MAINTENANCE AND QUALITY CONTROL
Maintenance - press, mounting and proofing machines; quality control at press side, control of incoming materials, waste or spoilage, troubleshooting.

Total No. of Periods: 45

REFERENCES
PT9253 COLOUR REPRODUCTION

OBJECTIVE
This course imparts the fundamental concepts of Colour Science & measurement and gives an overview of colour reproduction techniques. It gives an exposure to in-depth exploration of issues involved in color reproduction in print media and concepts behind image adjustment techniques. It also introduces the basic concepts of Color Management Systems.

1. COLOUR SCIENCE & MEASUREMENT
   Light, colour, Additive and Subtractive colour theory, Attributes of colour, Tristimulus values, Chromaticity diagram, CIELAB, Colour spaces, Colour difference, Spectrophotometer

2. PRINCIPLES OF COLOUR REPRODUCTION
   Image Acquisition, Colour originals for reproduction. Reproduction objectives, Colour reproduction – photography, printing, display devices; Colour printing - Colour separation techniques, Screen angles and moire patterns.

3. COLOUR CORRECTION & IMAGE ADJUSTMENTS
   Properties of coloured inks, Masking and its principles, Balanced inks, Jones Diagram, Gray balance, Masking equations, Neugebauer equation, Look Up Table, Image Adjustments - Colour correction, White point & Black point, Colour cast removal, USM, Black printer, UCR, GCR, UCA.

4. SPECTRAL SENSITIVITIES, INK & PAPER

5. COLOUR MANAGEMENT
   Colour Management – Need, Open loop, Closed loop, Calibration, Characterization, Conversion, ICC, Profiles, Rendering intent, Gamut mapping. Digital proofing – Need & issues, Viewing conditions

Total = 45

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE: To understand the process of Offset Plate making in general. To make them aware of different materials, and equipments used to make a quality offset plate.

1. IMAGE PLANNING
   Lithographic production – Introduction; planning layout – Information, type of work, Environment and working conditions, Preparing the layout; Imposition schemes; Book work – Margin calculations, Methods; Planning materials, tools, equipment, light tables.

2. METHODS OF IMAGE PLANNING AND ASSEMBLY
   Direct ruling to plate – Metal keys, Burnout masks, Paper templates; Hand assembly – Negative assembly to Golden rod, Golden rod with plastic interleave, Peelable membrane substrates; Conventional positive assembly, Pin register systems; Planning softwares – Features.

3. PLATE CHEMISTRY, COATING AND PROCESSING
   Base metals – Aluminium, Zinc, Stainless steel, Copper, Chromium, Nickel and their properties, Poly masters, paper masters. Graining – types; Contact angle and wettability; Anodisation – Process; Light sensitive materials – dichromated colloids, diazo, and photopolymer compounds; Type of plates – Albumin, Deep-etch, Multi metal, Wipe-on, PS positive and negative working plate chemistry, exposing, processing chemicals, procedures; Plate exposing unit; Light source – Types – advantages, disadvantages; Automatic plate processing machine– Design, method of use; Desensistizing process, gum, developing inks, lacquers and asphaltum. Waterless plates, performance characteristics; Electrophotographic plates – types, processing and use; Reflex plate making; Diffusion transfer plates. Plate handling and storage.

4. COMPUTER TO PLATE SYSTEMS

5. QUALITY CONTROL
   Quality Control – Importance; Quality aids – Star target, Dot gain scale, Stouffer gauge, Graduated halftone percentage scale, UGRA Plate control wedge, GATF standard offset colour control bar, Brunner control system, Dotmeter.

Total No. of Periods: 45

TEXT BOOKS

REFERENCES BOOKS
2. Lithographer’s Manual, GATF.

PT9255 OFFSET PLATEMAKING LABORATORY
OBJECTIVE: To provide hands on training to make imposition schemes and to expose plates using quality control aids.

1. Types of planning and layout preparation
2. Sheet work film assembly
3. Halfsheet work film assembly
4. Planning for irregular images
5. Film assembly for colour work
6. Study of exposing processing and punching systems.
7. Exposure optimization and standardization
8. Repeatability tests on Printing down frame
9. Wipe-on plate processing and standardization

Total No. of Periods: 45
OBJECTIVES

To do colour separation & colour correction using image editing softwares
To implement colour management system.

1. Introduction to image editing softwares
2. Scanning different types of originals using flatbed scanner (Also analyse the relationship between no. of gray levels & resolution)
3. File formats & Sampling
4. Tonal adjustment, Histogram analysis and equalization
5. Colour adjustments
6. Color separation of given original & proofing
7. Black Generation– UCR, GCR
8. Calibration and characterization of scanner & display device
9. Calibration and characterization of printer
10. Color management in image editing softwares
OBJECTIVE: To understand the controls, settings, and mechanisms of an offset machine and take prints.

1. Study of controls, operations and specifications of printing machines.
2. Single colour print in small offset machine.
3. Study of various mechanisms and settings.
4. Single colour print in big format machine.
5. Cylinder pressure setting.
7. Effect of packing on print length.
8. Two and four colour print in offset machine.
9. Four colour print in offset machine.
10. Densitometric measurements.

Total No. of Periods: 45