SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF ENGINEERING

SYLLABUS STRUCTURE FOR S.E. (PRINTING ENGINEERING AND GRAPHIC COMMUNICATION)

(2019 COURSE)

WITH EFFECT FROM YEAR 2020 - 21

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Semester I														
Course Code	**Course Name**	**Teaching Scheme (Hours/Week)**			**Examination Scheme and Marks**						**Credit**			
		Theory	**Practical**	**Tutorial**	**In-Sem**	**End-Sem**	**TW**	**PR**	**OR**	**Total**	**TH TW**	**PR OR**	**TUT**	**Total**
207004	Engineering Mathematics III	03	--	01	30	70	25	--	--	125	3	--	1	4
208281	Introduction to Printing Processes	03	02	--	30	70	25	25	--	150	3	1	--	4
208282	Material Science in Printing and Packaging	03	02	--	30	70	25	25	--	150	3	1	--	4
208283	Printing Digital Electronics	03	02	--	30	70	--	25	--	125	3	1	--	4
202060	Theory of Printing Machine and M/c. Components	03	02	--	30	70	--	--	25	125	3	1	--	4
208284	Print and Package Layout Design	--	04#	--	--	--	25	--	--	25	--	2	--	2
208285	Audit Course	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		**15**	**12**	**01**	**150**	**350**	**100**	**75**	**25**	**700**	**15**	**06**	**01**	**22**

Abbreviations:

TH: Theory TW: Term Work PR: Practical OR: Oral TUT: Tutorial

Note: Interested students of S.E. (Printing) can opt any one of the audit course from the list of audit courses prescribed by BoS (Printing Engineering)

#4: One Practical of Print and Package Layout Design shall be performed for 4 hours.

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Semester II														
Course Code	**Course Name**	**Teaching Scheme (Hours/Week)**			**Examination Scheme and Marks**						**Credit**			
		Theory	**Practical**	**Tutorial**	**In-Sem**	**End-Sem**	**TW**	**PR**	**OR**	**Total**	**TH TW**	**PR OR**	**TUT**	**Total**
208286	Finishing Techniques	03	02	--	30	70	25	25	--	150	3	1	--	4
208287	Introduction to Packaging Concepts	03	--	--	30	70	--	--	--	100	3	--	--	3
208288	Microprocessor and Micro-controller Techniques in Printing	03	02	--	30	70	--	--	25	125	3	1	--	4
203155	Electrical Machines and Utilization	03	02	--	30	70	--	--	25	125	3	1	--	4
208289	Print Production Techniques	03	02	--	30	70	--	25	--	125	3	1	--	4
208290	Communication Skills	--	02	--	--	--	25	--	--	25	--	1	--	1
208291	Project Based Learning	--	04	--	--	--	50	--	--	50	--	2	--	2
Total		**15**	**14**	--	**150**	**350**	**100**	**50**	**50**	**700**	**15**	**07**	--	**22**

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(207004) Engineering Mathematics III

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs/ Week	03	In Sem: 30 Marks
Tutorial: 1 Hrs/ Week	01	End Sem: 70 Marks
		Term Work: 25 Marks

Pre-requisites: Differential & Integral calculus, Linear Differential equations of first order and first degree, Collection, classification & representation of data, Permutations & combinations Fourier series and Vector algebra.

Course Objectives:

To make the students familiarize with concepts and techniques in Ordinary and Partial differential equations, Fourier transform, Laplace transform and Vector calculus. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

Course Outcomes:

At the end of the course the student will be able to:

1. Solve higher order linear differential equations and its applications to engineering problems in their disciplines.
2. Apply Integral transform techniques such as Fourier transform & Laplace transform to solve differential equations involved in Vibration theory, Heat transfer, Liquid level systems and related engineering applications.
3. Apply Statistical methods like correlation & regression and probability theory as applicable to analyzing and interpreting experimental data in testing and quality control.
4. Perform vector differentiation & integration, analyze the vector fields and apply to fluid flow problems.
5. Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.

Unit I: Linear Differential Equation (LDE) and Applications [8 hours]

LDE of n^{th} order with constant coefficients, Complementary Function, Particular Integral, Method of Variation of parameters, Cauchy's and Legendre's DE, Simultaneous and Symmetric simultaneous DE. Applications of LDE to engineering problems and Mass spring system.

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Unit II: Laplace Transform (LT) and Applications **[8 hours]**

Definition of LT, Inverse LT, Properties & theorems, LT of standard functions, LT of some special functions viz. Periodic, Unit Step, Unit Impulse, Error, Si(t) and Ei(t), first order Bessel's.

Applications of LT for solving ordinary differential equations, liquid level systems consisting of single tank and two tanks in series (interacting and non-interacting systems), Second order systems (Damped vibrator).

Unit III: Fourier Transform **[7 hours]**

Fourier integral theorem. Fourier Sine & Cosine integrals. Fourier transform, Fourier Cosine transform, Fourier Sine transforms and their inverses. Finite FT, Application of FT to problems on one and two dimensional heat flow problems.

Unit IV: Statistics and Probability **[7 hours]**

Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression estimates.

Probability, Probability density function, Probability distributions: Binomial, Poisson, Normal, Test of hypothesis: Chi-square test.

Unit V: Vector Calculus **[8 hours]**

Vector differentiation, Gradient, Divergence and Curl, Directional derivative, Solenoidal and Irrotational fields, Vector identities. Line, Surface and Volume integrals, Green's Lemma, Gauss's Divergence theorem and Stoke's theorem.

Unit VI: Applications of Partial Differential Equations **[8 hours]**

Basic concepts, modeling of Vibrating string, Wave equation, one and two dimensional Heat flow equations, method of Separation of variables, use of Fourier series, Applications of PDE to problems of Chemical and allied engineering.

Guidelines for Term Work

1) Tutorial shall be engaged in four batches (batch size of 20 students maximum) per division.
2) Term work shall be based on continuous assessment of six assignments (one per each unit) and performance in internal tests.

Text Books:

[T1] Ramana. B. V., (2014), Higher Engineering Mathematics, Tata McGraw-Hill.

[T2] Grewal. B. S., (1965), Higher Engineering Mathematics, 44rth Ed., Khanna Publication, Delhi.

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Reference Books:

[R1] Erwin Kreyszig, (2007), Advanced Engineering Mathematics, 9th Ed., John Wiley and Sons.

[R2] Greenberg. M. D., (1998), Advanced Engineering Mathematics, 2nd Ed. Pearson Education.

[R3] Peter V. O'Neil., (2011), Advanced Engineering Mathematics, 7th Ed. Cengage.

[R4] S. L. Ross, Differential Equations, 3rd Edition, Wiley India.

[R5] Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Elsevier Academic Press.

[R6] S. J. Farlow, (1993), Partial Differential Equations for Scientists and Engineers, Dover Publications.

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(208281) Introduction to Printing Processes

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Term Work: 25 Marks
		Practical: 25 Marks

Pre-requisites: NA

Course Objectives:

The objectives of the Course are:

1. Understand the basics of printing.
2. Understand design, layout and color requirements for printing processes.
3. Understand basics of screen printing processes.
4. Learn use of mesh and role of thread in screen printing.
5. Understand stretching, gluing and pre-press operations in screen printing process.
6. Understand printing surface preparation in screen printing.

Course Outcomes:

On successful completion of the course the student will be able to:

1. Analyze the printing workflow to understand pre-press, press and post press techniques
2. Apply the principals of design, layout and color to create an effective design.
3. Identify different press elements affecting screen process.
4. Analyze the effect of mesh geometry on ink transfer and dot reproduction.
5. Understand stretching, gluing and pre-press operations in screen printing.
6. Able to prepare screen and print basic jobs.

Unit I: Basics of Printing **[6 hours]**

Printing – Definitions, Brief History and Introduction

Pre-Press - Printing Workflow, Typography, 2D and 3D Typefaces, Family, Series of Type, Legibility and Readability of Type, Type Measurement, Type Alignment and Arrangement, DTP, Camera Processing, Types of Originals, Conversion to Film Output - Negative, Positive and Tracing, CTP Technology

Press - Principles of Printing, Impact and Non-Impact Printing Processes

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Post-Press - Binding Techniques, Hard Binding, Paperback Binding, Mechanical Loose Leaf Binding, Finishing Techniques such as Punching, Embossing, Foiling, Lamination, Varnishing, Spot UV

Unit II: Basics of Design, Layout and Color **[6 hours]**

Design - Introduction to Graphic Design, Fundamentals of Design, Principles of Design

Layout – Purpose and Advantages, Layout Styles, Layout Components, Stages in Preparing a Layout, Marking-Up, Dummy, Stages of Layout, Thumbnails, Rough Layout, Comprehensive Layout

Color - Definition of Color, Light, Electromagnetic Spectrum, Additive Color Theory, Subtractive Color Theory

Unit III: Basics of Screen Printing, Frame and Squeeze **[6 hours]**

Basics of Screen Printing –Introduction to Screen Printing, Important Elements Affecting the Process, Frames - Purpose and Requirements , Types of Materials, Types of Sections, Frame Size Selection Criteria, Squeeze – Purpose and Requirements, Types of Squeezes, Applications

Unit IV: Mesh and Role of Thread **[6 hours]**

Mesh- Purpose and Requirements, Types – PET, Polypropylene, Nylon, Stainless Steel etc. Geometry (Mesh Count and Thread Diameter), Mesh Opening, Mesh Weave, Color

Role of Thread Diameter– Ink Transfer, Fabric Area, Color and Thickness, Dot Reproduction

Unit V: Stretching, Gluing, Prepress and Halftone **[6 hours]**

Stretching – Prepare for Stretching – Grinding, Cleaning, Base Coat, Types of Stretching – Mechanical, Pneumatic, Gluing – Types and Selection of Glue, Marking Screen Details Prepress – Designing Text, Line and Graphics, Halftone - Screen Angle, Dot Calculation, Separation of 4 Color

Unit VI: Stencil Preparation and Printing **[6 hours]**

Stencil Preparation - Workflow, Coating- Print Side and Squeeze Side, Exposing – Time Calculation using Exposure Calculator (Mesh Count, Thread Diameter, Light Intensity, Emulsion , Emulsion Coating), Under, Over and Optimum Exposure, Printing – Commercial – File, Wedding Cards, Bill Book etc., Textile – Garment and Bags, Industrial Purpose –Advertise, Graphic Overlays, Polycarbonate, Dial Gauges, Gaskets and Automotive Products, PCB, PE

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Guidelines for Laboratory Conduction

1. Clean all tools, machine parts every time before starting of practical.
2. Check for the electrical connections before start up and end of the practical.
3. Wear apron while performing the practical in screen lab.
4. Direct contact with chemicals should be avoided.
5. Do not inhale the chemicals and cleaning agents used for cleaning.
6. Store the chemicals in cool dark place.
7. Write the experiment in the journal and get it checked within a week.

Term Work:

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

1. To learn about screen materials used in screen printing and learn stretching techniques.
2. To prepare the screen by direct photographic method and single color printing on paper.
3. To prepare the screen by indirect photographic method and two color printing on paper.
4. To prepare the screen by direct-indirect photographic method and single color printing on paper.
5. To prepare the screen by direct-indirect photographic method and 2 color printing on paper.
6. To prepare the screens by direct-indirect photographic method for 4 color printing.
7. To explore 4 color screen printing on paper.
8. To prepare screen and explore raised printing on paper..
9. To prepare screen and single color printing on fabric materials.
10. To prepare screen and 2 color printing on fabric materials.

Text Books:

[T1] Hand Book of Printing Technology, (2008), ISBN: 9788186732755, EIRI

[T2] NIIR Board, Screen Printing Technology Handbook, (2017), ISBN 10: 8178330539 / ISBN 13: 9788178330532, Asia Pacific Business Press Inc.

[T3] Jane Sampson, (2017), Screenprinting, ISBN-10: 9780719810008/ ISBN-13: 978-0719810008, ASIN: 0719810000, Crowood Press

[T4] Sarvdeep Singh (2014), Guide to Professional Screen Printing, ISBN: 9788192583730, 8192583732, 1st edition, Ferntree Publishing

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Reference Books:

[R1] H. Kipphan, (2001), Handbook of Print Media, ISBN: 3-540-67326-1 Springer-Verlag Berlin Heidelberg

[R2] Rogue C. Parker, (1993), Looking Good in Print - A Guide to Basic Design for Desktop Publishing, 3rd edition, Ventana Pr.

[R3] Alastair Campbell, (1983), The Designers Handbook, Little Brown

[R4] N. N. Sarkar, (2013), Art and Print Production. 2nd edition, Oxford University Press, India

Unit	Text Books	Reference Books
Unit I	T1	R1, R2, R3
Unit II	-	R1
Unit III	T1	R1, R2
Unit IV	T2, T3, T4	R1 ,R2, R4
Unit V	T2, T3, T4	R1
Unit VI	T2, T3, T4	R1

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(208282) Material Science in Printing and Packaging

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Term Work: 25 Marks
		Practical: 25 Marks

Pre-requisites: Applied Physics and Applied Chemistry

Course Objectives:

The objectives of the Course are:

1. Attain the basic technical knowledge of various materials used in different printing processes.
2. Know the importance various types of printing inks and their properties required in different printing processes.
3. Identify the various grades of papers used for printing and packaging applications and their properties.
4. Explain paper and plastic as a packaging materials.
5. Justify use of glass, textile ,metals in packaging industry.
6. Learn the method of testing the materials scientifically.

Course Outcomes:

On successful completion of the course the student will be able to:

1. Apply the knowledge to use metals and polymers in printing and allied industry.
2. Analyze the characteristics of various raw material used in printing ink and to formulate the best suitable ink for the printing application.
3. Analyze properties of paper for writing, printing, packaging
4. Analyze the characteristics of various paper and plastic based raw materials used to manufacture package and its properties for packaging and printing.
5. Apply the knowledge to use glass, textile and metals as packaging materials
6. Understand the various methods and instruments used for material analysis

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Unit I: Metals and Printing Chemicals **[6 hours]**

Metals used as image carriers, Metals used as substrate for various applications. Types and materials for rollers. Role of acids, alkalis and other chemicals in various printing process, Types and role of adhesives in printing and packaging, Surface tension, angle of contact, shape of a liquid surface in a capillary tube, determination of surface tension by capillary tube method, bubble pressure method, dynamic surface tension, Surface Tension measurement of liquid by Ring and Plate method

Unit II: Printing Inks, Properties and Testing **[6 hours]**

Classification and General characteristics of printing inks for various printing processes, Ingredients of printing ink such as pigments, Vehicles, solvents and additives etc, Manufacturing of printing ink, Drying and curing mechanism of printing inks, rheological properties of ink like viscosity, shear, yield, thixotropy, length and tack, Subjective and objective ink testing methods, Various ink problems like Set off, trapping, filling, caking, end use properties of ink

Unit III: Paper Manufacturing, Properties and Testing **[6 hours]**

Importance of paper and paper products in printing industry, Paper manufacturing process including Pulping, Bleaching, waste paper utilization and deinking, Stock preparation, Sizing, Different machines used for paper manufacturing, Single wire and Two wire, Pressing, Drying, Calendering, Super calendaring, Embossers etc., Different surface finishes obtained in paper, selection criteria of paper substrate for printing and converting applications Surface and Physical properties of paper such as GSM, thickness, density etc., strength properties of paper such as tensile, tearing, folding strength etc., chemical and optical properties of paper like pH, color, gloss, brightness and opacity, Importance of BIS and TAPPI standards for paper and its relation to printing industry.

Unit IV: Packaging Materials: Paper and Plastics **[6 hours]**

Specialty papers for Packaging, Folding board cartons and coated cartons; Types of Corrugated Boards, Applications

Introduction to polymer, Thermoset and Thermoplastic polymer, Natural and Synthetic polymer, application of polymers in printing industry as printing substrates, Classification of Polymers: Classification based on structure, origin, fabrication, properties etc. Linear, branched, cross linked polymers etc. Classification Nomenclature of polymers, Crystalline and Amorphous polymers. Polyethylene (PE): Types, Properties and Applications. Polypropylene (PP): Varieties, Properties and Applications. Polypropylene (PVC): Varieties, Properties, Compounding and

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Applications. Polystyrene (PS): Types, Properties and Applications. Co-polymerization, Alloying and Blending.

Unit V: Other Packaging Materials **[6 hours]**

Glass: Raw Materials used for manufacturing glass, properties, types of glass, glass bottle design, Applications, advantages, Limitations of glass as a packaging material

Metals: Aluminum and steel- properties, applications

Aluminum based: Conversion processes for Sheets - Aluminum Foil, properties and their applications. Metal cans: Types, applications, specifications , Collapsible tubes: Types, applications, advantages, disadvantages, Aerosol containers: Design, advantages, disadvantages

Textile Based Materials: Raw materials like jute, hemp, Types of jute bags, lining and its significance, applications. Comparison with plastic bags

Unit VI: Instruments and Testing Methods for Packaging Materials **[6 hours]**

Working principle of Confocal Laser Scanning Microscopy, Scanning Electron Microscopy and Atomic Force Microscopy, 2-D and 3-D analysis of substrate,

Testing methods for paper based materials: Bursting, tearing strength, puncture resistance, tensile strength etc

Testing for Multi-layer Films: Barrier properties, Mechanical properties such as tensile strength, tear strength, peel strength, bursting strength etc

Guidelines for Laboratory Conduction

1. Clean the equipments every time before starting of practical.
2. Check for the electrical connections before start up and end of the practical.
3. Wear apron while performing the practical in lab.
4. Do not inhale the solvents used for cleaning equipments and diluting inks.
5. Store the solvents in cool dark place.
6. Write the experiment in the journal and get it checked within a week.

Term Work:

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

1. To identify various types of plastic films
2. To measure the contact angle of liquid ink and surface energy of substrate
3. To measure the surface tension of an ink by Du Nouy Ring method
4. To measure tensile strength of multi-layer material

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5. To measure tear strength of paper based and multi-layer material
6. To measure the viscosity of paste and liquid ink
7. To find GSM and caliper thickness of substrate
8. To find top and bottom side and cross and machine direction of paper
9. To find Cobb value and measure opacity of paper
10. To measure brightness and gloss of substrate
11. To measure smoothness and porosity of substrate

Text Books:

[T1] L.C. Young, (1969), Printing Science, Pitman publication.

[T2] L.C. Young, (1973), Materials in Printing Processes, Focal Press publication.

[T3] D.S. Mathur, (2007), Properties of Matter, S. Chand and Co. Ltd.

[T4] Leach and Pierce, (1961), Printing Ink Manual, Springer Publication.

[T5] Dr. Nelson R. Eldred, (2001), What Printer Should Know About Ink, GATF Press, Pittsburgh

[T6] Lawrence A. Wilson, 3rd Edition , What Printer Should Know About Paper, , GATF Press, Pittsburgh

[T7] E.A. Apps, 1969 edition, Printing Ink technology, Leonard Hills, London Publication.

[T8] A.J. Athaley, (2002), Plastics in Packaging, Multi-tech Publication

[T9] S. Natarajan, M. Govindarajan, B. Kumar, 2nd edition, 2014, Fundamentals of Packaging Technology, , PHI Learning

[T10] Preeti Singh, Horst-Christian Langowski , 1 st edition Food Packaging Materials, CRC Press

Reference Books:

[R1] R. Holman, 3 rd Edition, Technology of Printing Inks, All India PIMA Publication

[R2] C. H. Williams, (2001), Printing Ink Technology, PIRA UK Publication

[R3] K.W. Britt,(2004), Handbook of Pulp and Paper technology, CBS Publishers

[R4] P. J. Hartsuch, (1961), Chemistry of Lithography, GATF Publication

[R5] Dara.S. S., (2010), A Textbook of Engineering Chemistry, S. Chand and Company Ltd., New Delhi.

[R6] B. Sivasankar., (2008), Engineering Chemistry, TATA McGraw Hill, 2008

[R7] Kenneth G. Budinski, Michael K. Budinski., (2010), Engineering Materials: Properties and Selection, Pearson Publication.

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[R8] P. Kannan and A. Ravi Krishnan, 9th edition- 2009, "Engineering Chemistry", Sri Krishna Hitech Company (P) Ltd, Chennai.

[R9] Gauri Shankar Misra, (2010), Introductory Polymer Chemistry, New Age

[R10] Bauer E., Pharmaceutical Packaging Handbook, 1st Edition- 2009, CRC Press

[R11] D. Selke, S. E. M., Culter, J. D. and Hernandez, R. J., (2004) "Plastics Packaging Properties, processing, Applications and Regulation", Carl HanserVerlag, USA

[R12] A. Soroka W., 3rd Ed 2002 "Fundamentals of Packaging Technology", IoPP

[R13] F. A. Paine, 1990, The Packaging User's Handbook, Springer,

Unit	Text Books	Reference Books
Unit I	T1,T2, T3	R4, R5, R6, R7, R8
Unit II	T4, T5	R1, R2
Unit III	T1, T2, T6	R3
Unit IV	T8, T9	R9, R10, R11, R12
Unit V	T9, T10	R13
Unit VI	T4, T8, T9, T10	R11, R12

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(208283) Printing Digital Electronics

Teaching Scheme	Credits	Examination Scheme
Theory: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Practical: 25 Marks

Pre-requisites: Digital Electronics

Course Objectives:

The objectives of the Course are:

1. Understand fundamentals of number systems, codes and its related conversions
2. Classify different Logic families and learn various circuit minimization techniques
3. Understand the combination logic and arithmetic circuits in digital electronics
4. Understand Sequential logic circuits and its applications in digital electronics
5. Describe ADC and DAC conversion circuits and different types of memories
6. Understand Basic fundamentals about the digital computers

Course Outcomes:

On successful completion of the course the student will be able to:

1. Identify the number based nomenclature used in digital electronics.
2. Apply knowledge for choosing proper logic families and minimize the complex digital circuits
3. Demonstrate the understanding of combinational logic circuits.
4. Demonstrate the understanding of Sequential logic circuits and its applications in printing industry.
5. Apply the knowledge of ADC, DAC circuits and memories for interfacing the devices used in printing industry.
6. Understand use of digital computer capabilities in printing industry.

Unit I: Introduction of number system **[6 Hrs]**

Decimal, Binary, Octal Hexadecimal number systems and their conversations, BCD codes, 8421, Excess - 3, Gray Code, ASCII code, Concept of bar code and its application in printing

Unit II: Fundamentals of Digital Electronics **[6 Hrs]**

Boolean algebra, De-Morgan theorems, all types of gates and their truth tables,

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Need of minimization, Minimization techniques, K-map simplification up to 4 variables, SOP and POS forms; don't care conditions, Logic families and comparative study of TTL, ECL and CMOS

Unit III: Combination logic and Arithmetic [6 Hrs]

Combination logic and Arithmetic such as addition, subtraction, 1's complement and 2's complement method. Binary multiplication and division. Half adder / Half subtractor, Full Adder / Full Subtractor, BCD adder. One bit digital comparator Concept and Application of ALU.

Unit IV: Sequential logic circuits and their applications in printing [6 Hrs]

Study of level clocked S-R, D, JK, M-SJK flip-flops (Includes logical diagrams, symbol truth - table, waveforms / timing diagrams). Edge triggered flip flops (includes S-R, D, JK, M-S Jk flip-flops along with logical diagram, symbol truth table, waveforms / timing diagram). Study of asynchronous and synchronous counters and their applications such as paper counting. Roller speed measurements etc Concept of modulo `N' counter, UP/Down counter. Principle operation of Universal shift register (IC 7495 including all modes of operation - concept only) and its application in printing.

Unit V: Digital signals and its storage and display Basic [6Hrs]

Introduction to ADC's and DAC's (includes classification and specifications in brief). Classification of Memories, study of RAM, ROM, EPROM, E PROM, NVRAM, SRAM, DRAM, concept of PLA, PAL and PLD's. Display Devices and decoders 7 segment LED display (includes basic diagrams of Common Anode and Common Cathode) study of decoder driver IC's such as IC 7447, 7448, LCD display & Display Drivers IC's such as 7106, 7107.

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Unit VI: Introduction to Digital Computer [6 Hrs]

Block diagram of digital computer, serial port / parallel port concept, Input devices such as Keyboard, Mouse, Joystick, Output Devices such as Printers (includes classification and one application of each), Floppy Disks, CD's concept of Modern, special accessories such as Digital Camera and Digital Scanner.

Guidelines for Laboratory Conduction

1. Clean all workspace and components parts every time before starting of practical.
2. Check for the electrical connections before start up and end of the practical.
3. Before switching On the Power supply to circuit boards, get connections checked by professor.
4. Write the experiment in the journal neatly and get it checked within a week.

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Term Work

Term Work shall consist of following experiments:

1. Logic gates – I
2. Logic gates – II
3. Comparative study of TTL and CMOS (Parameter measurement for any simple functional circuit using TTL IC and CMOS IC)
4. Study of code conversions and their applications in printing
    a. Binary to gray and gray to binary.
    b. Bar code evaluation
5. Arithmetic Circuits
    a. Half and Full Adder / Half and Full Subtractor functionality verification.
    b. One bit digital comparator.
6. Combinational Circuits
7. Sequential Circuits I
8. Sequential circuits II
9. Study of Shift Register IC 749 and its application in printing.
10. Study of ADC & DAC IC (8 bit only) or Study of or Display Devices and Drivers

Text Books:

[T1]: A. Anand Kumar, (2014), Fundamentals of Digital circuits, PHI learning private limited

Reference Books :

[R1]. R. P. Jain, (2009), Modern Digital Electronics, Tata McGraw Hill

[R2]. William Gothman, (1982), Digital Electronics - An introduction to theory and practice, Prentice Hall Publication.

[R3]. Malvino, Leach, (2014), Digital Electronics - Principles and applications, Prentice Hall Publication.

[R4] Ronald J. Tocci, (2009), Digital systems Principles and application, Hall Publication.

Unit	Text Books	Reference Books
Unit I	T1	R1
Unit II		R2
Unit III		R3
Unit IV		R4
Unit V		R3
Unit VI		R4

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(202060) Theory of Printing Machine and Machine Components

Teaching Scheme	Credits	Examination Scheme
Theory: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Oral: 25 Marks

Pre-requisites: NA

Course Objectives

1. To make the student conversant with commonly used mechanism for Printing industry application.
2. To develop competency in conducting laboratory experiments to measure power transmitted and absorbed by friction clutches.
3. To develop competency in conducting laboratory experiments to measure power transmitted and absorbed by brakes.
4. To develop competency in conducting laboratory experiments to measure power transmitted by belt, rope and chain drives.
5. To develop competency in drawing velocity and acceleration diagram for simple and complex mechanism
6. To develop competency in graphical and analytical method for solving problems in static and dynamic force analysis

Course Outcome

1. Analyze and evaluate mechanism for printing industry application.
2. Measure, analyze and evaluate power transmitted and absorbed by friction clutches.
3. Measure, analyze and evaluate power transmitted and absorbed by brakes.
4. Measure, analyze and evaluate power transmitted and absorbed by belt, rope and chain drives.
5. Draw, analyze and evaluate velocity and acceleration diagram for simple and complex mechanism
6. Apply, analyze and evaluate graphical and analytical method for solving problems in static and dynamic force analysis

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Unit I: Introduction **[6 Hrs]**

Definitions of link, kinematics pair, kinematics chain, mechanism, machine, structure, inversion, degree of freedom. Inversions of four bar chain, single slider crank chain and double slider crank chain. Intermittent motion mechanism, Ratchet and pawl arrangement, Pantograph mechanism

Unit II: Friction and Friction Clutches **[6 Hrs]**

Dry friction, Lubrication methods, principle of hydrodynamic and hydrostatic lubrication. Pivot and collar friction. Plate (single and multiple) clutch, cone clutch and centrifugal clutch, Torque transmitting capacity by uniform wear and uniform pressure theory, clutch operating mechanisms

Unit III: Brakes **[6 Hrs]**

Different types of brakes, Shoe brakes, External and Internal shoe brakes, Block brakes, Band brakes, Band and Block brakes, Braking torque.

Unit IV: Belt, Rope and Chain Drives **[6 Hrs]**

Flat and Vee belt, Rope, Limiting tension ratio, power transmitted, centrifugal effect, maximum power transmitted by a belt, slip, creep, initial tension. Selection of belt from manufacturer's catalogue. Chain drive classification of chain, pitch, pitches circle diameter, chain speed, angular velocity of sprocket, chain length.

Unit V: Velocity, Acceleration Analysis of Simple Mechanisms: Graphical Methods-I [6Hrs]

Importance of velocity and acceleration analysis in mechanisms, Velocity analysis of mechanisms by relative velocity method, acceleration analysis of mechanisms by relative acceleration method, velocity and acceleration image principle, Klein's construction.

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Unit VI: Velocity, Acceleration Analysis of Simple Mechanisms: Graphical Methods-II [6Hrs]

Concept of Coriolis component of acceleration, direction of coriolis component of acceleration, velocity and acceleration analysis of mechanisms having Coriolis component of acceleration, Numericals.

Term Work:

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

1. Study of inversions of one of the Kinematics Chains.
2. Study of Belt Drive.
3. Selection procedure of Belt from manufacturer's catalogue.
4. Study of Clutches.

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5. Study of Brakes.
6. Study of Belt and Chain drive.
7. Velocity and Acceleration Diagrams: Two problems on velocity and acceleration analysis using Graphical methods (based on Unit-V).
8. Velocity and Acceleration Diagrams: Two problems on velocity and acceleration analysis using Graphical methods (based on Unit-VI).

Text Books:

[T1] Thomas Bevan, (2009), Theory of Machines, 3rd Ed. Pearson Education.

[T2] S. S. Ratan, (2009), Theory of Machines, 3rd Ed., Tata McGraw Hill, New Delhi.

[T3] Ashok G. Ambekar, (2007), Mechanism and Machine Theory, 1st Ed. Prentice Hall of India Pvt. Ltd.

[T4] Sadhu Singh, (2013), Theory of Machines, Pearson Education.

Reference Books

[R1] John J. Uicker, Jr., Gordon R. Pennock, Joseph E. Shigley, (2017), Theory of Machines and Mechanism, 5th Ed. Oxford University Press.

[R2] Ghosh Amitabh and Mallik A. K., (1988), Theory of Machines and Mechanism, 2nd Ed. Affiliated East - West Press.

[R3] Hall Jr. and Allen S., Kinematics and Linkage Design, (1961), 1st Ed. Prentice Hall.

[R4] Wilson C.E., Sandler J. P. (2003) Kinematics and Dynamics of Machinery, 3rd Ed., Person Education.

[R5] Erdman A.G. and Sandor G.N., (1981), Mechanism Design, Analysis and Synthesis, Volume-I, Prentice Hall of India.

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(208284) Print and Package Layout Design

Teaching Scheme	Credits	Examination Scheme
Practical: 4# Hrs. / week	02	Practical: 25 Marks

Prerequisites: NA

Course Objectives:

1. Understand basic tools, commands of page lay-outing software.
2. Design lay-outing for text book, brochure and pamphlet.
3. Learn image editing tools of photo editing software.
4. Learn vector based software.
5. Generation of Control elements in a print and package layout.
6. Develop Structural Design for various Packages

Course Outcomes:

At the end of this course, students will be able to:

1. Implement basic tools, commands used in page lay-outing software for print and packaging applications.
2. Apply basic concept to design pamphlet, brouchure and text books.
3. Apply different filters, styles of different filter of photo editing software.
4. Convert color image into gray scale image in photo editing software.
5. Design a magazine cover page using vector base software.
6. Create Structural Design for Universal, Tray Type, Straight and Reverse Tuck-in Carton

Term Work shall consist of following experiments:

1. Introduction to page lay-outing software.
2. Design a single color brochure using lay-outing software for A4 size and create print layout for offset machine size such as 15 x 20 inches, 18 x 23 inches, 20 x 30 inches etc.
3. To design a book-work using lay-outing software and different imposition styles.
4. Generate proofing marks, print marks, registration marks and quality control aids in the layout.
5. Introduction to image editing tools using photo editing software.
6. Design a magazine cover page using vector base software.
7. Structural Design for Universal Carton.
8. Structural Design for Straight Tuck-in Carton.
9. Structural Design for Reverse Tuck-in Carton.
10. Structural Design for Tray Type Carton.

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(208285) Audit Course

In addition to credits course, it is recommended that there should be audit course (non-credit course) preferably in each semester from second year. The student will be awarded grade as AP on successful completion of audit course. The student may opt for one of the audit courses per semester, starting in second year first semester. Though not mandatory, such audit courses can help the student to get awareness of different issues which make impact on human lives and enhance their skill sets to improve their employability. List of audit courses offered in each semester is provided in curriculum. Each student has to choose one audit course from the list per semester. Evaluation of audit course will be done at institute level. Method of conduction and method of assessment for audit courses is suggested.

The student registered for audit course shall be awarded the grade AP and shall be included such grade in the Semester grade report for that course, provided student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA. Evaluation of audit course will be done at institute level itself. (Ref-http://www.unipune.ac.in/Syllabi_PDF/revised-2015/engineering/UG_RULE_REGULATIONS_FOR_CREDIT_SYSTEM-2015_18June.pdf)

Guidelines for Conduction and Assessment (Any one or more of following but not limited to)

- Lectures/ Guest Lectures
- Visits (Social/Field) and reports
- Demonstrations
- Surveys
- Mini Project
- Hands on experience on specific focused topic

Guidelines for Assessment (Any one or more of following but not limited to)

- Written Test
- Demonstrations/ Practical Test
- Presentations
- IPR/Publication
- Report

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List of courses under Audit Course

Course Code	Audit Course Title
208285-I	Basic Photography
208285-II	Personalized Printing I

Students can opt for audit course from the list of Audit Course of any branch of engineering.

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(208286) Finishing Techniques

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs. / week	03	In Sem: 30 Marks
Practical: 2 Hrs. / week	01	End Sem: 70 Marks
		Term Work: 25 Marks
		Practical: 25 Marks

Course Objectives:

The students shall be able to:

1. Develop the knowledge of book binding techniques.
2. Understand various imposition schemes for book binding.
3. Use Tools & Equipment and their care in Binding department.
4. Select different Binding Material and method to suit the product requirement.
5. Produce the final finished printed product with suitable method.
6. Estimation of finished jobs including paper other raw material, processing charges.

Course Outcomes:

The students shall be able to:

1. Understand parts of book and various binding techniques.
2. Apply various imposition schemes.
3. Select a book production method and equipment as per the job requirements.
4. Choose material for book binding as per the job requirements.
5. Understand various finishing techniques.
6. Calculate cost required for book binding and finishing as per the job requirements.

Unit I: Book Binding Techniques **[6 Hrs.]**

Anatomy of a book and terminology in use, Introduction to various binding techniques, Industrial binding techniques - Adhesive/Perfect Binding, Hardcover binding, Wire stitching, Office stationery binding techniques - Loose leaf binding, spiral, ring, comb binding etc., Legacy hand binding methods - Quarter bound, half bound, full bound, cover drawing, Stitching schemes such as french, kettle, Adhesive binding process - spine preparation, adhesive application, creasing, nipping, Hardcover binding process – end paper, case making, book block making, casing in, finishing

Unit II: Book Binding and Planning Schemes **[6 Hrs.]**

Imposition schemes for various signature schemes - saddle stitch, perfect bound, various folding

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schemes, Imposition schemes for odd signatures, insertions and wrap around signatures, Book cover planning for soft cover and hard cover case, 2-up imposition schemes, come and go imposition scheme, Package Step and repeat work.

Unit III: Book Production Methods and Equipment [6 Hrs.]

Folding - folding schemes and mechanisms (buckle folding, knife folding), equipment configurations - All Buckle folding, combination folding machines, terminology in use, (KTL, KLL etc.), Problem involving folding, Gathering - automated gathering process, signature inspections systems, collating marks, Sewing process and sewing equipment mechanisms, Perfect binding process and inline/offline perfect binding operations, Gluing and case making process, hardcover book manufacturing, Three knife trimming, Troubleshooting of book binding, cutting machine-operational procedure of sensors and hydraulic systems; problems and remedies during cutting.

Unit IV: Materials Used in Print and Package Finishing [6 Hrs.]

Adhesives - Hot melt adhesives, animal (protein) glues, water based adhesives, PUR hot-melts, Theory of adhesion, Prevention and deterioration of adhesive, Application of adhesives in various print finishing processes - lamination, sealing, tipping, gluing off of spine, side glue application, case making, casing in, Securing materials - threads, wire, Reinforcing and lining materials - mull, kraft, gauze, covering materials - printed and laminated materials, rexin, leather etc., Material testing and QC procedures for book binding materials.

Unit V: Ancillary Processes and Print and Package Surface Finishing Techniques [6 Hrs.]

Surface finishing techniques (Book and Carton), Lamination, Different types of Varnishes, hot/cold foil stamping, embossing/debossing, Utility operations - Ruling, index cutting, numbering, punching, perforating, corner cutting, tag stringing, calendar rimming, eye-letting, die punching, velvet printing, Post-press material flow and inventory management processes, Hybrid finishing formats and equipments, Trends and developments in finishing operations.

Unit VI: Costing and Estimation for Print and package Finishing [6 Hrs.]

Estimating book sizes and thickness, estimating material consumption of book binding materials, Estimation for finished job including paper, other raw material, processing charges etc.

Term Work

Term Work shall consist of following experiments

1. To prepare folded signatures using right angle folds - Folding - standard folding schemes up to 16 pages

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2. To prepare folded signatures using zigzag folds and other types of folding styles
3. To prepare saddle and side stitched booklet
4. To prepare half bound book - Cut flush - French stitch
5. To prepare quarter bound book - ASTI - Kettle stitch
6. To prepare Half bound book - Kettle stitch
7. To prepare Full bound book - French stitch
8. To prepare Full bound book with kettle sewing and decorate it using finishing Techniques
9. To prepare various document files
10. To prepare envelope for various applications.

Text Books:

[T1] B. D. Mendiratta, Binding & Finishing Printek Publication, New Delhi.

[T2] A. G. Martin, (1980), Finishing process in Printing Focal Press, London.

Reference Books:

[R1] Hassy Whetton, Practical Printing & Binding Ohams Press Ltd. London.

[R2] Pocket pal, International Paper Company, U.S.A.

[R3] Ralp Lyman, (1993), Binding and Finishing, GATFPress

[R4] T. J. Tedesco, (1999), Binding, Finishing and Mailing: The Final World", GATFPress, Pittsburgh.

[R5] Arthur W. Johnson, (1986), Manual of Book Binding, Thames and Hudson.

[R6] Arthur W. Johnson, (1985), The Practical Guide to Craft Book Binding, Thames and Hudson.

[R7] T. M. Adams, D.D. Faux and L. T. Ricber, (1996), Printing Technology, Delmar Publications Inc.

[R8] Helmutt Kipphan, (2000), Handbook of Print Media, Springer, Heidelberg.

Unit	Text Books	Reference Books
Unit I	T1	R1, R2, R3,R6,R8
Unit II	T1	R1, R3, R4, R5
Unit III	T1,T2	R1, R3
Unit IV	T2,T2	R1 ,R3, R4, R5
Unit V	T1,T2	R1,R2, R3, R8
Unit VI	T2,T2	R1, R3, R4, R8

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(208287) Introduction to Packaging Concepts

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs/ Week	03	In Sem: 30 Marks
		End Sem: 70 Marks

Pre-requisites: Material Science in Printing and Packaging

Course Objectives:

The objectives of the course are:

1. Attain the basic technical knowledge on requirements of packaging.
2. Know the elements of package design.
3. Learn the tools for marketing a package.
4. State the behaviour of Product and Package Characteristics.
5. Learn quality checks for a package.
6. Learn scope of packaging in India and abroad with environmental considerations.

Course Outcomes:

On successful completion of the course the student will be able to:

1. Understand the need and requirements of packaging.
2. Know the design elements required for a package.
3. Understand role of packaging as a marketing tool.
4. Correlate between product and package.
5. Understand the need for quality checks for a package.
6. Learn Packaging Growth in India and Abroad, Packaging Laws and Regulations

Unit I: Introduction to Packaging **[6 hours]**

Need & Evolution of Packaging, Definitions of Packaging, Basic Requirements - Protection, Preservation, Containment, Machinability, Communication, Re-use and Recycability, Types of Packaging, Packaging Hazards – Storage, Transportation, Chemical, Climatic, Biological.

Unit II: Elements for Package Design **[6 hours]**

Graphic Design Elements for a Package, Significance of Shape, Size, Colour, Font, Texture, Lines, Balance & Unity, Symmetry and Harmony.

Unit III: Packaging: A Marketing Tool **[6 hours]**

Market Considerations, Importance of Demography, Psychography, Retail Market, Brand Loyalty.

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Unit IV: Product - Package Relationship **[6 hours]**

Product Characteristics: Physical (nature, shape, size, texture, Centre of gravity, etc.), Chemical (Acidic, basic, reactivity etc.), Biological (Effect of micro-organisms) and Effect of moisture, oxygen and other gases; Package Characteristics: Material (Plastic, paper, wood, etc.), Physical (tensile, breaking load, burst, molecular/fibre direction, etc.), Chemical (Unreacted chemicals present, pH, etc.), Biological (sensitivity to microorganisms), Permeability (Barrier properties – Absorption/Diffusion of moisture and gases).

Unit V: Quality Standards in Packaging **[6 hours]**

Need and importance of Quality Control in packaging, Significance of specifications; Significance of Testing, Packaging Standards, Conditioning, Sampling, Package Testing.

Unit VI: Packaging Perspective **[6 hours]**

Packaging Costs, Environmental considerations and waste management, Packaging Laws and Regulations, Packaging Scenario – World and India, Comparison, Scope and Growth in India.

Text Books:

[T1] Soroka W., (2002), Fundamentals of Packaging Technology, 3rd Ed, IoPP.

[T2] Paine F. A., (1991), Packaging User's Handbook, 1st Ed, Blackie Academic & Professional.

[T3] Byett J. et al., (2001), Packaging Technology, 2nd Ed, The Institute of Packaging (SA).

Reference Books:

[R1] Selke, S. E. M., Culter, J. D. and Hernandez, R. J., (2004), Plastics Packaging: Properties, Processing, Applications and Regulation, Carl Hanser Verlag, USA.

[R2] Joseph F. H, Robert J. K, Hallie F, (1998), Handbook of Package Engineering, 3rd Ed., Technomic Publishing.

[R3] Yam K. L., (2009), The Encyclopedia of Packaging Technology", 3rd Ed. Wiley.

Unit	Text Books	Reference Books
Unit I	T1,T2, T3	R1, R2
Unit II	T2, T3	R1, R2
Unit III	T3	R3
Unit IV	T2, T3	R3
Unit V	T3	R3
Unit VI	T3	R3

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(208288): Microprocessor and Micro-controller Techniques in Printing

Teaching Scheme	Credits	Examination Scheme
Theory: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Oral: 25 Marks

Pre-requisites: Fundamentals of digital electronics

Course Objectives:

The objectives of the Course are:

1. Understand fundamentals of microprocessor 8085
2. Use of 8085 instruction set for program writing.
3. Learn architecture and memory organization of 8051 microcontroller
4. Develop the program writing skills with help of 8051 instruction set
5. Describe interfacing concepts and procedure for interfacing peripherals.
6. Learn interfacing of printers with microprocessor and microcontroller.

Course Outcomes:

On successful completion of the course the student will be able to:

1. Differentiate between the families of microprocessor and microcontroller.
2. Apply the programming skills for controlling any I/O device with microprocessor.
3. Explain memory organization, internal architecture of 8051 micro-controller.
4. Apply the knowledge of instructions set of 8051 for program writing.
5. Interface the I/O devices with microcontroller
6. Demonstrate the use of microprocessor and microcontroller for automation in the field of printing

Unit I: Introduction of Microprocessor **[6 hours]**

Microprocessor architecture and its operations, Study of microprocessor 8085 pin out and signals, Memory organization and memory mapping, Interfacing devices and review of input output devices, Block diagram and working of 8085 based microcomputer system

Unit II: Programming Concepts of Microprocessor **[6 hours]**

Classification of instructions. Program writing skills of hand-coding. Assembly language

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programming. Expected execution of simple programs, Addressing modes, Status of flags. Arithmetic logical operations, Instruction timings and timing delays, Stack and subroutines

Unit III: Introduction of Microcontrollers **[6 hours]**

Architecture of microcontroller 8051, Comparison e ^{ith} microprocessor, Clock and oscillator. Flags PSW, Internal memory SFR, Counter, Timer, serial IO and interrupt

Unit IV: Programming concepts of Microcontroller **[6 hours]**

Instruction set of microcontroller 8051, Addressing modes of microcontroller 8051, Programming of microcontroller 8051

Unit V: Interfacing Peripheral Devices **[6 hours]**

Basics of interfacing concepts, Study of interfacing devices, Study of programmable peripheral IC 8255, Study of programmable timer IC 8253, Study of programmable interrupt control IC 8259

Unit VI: Microprocessor and it's Applications in Printing Technology **[6 hours]**

Stepper moto drive and controller, Printer interface with 8085 Study of programmable logic controller "with block diagram and simple programming (8 bit) related to specific printing operation sequence. Introduction to contemporary microprocessors

Guidelines for Laboratory Conduction

1. Clean all workspace and components parts every time before starting of practical.
2. Check for the electrical connections before start up and end of the practical.
3. Before switching On the Power supply to circuit boards, get the connections checked by your professor.
4. Write the experiment in the journal neatly and get it checked within a week.

Term Work:

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

1. Write and execute Programs for
   a) Addition, Subtraction (8 bit and 16 bit)
   b) Multiplication, division (8 bit)
2. Write and Execute Programs for
   a) Time delay using Register Pair
   b) Decade counter
   c) Up / Down Counter

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d) Pulse Timing for Flashing Lights

3. Study of interfacing chips 8279

a) Chip study waveform Observation

b) Program related to printing field application

4. Write and Execute a Program for Serial Data Transfer.
5. Study of Interrupt Controller 8259
6. Interfacing with ADC/DAC (8 bit only)
7. Interfacing of Stepper Motor
8. Study of 8255 Chip & Interfacing with Printer (any type)
9. Study of PLC and Simple Program Execution
10. Study of EPROM Programmer OR Study of Timer Controller Chip 8253

Text Books:

[T1] Krishna Kant, (2011), Microprocessors and Micro-controllers: Architecture, Programming and System, PHI Learning Private Limited.

[T2] R.S Gaonkar, (1996), Microprocessor Architecture, programming and applications with 8085, Wiley Eastern Publication

[T3] Kenneth Ayala, (2007), 8051 Micro-controller Architecture, Programming and Applications, PHI

Reference Books:

[R1] Mazidi, M.A., (2008), the 8051 Microcontroller and Embedded System, Pearson Education.

[R2] A.P. Mathur, (1989), Microprocessor architecture & applications, TMH

[R3] Lance Leventhal, (1979), 8080/8085A Assembly language Programming, Mc Graw Hill

[R4] Douglus Hall, (1983), Microprocessor and Digital systems, McGraw Hill

[R5] Ajay Deshmukh, (2005), Microcontroller Theory and application, TMH

Unit	Text Books	Reference Books
Unit I	T1	R2, R3
Unit II	T2	R4
Unit III	T3	R1
Unit IV	T2, T3	R5
Unit V	T2, T3	R1, R5
Unit VI	T2, T3	R1,R5

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(203155) Electrical Machines and Utilization

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Oral: 25 Marks

Pre-requisites: Electromagnetic Induction

Course Objectives:

1. Study and differentiate between AC and DC machines. Learn about the purpose of starters. Study speed control methods and evaluate performance of motors.
2. Understand the construction & working principle of transformer.
3. Differentiate stationary and rotating machines and learn special purpose machines.
4. Understand different types of electrical heating, their applications.
5. Study laws of illumination, design of lighting scheme and analyze the methods of lighting calculations.
6. Learn drives and components such as switches, relays, contactors used in printing industry.

Course Outcomes:

1. Exhibit knowledge of working of DC machines, 3 phase induction motor. Able to draw characteristics for DC machines, 3 phase induction motor .
2. Demonstrate speed control methods employed for DC motors and 3 phase induction motor. Solve various numerical on power stages in AC and DC machines.
3. Estimate regulation and efficiency of transformer by direct and indirect methods
4. Understand various laws of illumination and lighting schemes
5. Understand working principle of electric heating and its applications
6. Identify particular electrical machine, electric drives and components for a specific application by studying various characteristics.

Unit I: D.C. Machines **[6 hours]**

D.C. Generator: Construction & Principle of working, Types of D.C. Generator, EMF Equation

D.C. Motors: Working Principle, Back EMF, Types of motors, Torque Equation, Characteristics of Motors, Starting & Reversing, Speed Control Methods of Shunt and Series Motors, Necessity of Starters, Two and Three Point Starters, Efficiency & Losses, Applications of motors.

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Unit II: Special Purpose Motors and Single phase Transformer. **[6 hours]**

Special Purpose Motors- Servo Motor, Stepper Motor, Universal Motor, Brushless DC (BLDC) Motor and Permanent Magnet Synchronous Motor (PMSM) (Construction & Applications)

Single phase Transformer: Construction and working principle of transformer, Types of Transformer, Transformer Rating, Losses in a transformer and their variation with load, Efficiency. Open circuit and short circuit tests for determination of equivalent circuit parameters and determination of voltage regulation and efficiency.

Unit III: Three Phase Induction Motor **[6 hours]**

Basic Principle of Operation, Rotating Magnetic Field, Types of Induction Motors, Slip, Rotor Current, Power and Torque Relations, Torque -Slip Characteristics, Relationship Between Rotor Copper Loss, Slip and Rotor Input, Different Types of Starters, Speed Control of Induction Motors, Applications

Unit IV: Illumination **[6 hours]**

Laws of Illumination, Inverse Square law, Lambert's Cosine Law, Requirements of Good Lighting Scheme, Types of lighting scheme, Special Purpose Lighting: Street Lighting, Flood Lighting.

Unit V: Electrical Heating **[6 hours]**

Advantages of Electrical Heating, Resistance and Arc Heating, Principal of Induction Heating and Dielectric Heating, Furnaces, Temperature Control of Furnaces. Application of Different Heating Methods.

Unit VI: Special Components and Drives **[6 hours]**

Special Components in Printing Industry:- Various types of Relays, Contractor, Limit Switches, Proximity Switches, Micro Switches, Solenoids, Photocells, Electric Encoders

Advantages of Electrical Drives, Individual & Group Drive, Selection of motors depending on load characteristics.

Term Work:

Any 7 Experiments from 1-8 experiments list below. 1 Compulsory report of industrial visit.

1. Speed control of D.C. Shunt Motor by variation of armature voltage and field current.
2. Brake test on D.C. Shunt Motor
3. Load test on D.C. Series Motor
4. Study of special purpose machines.
5. O.C. and S.C. test on single phase Transformer

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6. Load Test on single phase transformer.
7. To study of various starters used for Three Phase Induction Motors.
8. Load test on Three Phase Induction Motor
9. A report on Industrial Visit to any one of place given below where students can observe A] Various Motors B] Transformer

Text Books:

[T1] Battacharya. S. K., (2015), Electrical Machines, Tata Mc Graw Hill Publication.

[T2] Manikandan K., (2005), Electrical Machines & Drives, Scitech Publications, Chennai

[T3] Ashfaq Husain, (2012), Electric Machines, 2nd Ed., Dhanpat Rai & Co.Ltd.

[T4] Pratab. H., (2017), Art & Science of Utilization of Electrical Energy, Dhanpat Rai & Com.

[T5] Deshmukh. B. H., (2018), Electrical Technology, Nirali Prakashan.

Reference Books:

[R1] Taylor. E. O., (1971), Utilization of Electrical Energy, Orient Blackswan

[R2] Theodore W., (2007), Electrical Machines, Drives and Power Systems, 4rth Ed., Pearson Education.

[R3] B. L. Theraja, A. K. Theraja, (2013), A Text Book of Electrical Technology - Vol II, S. Chand and Company Ltd.

Unit	Text Books	Reference Books
Unit I	T1, T2, T3, T5	R2, R3
Unit II	T1, T2, T3, T5	R2, R3
Unit III	T1, T2, T3, T5	R2, R3
Unit IV	T4,T5	R1
Unit V	T4, T5	R1
Unit VI	T5	R2

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(208289) Print Production Techniques

Teaching Scheme	Credits	Examination Scheme
Lectures: 3 Hrs/ Week	03	In Sem: 30 Marks
Practicals: 2 Hrs/ Week	01	End Sem: 70 Marks
		Practical: 25 Marks

Pre-requisites: Introduction to Print Processes, Print and Packaging Layout Design

Course Objectives:

The objectives of the Course are:

1. Learn and work with various types of Original
2. Draw page lay-outs for varying printing processes and applications.
3. Understand halftone techniques for print separation.
4. Understand the requirements for process color and spot color printing.
5. Compute densitometry functions for the evaluation of print quality.
6. Perform cost estimation for different print jobs.

Course Outcomes:

On successful completion of the course the student will be able to:

1. Analyze the requirements of typesetting to create an effective design.
2. Prepare page lay-outing standards to create effective design for specific job.
3. Apply different halftone techniques for dot reproducibility.
4. Apply the various screening techniques, viewing and illumination conditions for print quality assessment.
5. Measure and calculate density, dot gain, contrast and trap for print quality evaluation.
6. Apply the production strategy for costing of specific job.

Unit I: Text Composing **[6 Hrs.]**

Printer's measurement system, Type series, Family, Typographic Parameters, Copy mark- up, Casting off, Copy editing, Proof reading marks. House style, Fonts - Outline, True type, Open type.

Unit II: Print Layout Preparation **[6 Hrs.]**

Basics of page layout, important considerations: margins, bleeds, marks and print aids. Layout for packaging designs, carton and flexible. Proofing systems, dummy preparation, instructions for print production, ISO standards for layout of different printing processes.

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Unit III: Image Reproduction **[6 Hrs.]**

Originals: Analog and Digital Originals, Line & halftone techniques, Basic prepress, Halftone theory, methods of converting continuous tone to Halftone - AM, FM & hybrid screening, Dot reproduction, Color correction in DTP – Tonal Gradation Curve, UCR and GCR, Substrate gloss, Print gloss, thermal stability, water resistance, weathering, scratch resistance, abrasion resistance

Unit IV: Process Colors and Spot Colors **[6 Hrs.]**

Screening frequency and screen angles, print sequence, verification of plate specifications, verification of inks, viewing and illumination conditions, requirements of spot color printing

Unit V: Understanding Dot gain and Densitometry **[6 Hrs.]**

Study of different types of dot gain: mechanical dot gain and optical dot gain, Murray Davis Equation and Yule Neilson equation, Types of Densitometers such as Reflection and Transmission density, Print Density, Characteristics curve, Dot Compensation curves, Calculating Print Contrast, Grayness, Hue error and Ink Trapping, Grey Balance

Unit VI: Management and Production Planning **[6 Hrs.]**

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, costing for print production, various parameters of post press considerations.

Guidelines for Laboratory Conduction

1. Handle all measurement devices carefully
2. Wait for instructions prior to use of any testing and measuring instruments
3. Calculations should be carried out independently

Term Work:

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

1. Study various types of Conventional Originals, Digital Originals and Resolution
2. Study the settings of a scanned photograph and editing of the photograph for further processing
3. Prepare a design for offset printing and check for the parameters such as over printing and color separation

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4. Prepare a design and apply UCR, GCR and Tonal gradation curves in image editing software.
5. Study working of Densitometer and measure density, dot gain, dot area, contrast and trapping
6. Calculate mechanical and optical dot gain for at least 5 different substrates
7. Study elements in a control strip
8. Study the spot color applications and spot color separations used in different printing software.
9. Study ISO printing standards and design a layout according to ISO standards for any one of the printing processes.
10. Costing of design and layout for different print process

Text Books

[T1] Kimberly Elam, (April 2007) Typographic Systems: Frameworks for Type Beyond the Grid, Princeton Architectural Press

[T2] Frank Cost, (1997), Pocket Guide to Digital Printing, Delmar Publishers

[T3] Noemer, Ewad Fred, Handbook of Modern Halftone Photography, Perfect Graphic Arts, Demarset, U.S.A.

Reference Books

[R1] H. Kipphan, (2001), Handbook of Print Media, Springer Publication.

[R2] Eric Chambers, (1977), Manual of graphic reproduction for lithography, Litho Training Services Ltd., London.

[R3] R.W.G. Hunt, (1975), The Reproduction of Color, 3rd edition, John Wiley & Sons, New York.

[R4] Phil Green, (1995), Understanding Digital Color, 2nd Edition, GATF Press.

[R5] David Bergsland, (1997), Printing in a Digital World, Delmar Publishers.

Unit	Text Books	Reference Books
Unit 1	T1	R1, R2, R3
Unit 2	-	R3
Unit 3	-	R1, R5
Unit 4	T2, T3	R1, R2, R5
Unit 5	-	R1
Unit 6	-	R1

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(208290) Communication Skills

Teaching Scheme	Credits	Examination Scheme
Practicals: 2 Hrs/ Week	01	Term work: 25 Marks

Pre-requisites: Introduction to Print Processes, Print and Packaging Layout Design

Course Objectives:

The objectives of the Course are:

1. Know the basic requirements of Self Awareness and Self Development
2. Understand the importance of communication, types, barriers of communication for effective communication
3. Understand the etiquettes for corporate grooming & dressing, Email and telephone etiquettes, etiquettes in social and office setting
4. Understand the various types of leadership skills
5. Understand stress management skills
6. Develop the time management skills

Course Outcomes:

On successful completion of the course the student will be able to:

1. Apply the SWOT analysis for evaluation of Self Awareness and Self Development
2. Analyze the importance of communication, different types and barriers of communication for effective communication
3. Apply the various etiquettes for social and Corporate grooming
4. Analyze the interpersonal skills to develop the interpersonal relationship to work in Team.
5. Analyze the leadership skills to organize the events.
6. Apply the professional approach to solve practical issues and time and stress management.

Unit I: Self Awareness and Self Development **[4 Hrs.]**

Self-Assessment , Self-Appraisal, SWOT, Goal setting - Personal & career - Self Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating, SWOT analysis & goal setting, prioritization.

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Unit II: Communication Skill **[6 Hrs.]**

Importance of communication, types, barriers of communication, effective communication Speaking Skills – Public Speaking, Presentation skills, Group discussion - Importance of speaking effectively, speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self-expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, positive image projection techniques. Listening Skills: Law of nature- you have 2 ears and 1 tongue so listen twice and speak once is the best policy, Empathic listening, Avoid selective listening, Group Discussion - characteristics, subject knowledge, oral and leadership skills, team management, strategies and individual contribution and consistency, Presentation skills - planning, preparation, organization, delivery. Written Skills – Formal & Informal letter writing, Report writing, Resume writing - Sentence structure, sentence coherence, emphasis. Paragraph writing. letter writing skills – form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc.

Unit III: Corporate / Business Etiquettes **[2 Hrs.]**

Corporate grooming & dressing, Email & telephone etiquettes, etiquettes in social and office setting, Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Body language, Meeting etiquettes (targeted at young professionals who are just entering business environment), Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities.

Unit IV: Interpersonal Relationship **[4 Hrs.]**

Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity, Group Discussion- Preparation for a GD, Introduction and definitions of a GD, Purpose of a GD, Types of GD, Strategies in a GD , Conflict management, Do's and Don'ts in GD

Unit V: Leadership Skills **[2 Hrs.]**

Leaders' role, responsibilities and skill required - Understanding good Leadership behaviors, Learning the difference between Leadership and Management, Gaining insight into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and Communication Skills, Learning about Commitment and How to Move Things Forward, Making Key Decisions, Handling Your and

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Other People's Stress, Empowering, Motivating and Inspiring Others, Leading by example, effective feedback

Unit VI: Other Skills **[2 Hrs.]**

Time management - The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan ahead, how to handle interruptions , to maximize your personal effectiveness, how to say "no" to time wasters, develop your own individualized plan of action, Stress management - understanding the stress and its impact, techniques of handling stress, Problem solving skill, Confidence building Problem solving skill, Confidence building

Guidelines for Laboratory Conduction

1. Handle all measurement devices carefully
2. Wait for instructions prior to use of any testing and measuring instruments
3. Calculations should be carried out independently

Term Work:

Note: Term-work shall consist of record of the 8 assignments presented in the form of journals.

1. SWOT analysis
2. Personal & Career Goal setting – Short term & Long term
3. Presentation Skill
4. Letter/Application writing
5. Report writing
6. Listening skills
7. Group discussion
8. Resume writing
9. Public Speaking
10. Stress management
11. Team Activity-- Use of Language laboratory

*** Perform any 8 exercises out of above 11 with exercise no. 11 as compulsory.**

Teaching Methodology

Each class should be divided into three batches of 20-25 students each. The sessions should be activity based and should give students adequate opportunity to participate actively in each activity.

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Teachers and students must communicate only in English during the session. Specific details about the teaching methodology have been explained in every activity given below.

Practical Assignments (Term work)

Minimum 8 assignments are compulsory and teachers must complete them during the practical sessions within the semester. The teacher should explain the topics mentioned in the syllabus during the practical sessions followed by the actual demonstration of the exercises. . Students will submit report of their exercise (minimum 8) assignments as their term work at the end of the semester but it should be noted that the teacher should assess their assignment as soon as an activity is conducted. The continual assessment process should be followed.

1. SWOT Analysis

The students should be made aware of their goals, strengths and weaknesses, attitude, moral values, self confidence, etiquettes, non- verbal skills, achievements etc. through this activity. The teacher should explain to them on how to set goals, SWOT Analysis, Confidence improvement, values, positive attitude, positivethinking and self esteem. The teacher should prepare a questionnaire which evaluate students in all the above areas and make them aware about these aspects.

2. **Personal & Career Goal Setting:** Short term & Long term

3. Presentation Skills

Students should make a presentation on any informative topic of their choice. The topic may be technical or non-technical. The teacher should guide them on effective presentation skills. Each student should make a presentation for at least 10 minutes.

4. Letter/Application Writing

Each student will write one formal letter, and one application. The teacher should teach the students how to write the letter and application. The teacher should give proper format and layouts.

5. Report Writing

The teacher should teach the students how to write report .. The teacher should give proper format and layouts. Each student will write one report based on visit / project / business proposal etc.

6. Listening Skills

The batch can be divided into pairs. Each pair will be given an article (any topic) by the teacher. Each pair would come on the stage and read aloud the article one by one. After reading by each pair, the other students will be asked questions on the article by the readers. Students will get marks for correct answers and also for their reading skills. This will evaluate their reading and listening skills. The teacher should give them guidelines on improving their reading and listening skills. The teacher should also give passages on various topics to students for evaluating their reading comprehension.

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7. Group Discussion

Each batch is divided into two groups of 12 to 14 students each. Two rounds of a GD for each group should be conducted and teacher should give them feedback.

8. Resume Writing

Each student will write one formal letter, and one application. The teacher should teach the students how to write the letter and application. The teacher should give proper format and layouts.

9. Public Speaking

Any one of the following activities may be conducted:

a. **Prepared Speech:** Topics are given in advance, students get 10 minutes to prepare the speech and 5 minutes to deliver.

b. **Extempore Speech:** Students deliver speeches spontaneously for 5 minutes each on a given topic.

c. **Story Telling:** Each student narrates a fictional or real life story for 5 minutes each.

d. **Oral Review:** Each student orally presents a review on a story or a book read by them.

10. **Team Activity:** Use of Language laboratory

Text Books

[T1] Communication Skills : Sanjay Kumar and Pushpa Lata , Oxford University Press

[T2] Developing Communication Skill : Krishna Mohan, Meera Banerji,- McMillan India Ltd.

[T3] English for Business Communication : Simon Sweeney , Cambridge University Press

Reference Books

[R1] NASSCOM-Global Business Foudation Skills: Accenture,Convergys,Dell et.al. Foundation Books : Cambridge University Press

[R2] Basic Managerial Skills for all E. H. McGrath, Eastern Economy Edition, Prentice hall India.

[R3] Personality Development and Group Discussions,Barun K. Mitra, Oxford University Press 4. Group Dissussions and Interview Skills : Priyadarshi Patnaik : Foundation Books : Cambridge University Press

[R4] Thinks and Grow Rich: Napoleon Hill, Ebury Publishing, ISBN 9781407029252

[R5] Awaken the Giant Within: Tony Robbins HarperCollins Publishers, ISBN-139780743409384

[R6] Change Your Thoughts, Change Your Life: Wayne Dyer, Hay House India, ISBN-139788189988050

[R7] Habits of Highly Effective People: Stephen Covey Pocket Books, ISBN-139781416502494

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[R8] The Power of Your Subconscious Mind: Dr Joseph Murphy Maanu Graphics , ISBN-13 9789381529560

[R9] The new Leaders: Daniel Coleman Sphere Books Ltd , ISBN-139780751533811

[R10] The 80/20 Principal: by Richard Koch, Nicholas Brealey Publishings ,ISBN-13 9781857883992

[R11] Time management from inside out: Julie Morgenstern, Owl Books (NY), ISBN-13 9780805075908

[R12] Wonderland of Indian Manageress: Sharu Ranganekar, Vikas Publishing Houses, ISBN-13 9788125942603

[R13] You can win: Shiv Khera, Macmillan, ISBN-139789350591932

[R14] The Ace of Soft Skills: Attitude, Communication and Etiquette for Success: Gopalaswamy Ramesh, Mahadevan Ramesh

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(208291) Project Based Learning

Teaching Scheme	Credits	Examination Scheme
Practical: 4 Hrs/ Week	02	Term work: 50 Marks

Preamble:

For better learning experience, along with traditional classroom teaching and laboratory learning; project based learning has been introduced with an objective to motivate students to learn by working in group cooperatively to solve a problem.

Project-based learning (PBL) is a student-centric pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge, or problem. It is a style of active learning and inquiry-based learning. (Reference: Wikipedia). Problem based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development.

Course Objectives:

1. To emphasizes learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes:

1. Project based learning will increase their capacity and learning through shared cognition.
2. Students able to draw on lessons from several disciplines and apply them in practical way.
3. Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

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- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame.

A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be **exemplary**. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

1. A few hands-on activities that may or may not be multidisciplinary
2. Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize and present their learning.
3. Activities may include- Solving real life problem, investigation /study and Writing reports of in depth study, field work.

Assessment:

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness.

Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities.

Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and

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services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.

1. Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.
2. Individual assessment for each student (Understanding individual capacity, role and involvement in the project).
3. Group assessment (roles defined, distribution of work, intra-team communication and togetherness).
4. Documentation and presentation

Evaluation and Continuous Assessment:

It is recommended that the all activities are to be record and regularly, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes.

Recommended parameters for assessment, evaluation and weightage:

1. Idea Inception **(5%)**
2. Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product **(50%)** (Individual assessment and team assessment)
3. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) **(25%)**
4. Demonstration (Presentation, User Interface, Usability etc) **(10%)**
5. Contest Participation/ publication **(5%)**
6. Awareness /Consideration of Environment/ Social /Ethics/ Safety measures/Legal aspects **(5%)**

PBL workbook will serve the purpose and facilitate the job of students, mentor and project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

References:

Websites:

1. https://www.pblworks.org/what-is-pbl
2. https://www.edutopia.org/project-based-learning
3. https://www.teachthought.com/project-based-learning/20-examples-of-project-based-learning/
4. https://educatorsusa.org/our-programs/professional-development/project-based-learning/
5. https://www.schoology.com/blog/project-based-learning-pbl-benefits-examples-and-resources

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