Screen Printing Curriculum

College or Vocational Tech Level

Course Catalog Description

This course will introduce students to the field of screen printing from a highly technical, in depth perspective. It will cover all aspects of the process and stress technical aspects of the process. This outline could be suitable for a college or vocational level student.

Course Objectives

A. To develop an understanding of the scope of the screen printing industry.

B. To learn how each of the printing processes (offset, flexo, gravure, screen) differ from one another.

C. To understand the fundamentals of the screen printing process
   1) Design and image generation
   2) Frames, mesh, and emulsion
   3) Squeegee and flood bar
   4) Substrates
   5) Inks
   6) Presses
   7) Finishing and converting

D. To learn the economic issues of screen printing
   1) Equipment costs
   2) Material costs
   3) Labor costs

E. To be aware of safety and environmental issues

F. To understand various aspects of quality control

G. To develop basic computer literacy

H. To learn basic math and learning skills

I. To develop oral and written communication skills

J. To develop career awareness of the screen printing industry

Course Outline and Content

Lectures

A. Introduction
   1) Objectives
   2) Overview of course, topics, labs

B. Overview of the major printing processes
   1) Lithography
   2) Relief process (flexography, letterpress)
   3) Intaglio process (gravure)
   4) Screen printing
   5) Pad transfer printing
   6) Other printing methods
      a) Electrophotographic printing
      b) Ink-jet printing

c) Thermal transfer
7) Ink deposition comparison

C. Basics of screen printing
1) Essential components
a) Mesh, frame, stencil
2) Hands-on printing demo (poster, decal or textile)

D. Graphic, textile, and industrial/functional
1) Graphics
2) Point of purchase & display
3) Decal (short term, long term)
4) Specialty (compact disc, containers, binders)
5) Textile
6) Outdoor (billboard, metal signage, RV, fleet, marine)
7) Automotive (instrument panels, wood grain)
8) Electronics (membrane switches, graphic overlays, printed circuit boards)
9) Sports equipment (skis, snowboards, bats)
10) Medical (sensors and coatings, fuel cells and batteries)

E. Screen mesh
1) Composition
a) Polyester, low elongation
b) Nylon
c) Composite
d) Wire, stainless steel
e) Natural fibers (silk, cotton organdy)
f) Specialty meshes (metallized polyester, carbonized mesh, calendared mesh)
2) Mesh count
3) Thread diameter
4) Weave: plain, twill, specialty (double twill, billboard, panama weave, vario)
5) Mesh color
a) Dyed,
b) White
6) Mesh opening
7) Percentage of open area
8) Theoretical ink volume
10) Mesh under tension
11) Instrumentation & tools:
a) Mesh counter (microscope and reticle, film tools)

F. Frames
1) Retensionable
2) Stretch and glue types

G. Stretching systems (troubleshooting)
1) Retensionable frames
2) Mechanical
3) Pneumatic (static frames)
4) Instrumentation and tools:
a) Screen tension meters (Mechanical/Analog, Electronic/Digital)

H. Mesh preparation
1) Abrading
2) Degreasing
3) Dust Control

I. Stencil systems
   1) Direct emulsions
      a) Diazo
      b) Dual Cure
      c) Photopolymer
   2) Capillary films
      a) Diazo
      b) Dual cure
      c) Photopolymer
   3) Indirect films
      a) Gelatin
      b) Polymer
   4) Knife-cut stencils
      a) Water resistant
      b) Solvent resistant
   5) Evaluating stencil quality:
      a) Resolution, definition, acutance
   6) Instrumentation & tools: measuring EOM and Rz

J. Exposure Sources
   1) Spectral Output
      a) Light source
      b) Emulsion sensitivity
   2) Intensity
   3) Peak Irradiance
   4) Lamp distance
   5) Exposure duration
   6) Lamp Types
      a) Metal Halide
      b) Pulsed Xenon
      c) Quartz Halogen
      d) Fluorescent Tubes
      e) Other
   7) Instrumentation & Tools: Integrators, Exposure Calculators, Radiometers
   8) Exposure Time

K. Pre-press and Films
   1) Electronic
   2) Computer Generation
   3) Output Devices
      a) Ink jet printers
      b) Image setters high resolution film output
      c) Laser Printers
      d) Direct to Screen
   4) Evaluating Film Quality
      a) Density (d-max)
      b) Film Base Density (d-min)
      c) Image Quality (Resolution & Definition)

L. Squeegees
   1) Composition
   2) Profile
   3) Durometer
   4) Flex

5) Length
6) Angle
7) Pressure
8) Sharpening and Maintenance
9) Instrumentation & Tools: Shore A Hardness Tester

M. Inks
1) Graphic Inks
a) Conventional Solvent Based Components
b) Ultraviolet Curable Components
c) Water-Containing
(1) Co-Solvent Graphics Inks
(2) Water-Reducible UV Inks
(3) Water-Based UV Inks
2) Textile Inks
a) Plastisol Components
b) Water based Dye-Discharge
c) Special Effects (Foil, Glitter, Fluorescent, Luminescent, Reflective Textures Puff, Suede, Leather-look, High Density, Gels, Latent Image)
3) Industrial Inks
a) Epoxies, Urethanes, Enamels
b) Specialty Products (Compact Disc, Containers, Binders)

N. Color Appearance
1) Color Matching
2) Pigments
3) Metamerism
4) Factors Affecting Color Appearance
5) Opacity
a) Transparent
b) Translucent
c) Opaque
6) Substrate Effects
7) Ink Deposit Variables

O. Substrates
1) Papers and Boards (Uncoated and Coated)
2) Plastic Substrates: Vinyl, Styrene, Polyolefin
3) Industrial Films: Polycarbonates, Polyesters
4) Specialty Materials
a) Polyimide
b) Glass
c) Ceramic,

P. Printing Equipment
1) Manual Tabletop
2) Graphics: Clamshell, Four-Post, Cylinder
3) Textile: Multi-Station Manual Carousel, Automatic
4) Industrial & Specialty: Compact Disc, Container

Q. Press Setup and Operation
1) Parallel Planes
2) Screen Frame Clamping
3) Off Contact
4) Peel-off
5) Color Sequence or Print Order

6) Controlling Ink Deposit using Press Controls
- Squeegee
- Speed
- Pressure
- Squeegee angle
- Squeegee edge profile
- Preregistration

R. Drying Equipment
1) Racks
2) Heated Dryers
3) Electric
4) Gas Fired
5) Flash-Curing Units
6) IR
7) Quartz
8) UV Reactors
9) EB (Electron Beam) Curing

S. Finishing Processes
1) Folding
2) Die Cutting
3) Punching
4) Slitting
5) Lamination
6) Vacuum Forming
7) Thermal Forming

T. Four Color Process Screen Printing Functional Inks
1) Separations and Film Positives
a) Traditional/Stochastic Algorithms
b) Screen Angles
c) Line Ruling / Frequency
d) Dot Shapes
e) Highlight, Shadow, Gradations, Mid-tones
f) Color Balance, GCR, UCR, Process Control Strips
g) Fingerprinting
2) Densitometers and Press-Side Controls
3) Dot Gain / Dot Loss
4) Moiré Effects
5) Inks for Four Color Process
a) Rheology
b) Density Standards
6) Proofing Systems
7) Substrates
8) Four Color Process Perceptions
a) Lighting
b) Pigment Purity
c) The Human Eye
d) Color Blindness

U. Economic Aspects of Screen Printing
1) Equipment costs
a) Screen making equipment
b) Printing equipment

c) Ink mixing equipment
d) Finishing equipment
- Building your own equipment
- Buying used equipment
- Equipment Plans

2) Material costs
a) Screen fabric
b) Stencil cost
c) Inks
d) Squeegee replacement
e) Substrate

3) Labor costs
a) Prepress
b) Press
c) Finishing

V. Health and Safety
1) Exposure to hazardous substances
a) Inhalation
b) Dermal contact
c) Ingestion
d) Eye contact

2) Safe handling of hazardous substances
3) Spills and disposal of hazardous substances
4) General safety concerns in the printing environment
5) Safety rules for the school laboratory
6) Use of MSDS sheets

W. Environmental Issues
1) Environmental standards
2) Environmental procedures
3) Waste removal
4) Air quality standards

X. Quality Control
1) Quality checks
2) Equipment
3) Procedures

Y. Math skills
1) Reading ruler
a) Inch system
b) Metric system
c) Point / pica system

2) Stock calculations
3) Calculate percentage size for reproduction of illustration or photo

Z. Learning skills
1) Reading
2) Writing
a) To show basic writing skills through writing assignments

3) Oral Expression
a) To show basic communication skills by making a brief presentation

4) Problem solving

AA. Basic computer literacy
1) Use of hardware

2) Use of operating systems
   a) Macintosh
   b) Windows
3) Software
   a) Illustration (Adobe Illustrator, CorelDraw)
   b) Word processing
   c) Page layout (Quark XPress or InDesign)
   d) Photo manipulation (Photoshop)
   e) Other
4) Use of peripherals
   a) Scanner
   b) Digital camera
5) Output Hardware
   a) Laserwriter
   b) Color inkjet printer
   c) Imagesetter
   d) Large format printer
6) Access information on the Internet

BB. Career Awareness of the screen printing industry
1) Job classifications
2) Job skill requirements
3) Field trips to local printing companies
4) Guest speakers from industry
5) Companies recruiting employees

CC. Cooperative Work Experience

Lab Experiences

A. Lab demonstrations
1) Film production
2) Fabric tensioning
3) Stencil application and processing
   a) Direct emulsion
   b) Capillary film
   c) Indirect stencil
4) Printing
5) Press cleanup
6) Screen reclaiming

B. Lab Projects

Homework assignments

Instructional Techniques

A. Lectures
B. Demonstrations
C. Visual aids
D. Audio visual media
1. SGIA Career video
2. SPTF Qwik Trak learning modules
3. Industry videos
   a) Ulano screen making
   b) Chromaline screen making

E. Guest speakers
F. Laboratory work
G. Evaluation
H. Related text materials
I. Field trips

Methods of Evaluation

A. Classwork
B. Lab work
C. Final Exam

Bibliography

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