List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Industrial and Production Engineering*

Programme Name : *B.Tech.*

Academic Year : 2021-22

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

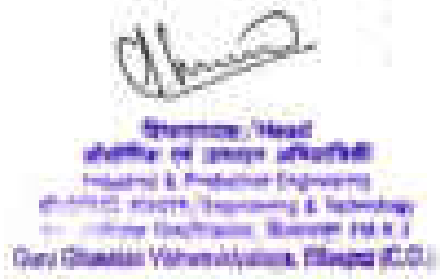
Sr. No.	Course Code	Name of the Course
01.	IP3TBS01	STATISTICAL METHODS
02.	IP3TES11	STRENGTH OF MATERIALS
03.	IP3TES12	MATERIAL SCIENCE AND METALLURGY
04.	IP3TPC11	THEORY OF MACHINE
05.	IP3TPC12	MANUFACTURING PROCESSES - I
06.	IP3LPC11	THEORY OF MACHINE LAB
07.	IP3LES12	STRENGTH OF MATERIALS LAB
08.	IP3THS11	ENGINEERING ECONOMICS
09.	IP3THS12	WORK STUDY AND ERGONOMICS
10.	IP4TBS02	NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING
11.	IP4TPC21	MACHINE DRAWING
12.	IP4TPC22	INDUSTRIAL ENGINEERING
13.	IP4TPC23	MANUFACTURING PROCESSES-II
14.	IP4TPC24	FLUID MECHANICS
15.	IP4LPC21	NACP
16.	IP4LPC24	FLUID MECHANICS LAB
17.	IP4TPE11	BUSINESS COMMUNICATION AND PRESENTATION SKILL
18.	IP4TPE12	OCCUPATIONAL HELATH AND SAFETY

19	IP4TPE13	BUSSINESS ETHICS AND CORPORATE GOVERNANCE
20	IP5TPC31	METAL CUTTING
21	IP5TPC32	FLUID MACHINERY
22	IP5TPC33	MACHINE DESIGN- I
23	IP5TPE21	TURBO MACHINES
24	IP5TPE22	INTERNAL COMBUSTION ENGINE
25	IP5TPE23	MEMS AND NANO TECHNOLOGY
26	IP5TPE31	TOTAL QUALITY MANAGEMENT
27	IP5TPE32	INDUSTRIAL AUTOMATION
28	IP5TPE33	MECHATRONICS
29	IP5TOE11	FINANCIAL MANAGMENT
30	IP5TOE12	MANAGERIAL ECONOMICS
31	IP5TOE13	FINANCIAL ACCOUNTING AND COSTING
32	IP5LPC31	METAL CUTTING LAB
33	IP5LPC32	FLUID MACHINERY LAB
34	IP5LPC33	SEMINAR
35	IP6TPC41	MACHINE DESIGN- II
36	IP6TPC42	MEASUREMENT, METROLOGY & CONTROL
37	IP6TPC43	WELDING ENGINEERING
38	IP6TPE41	MATERIAL MANAGEMENT
39	IP6TPE42	PLANT LAYOUT AND MATERIAL HANDLING
40	IP6TPE43	MAINTANCE AND RELIABILITY ENGINEERING
41	IP6TPE51	Automobile Engineering
42	IP6TPE52	POWER PLANT ENGINEERING
43	IP6TPE53	HEAT & MASS TRANSFER

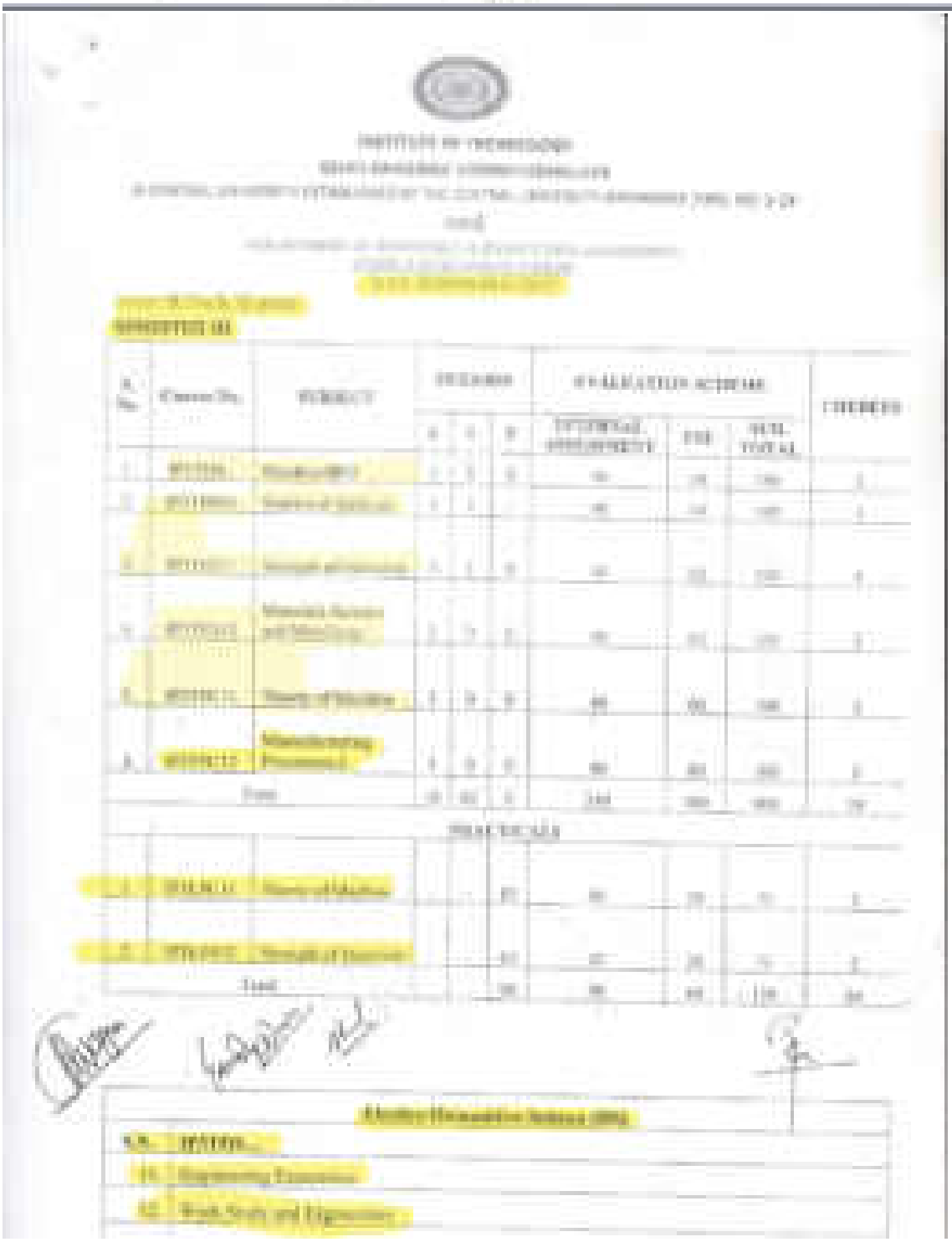
44	IP6TOE21	ENTERPRISE RESOURCE PLANNING
45	IP6TOE22	MANAGEMENT INFORMATION SYSTEM
46	IP6TOE23	SIX SIGMA AND DOE
47	IP6LPC42	MEASUREMENT AND METROLOGY LAB
48	IP6LPC43	WELDING ENGINEERING LAB
49	IP7TPC51	PRINCIPLES OF MANAGEMENT
50	IP7TPC52	PRODUCTION PLANNING AND CONTROL
51	IP7TPC53	CAD/CAM
52	IP7TOE31	PRODUCT DESIGN & DEVELOPMENT
53	IP7TOE32	ENTERPRENUERSHIP DEVELOPMENT
54	IP7TOE33	STRATEGIC MANAGEMENT
55	IP7TPE61	MACHINE TOOL DESIGN
56	IP7TPE62	REFRIGERATION AND AIR CONDITIONING
57	IP7TPE63	COMPOSITE MATERIALS AND TECHNOLOGY
58	IP7LPC53	CAD/CAM LAB
59	IP7LPC54	SEMINAR ON SUMMER TRAINING (ABOUT 30 DAYS)
60	IP7LPC55	MINOR PROJECT
61	IP8TPC61	OPERATION RESEARCH
62	IP8TPC62	MARKETING MANAGEMENT
63	IP8TOE41	SUPPLY CHAIN MANAGEMENT
64	IP8TOE42	SAFETY MANAGEMENT AND LABOUR LAW
65	IP8TOE43	FINITE ELEMENT METHOD
66	IP8TPE71	FLUID POWER AND CONTROL
67	IP8TPE72	ROBOTICS AND ROBOT APPLICATION
68	IP8TPE73	POWDER METALLURGY & CERAMICS

69	IP8LPS02	MAJOR PROJECT
70	IP8LPC01	COMPREHENSIVE VIVA
71	IP01TBS01	MATHEMATICS-II
72	IP01TBS02	CHEMISTRY
73	IP01TES01	PROGRAMMING FOR PROBLEM SOLVING
74	IP01TES02	ENGINEERING MECHANICS
75	IP01PBS01	CHEMISTRY LAB
76	IP01PES01	PROGRAMMING FOR PROBLEM SOLVING LAB
77	IP01PES02	WORKSHOP AND MANUFACTURING PRACTICES
78	IP01PES03	ENGINEERING MECHANICS LAB
79	IP01PMC01	INDUCTION TRAINING PROGRAMME
80	IP02TBS03	PHYSICS
81	IP02TES03	BASIC ELECTRICAL ENGINEERING
82	IP02TBS04	MATHEMATICS-I
83	IP02THS01	ENGLISH
84	IP02THS02	ENVIRONMENTAL SCIENCES
85	IP02PBS02	PHYSICS LAB
86	IP02PES04	BASIC ELECTRICAL ENGINEERING LAB
87	IP02PES05	ENGINEERING GRAPHICS AND DESIGN
88	IP07TMC02	Indian Constitution
89	IP07TPE51	Fundamentals Of Green Manufacturing
90	IP07TOE21	Advanced Manufacturing Processes
91	IP07TOE23	Maintenance Management
92	IP08TMC03	Essence Of Indian Traditional Knowledge
93	IP08THS41	Intellectual Property Rights

94	IP08TOE31	Computer Aided Process Planning
95	IP08TOE32	Microprocessors In Automation



Scheme and Syllabus



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & CULTURE OF MATTER

IPEE1812 WORK STUDY AND ERGONOMICS (Elective)

Unit I

Introduction to vision condition systems and ergonomics. Human factors in design and engineering. Sources of ergonomics and aesthetic design. Physiological aspects of work.

Unit II

Work measurement through physiological tests. Work physiology. Paced and unpaced work performance. Data logging, data reduction, data extraction and analysis techniques. Gross human assessing, Anthropometry, Bio-mechanics, muscle strength and exertion potential of different faults.

Unit III

Workspacing. Environmental effects, exercises for evaluation of national trees and work spaces. Environmental condition including temperature, illumination, noise and vibration.

Unit IV

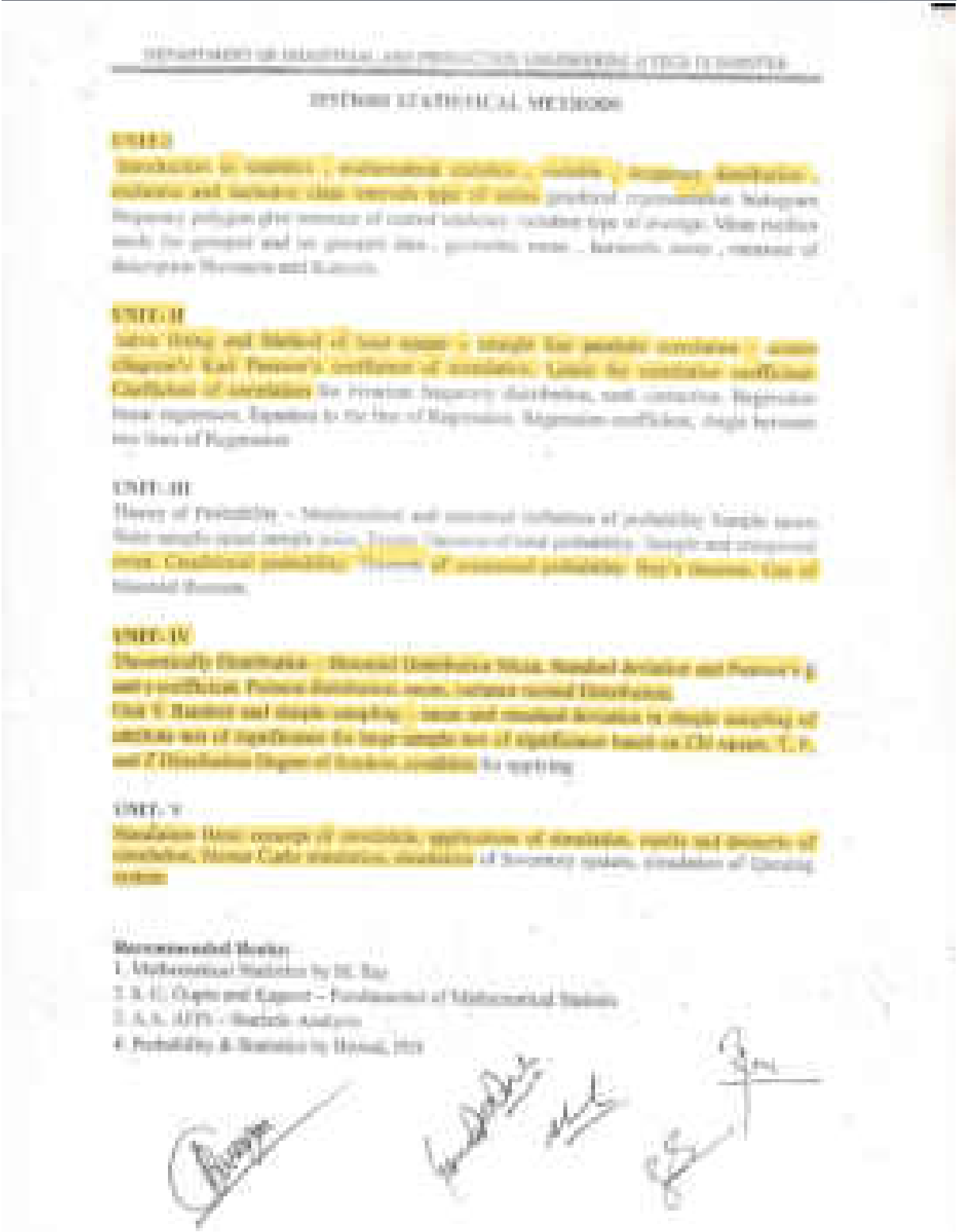
Perception and information processing, design of displays, hand control, typography, and controlled, layout and compositions.

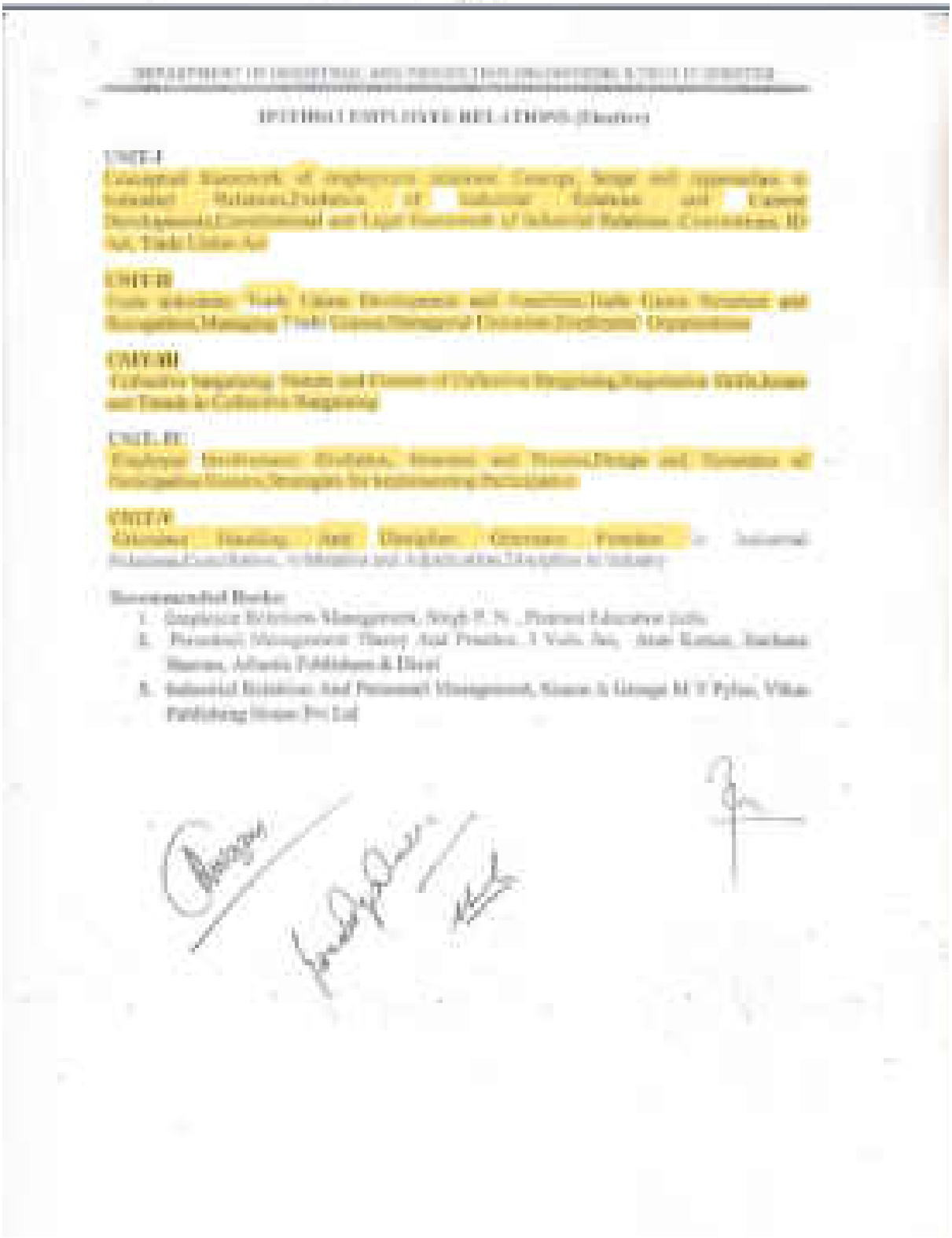
Unit V

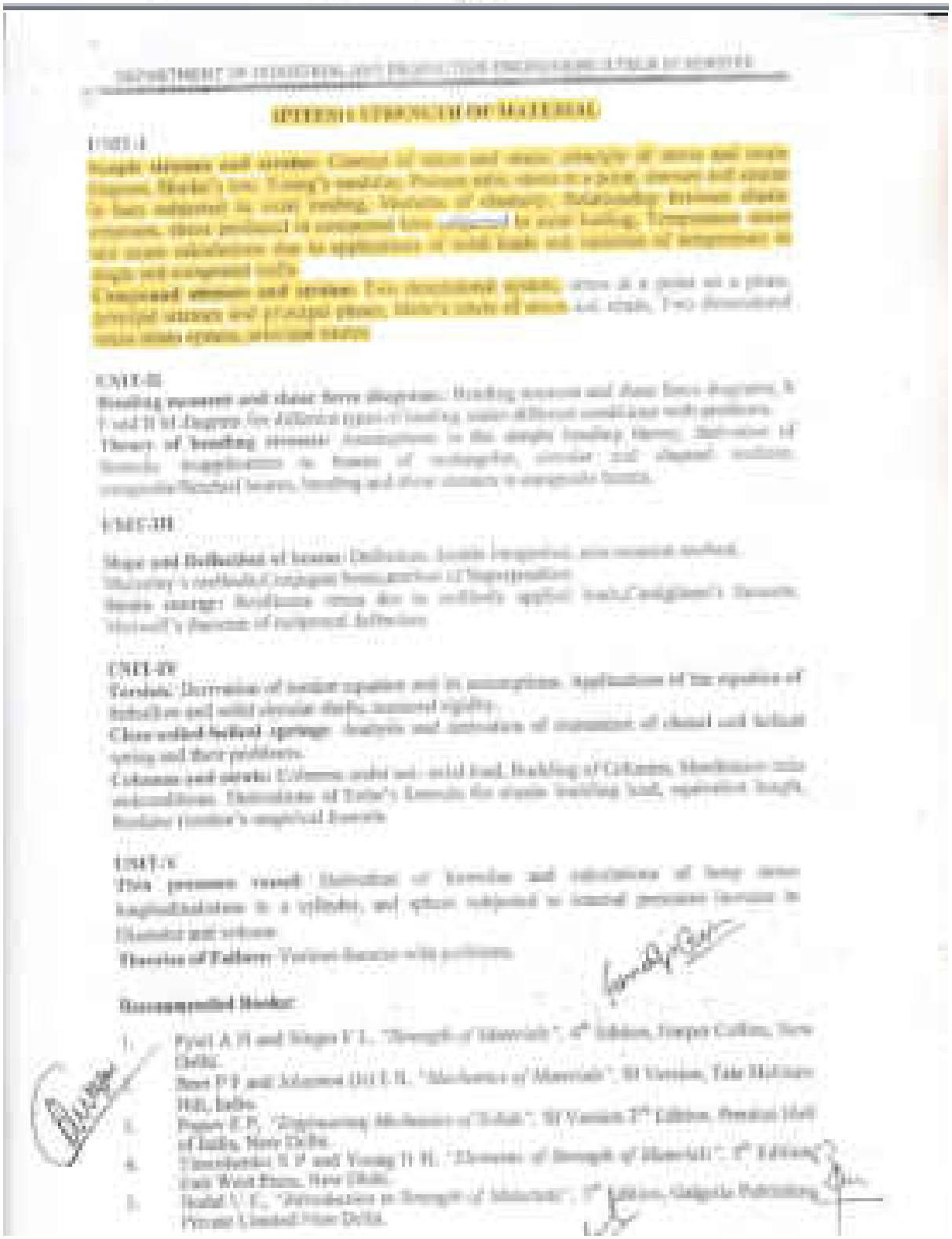
Exercises in evaluation of human response (speaker) interface, product safety and product liability. Design considerations for ergonomics, robotic feature problems.

Recommended Books:

1. D. C. Alexander, *Applied Ergonomics*, Taylor & Francis.
2. Jan Dul, *Ergonomics for Beginners*, Taylor & Francis.
3. David Pye, *The Nature & Aesthetics of Design*, Cardinan Press.







DETAILED STRUCTURE OF MATERIAL

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

UNIT-V

Recommended Books:

1. Pytel A. H and Singer F. L., "Strength of Materials", 4th Edition, Harper Collins, New Delhi.
2. Beer F.P and Johnston (Jr) E.R., "Mechanics of Materials", SI Version, Tata McGraw Hill, India.
3. Popov E.P., "Engineering Mechanics of Solids", SI Version 2nd Edition, Prentice Hall of India, New Delhi.
4. Timoshenko S.P and Young D.H., "Elements of Strength of Materials", 5th Edition, East West Press, New Delhi.
5. Sadhu V. C., "Introduction to Strength of Materials", 1st Edition, Galgotia Publishing Private Limited New Delhi.

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & SCIENCE

MATERIAL THEORY OF MACHINE

UNIT- I

Basic Concepts: Kinematics of machine, Kinematic link and their different types, types of kinematic pair, Kinematic chain, mechanism and inversion of four bar chain and slider crank mechanism. Degree of freedom, synthesis of linkages - normal synthesis, Grashof's criterion and introduction to dimensional synthesis. Brief introduction to mechanism with lower pairs, pantograph, Arc's & Scheinman's steering mechanism.

UNIT-II

Velocity Analysis: Motion of a link, velocity of a point on a link by relative velocity method, velocities of slider crank mechanisms, setting velocity at a pin plate, velocity of a point on a link by instantaneous center method, properties and types of I-Centre, Kennedy Theorem and methods of locating I-centers in a mechanism.

Acceleration Analysis: Acceleration of a point on a link, acceleration in slider crank mechanism, Coriolis component of acceleration, Quick return mechanism.

UNIT-III

Gears: Classification of gears, terminology used in gears, law of gearing, velocity of sliding, Spread tooth, construction and properties of an involute, construction and properties of cycloidal tooth, effect of variation of center distance on the velocity ratio of involute profile tooth gears, length of path of contact, arc of contact, number of pairs of teeth in contact, interference, minimum number of teeth, interference between rack and pinion, nonstanding, terminology of helical and worm gears.

UNIT- III

Gear Trains: Definition of simple, compound, reverted and epicyclic gear trains, velocity ratio of epicyclic gear trains.

Clutch: Single plate and multi plate clutch, cone clutch.

Brakes: types and analysis by assuming uniform pressure and uniform wear theory, simple brake, band brake, block brake and internal shoe brake.

UNIT- IV

Cams and Followers: Types of cams and followers, Specified motion of followers, Uniform acceleration & deceleration, S.H.M. and uniform velocity Graphical construction of cam profile.

Turning Moment of Flywheel:

Function of a flywheel, Crank effort diagrams, Fluctuation of speed and energy, Effect of centrifugal tension of flywheel, inertia torque and its effects on Crank effort diagrams

UNIT-V

Governors: Distinction between function of a flywheel and governor, types of governor, Watt, porter proell, hartnell governor.

Balancing: Static and dynamic balancing, balancing of several masses in different planes.

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING, SYSTEM ENGINEERING

BTITPC 12 MANUFACTURING PROCESSES-I

UNIT-I

Lathe: Lathe design and accessories, Specification, Types of Lathe, access lathe, capstan and turret lathe, various operations performed on lathe, operating conditions, calculation of material
removal rate.

Drilling: Fundamental of drilling process, types of drilling machine, types of drills, geometry of twist drill, various operations performed on drilling machine.

Milling: Introduction, types and processes, Milling cutters, up and down milling, different operations on milling, balancing and types, calculation of MRR.

Boring: Introduction to boring, reaming, tapping and tops, cross hole making operations.

UNIT-II

Broaching: Introduction, Machines and processes.

Grinding: Classify grinding machines,conventional features and working of various grinding and super-finishing machines.

Honing, lapping, buffing & super finishing processes with their applications.

Threads Manufacturing: Introduction, thread production processes and machines.

UNIT-III

Planning: Introduction, different operations and calculation of MRR.

Gear Manufacturing: Introduction to gear cutting process, gear forming, gear shaping, gear hobbing and gear finishing along with inspection.

Forming: Mechanism of forming process, elastic and plastic deformation.

UNIT-IV

Rolling: Classification, Amount of Hot & Cold rolling, rolling mills & its types, two-hi, four-hi, six-hi and twenty-hi rolling mill, calculation of rolling parameters & rolling defect.

Forging: Classification of forging process, forging equipments, calculation of forging parameters, forging defects.

Extrusion: Types, extrusion equipments & analysis of processes, drawing of rods, wire & tube and their analysis, defects in extrusion & drawing.

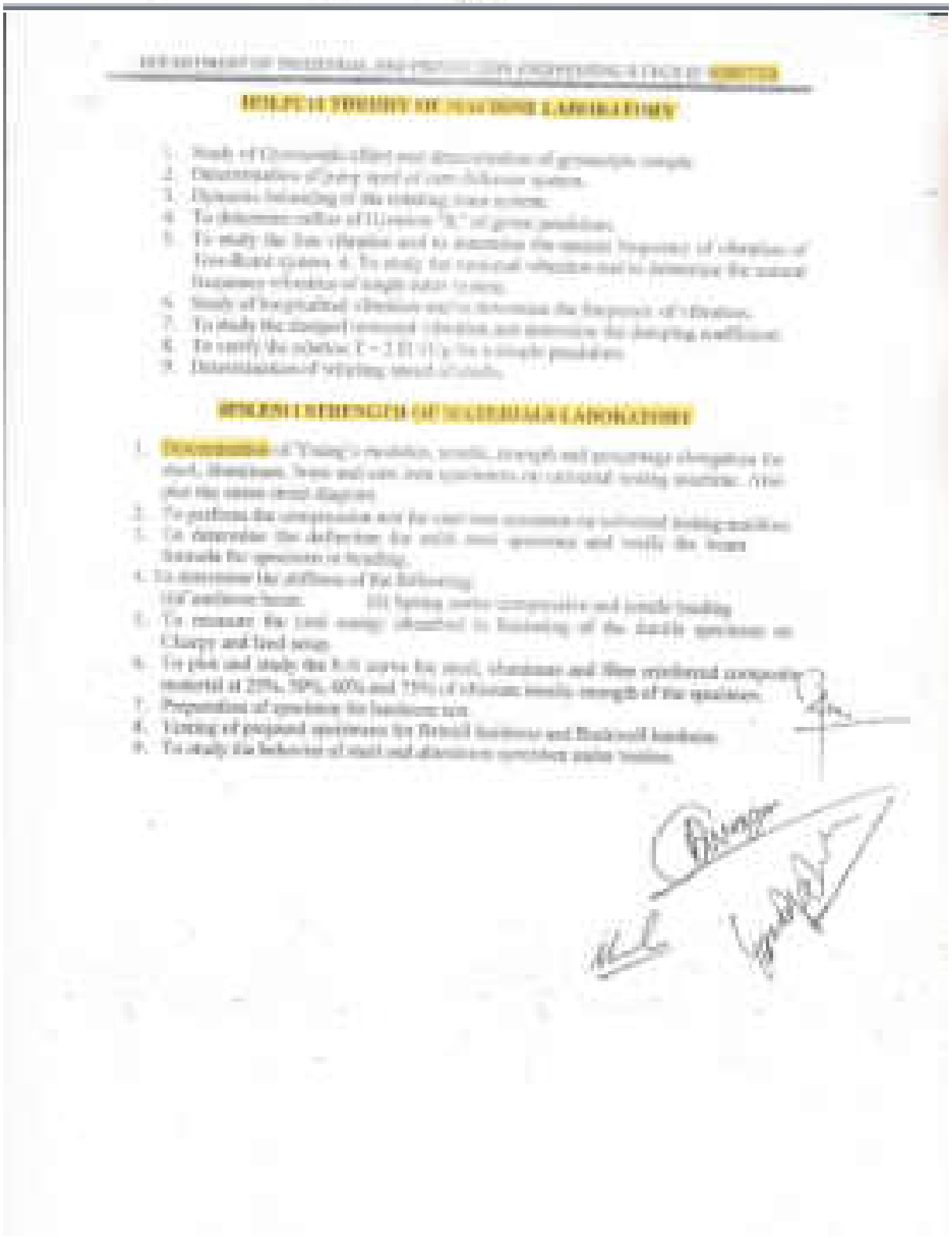
UNIT-V

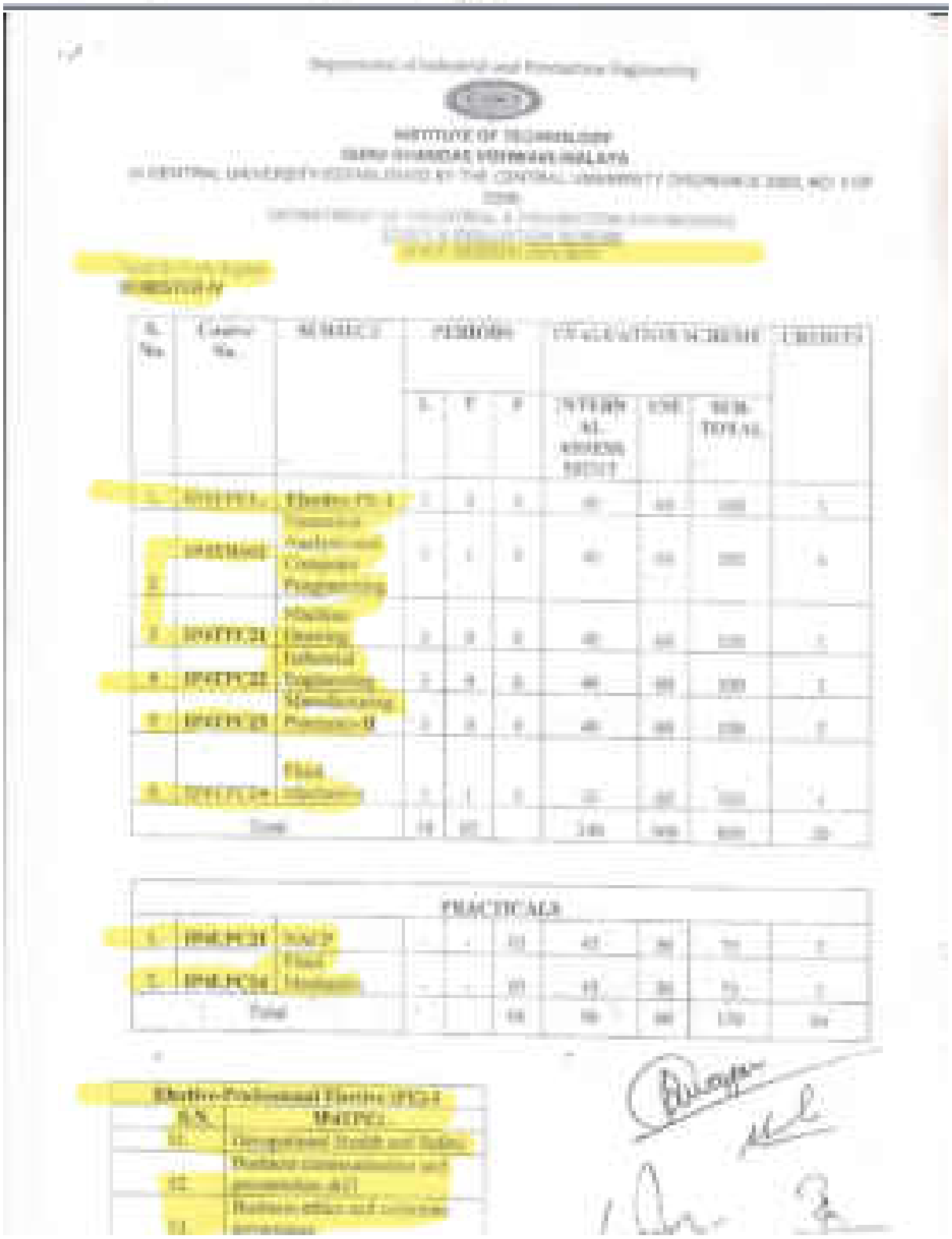
Work Holding Device: Introduction to jigs and fixtures their types, design criteria for jigs and fixtures, assessment justification of jigs and fixtures.

Plastic Working: Plastic processing, injection, compression & blow moulding, plastic design principles processes, machines and equipments, parameters and force calculations.

Recommended Books:

1. Raghavan, Material Science and Engineering.
2. Swamp, Elements of Metallurgy.
3. Vasishak, Elements of Material Science and Engineering.
4. Agarwal, D.K. Introduction to engineering Materials.





DEPARTMENT OF PROFESSIONAL AND PRODUCTION PROGRAMMING & TECH OF SERVICES

OPTIMIC NUMERICAL ANALYSIS & COMPUTER PROGRAMMING

UNIT-I

Approximation and errors in Computation

Approximation and round of errors, truncation errors and Taylor series, Determination of roots of [illegible] and [illegible] equations by Graphical methods and Bisection, Regula-Falsi [illegible] and Newton-Raphson methods, solution of Linear simultaneous, linear algebraic equations by [illegible] Gauss-Jordan and Gauss-Seidel iteration method.

UNIT-II

Empirical Laws, Curve Fitting & Interpolation

Curve fitting linear and non-linear regression analysis (Method of [illegible] average and least squares) [illegible] differences, backward, forward and central difference relation and their use in Numerical differentiation and integration and their application in [illegible].

UNIT-III

Numerical Solution of Ordinary Differential Equations

Numerical Integration by Trapezoidal rule, Simpson's [illegible] rule and its [illegible] Application of differential relation to the solution of partial differential equations. Numerical solution of ordinary differential equations by Taylor's series, Euler, modified Euler, Runge-Kutta and Predictor-Corrector method.

UNIT-IV

Numerical Solutions of partial differential Equations

Introduction, classification of second order equations, finite difference approximations to partial derivatives, elliptic equations, solution of Laplace equation, solution by Poisson's equation, solution of elliptic equations by relaxation method, parabolic equations, solution of one-dimensional heat equation, solution of two-dimensional heat equation, Hyperbolic equations, solution of wave equation.

UNIT-V Computer Programming

VD Statement, Mathematical Relational & Conditional statement & Expressions, Recent Loops and Control Statement, Introduction to one dimensional array and two dimensional arrays. Basis of DO file Handling.

Recommended Books:

1. Numerical Methods in Engineering & Science-Dr. B.S.Grewal-Khanna Publishers.
2. Numerical Methods-P.Kandaswamy, K.Thilagavathy & K. Gunavathy-S Chand & Co.
3. Let us C-Yashwant Kanthar
4. Introductory Methods of Numerical Analysis-S.S.Sastry, 3rd Edn.-PHI-New Delhi.
5. Numerical Methods Analysis-James B.Scarborough, Oxford & IBH Publishing Co.-New Delhi.
6. Theory & Problem in Numerical Methods-T Veeraraju, T. Ramchandran- TMH.
7. Numerical Methods for Engineers-Steven C. Chapra,Raymond P. Canale.
8. The Spirit of C-Henry Mullish & Herbert L.Cooper-Jaico Pub. House.

MACHINE DRAWING

Unit-I

Unit-II

Unit-III

Unit-IV

Unit-V

Recommended books:

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & FACULTY OF SCIENCE

[illegible] INDUSTRIAL ENGINEERING

Unit-I Introduction

History & Development of industrial engineering. Productivity definition, means of increasing productivity, work study definition, productivity and work study, Human factor in the fabrication, Work of F.W. Taylor, Frank and Lillian Gilbert and their contribution.

Unit-II Method Study

Definition & Basic procedure, selection of jobs, recording techniques, micro motion, study, Therbligs, cyclograph and Chronocyclo graph, principle of motion economy, design of work place layout, analysis in the form of chart, operation chart, flow process chart, flow diagram, string diagram, man machine chart, two hand chart, flow chart.

Unit-III Work Measurement

Definition, objectives, application, number of cycle to be timed, time study equipment, performance rating, allowances, number of cycle to be recorded, determination of standard time, predetermined motion time systems, Conducting work sampling study & constructing standard time.

Unit-IV Wages & Incentives

Characteristics of a good wage in incentive system, control of wage payment, Concept of wage incentive schemes, financial and non financial, Taylor differential piece rate, Halsey premium plans, Merrick's multiple piece rate system, Group incentive scheme.

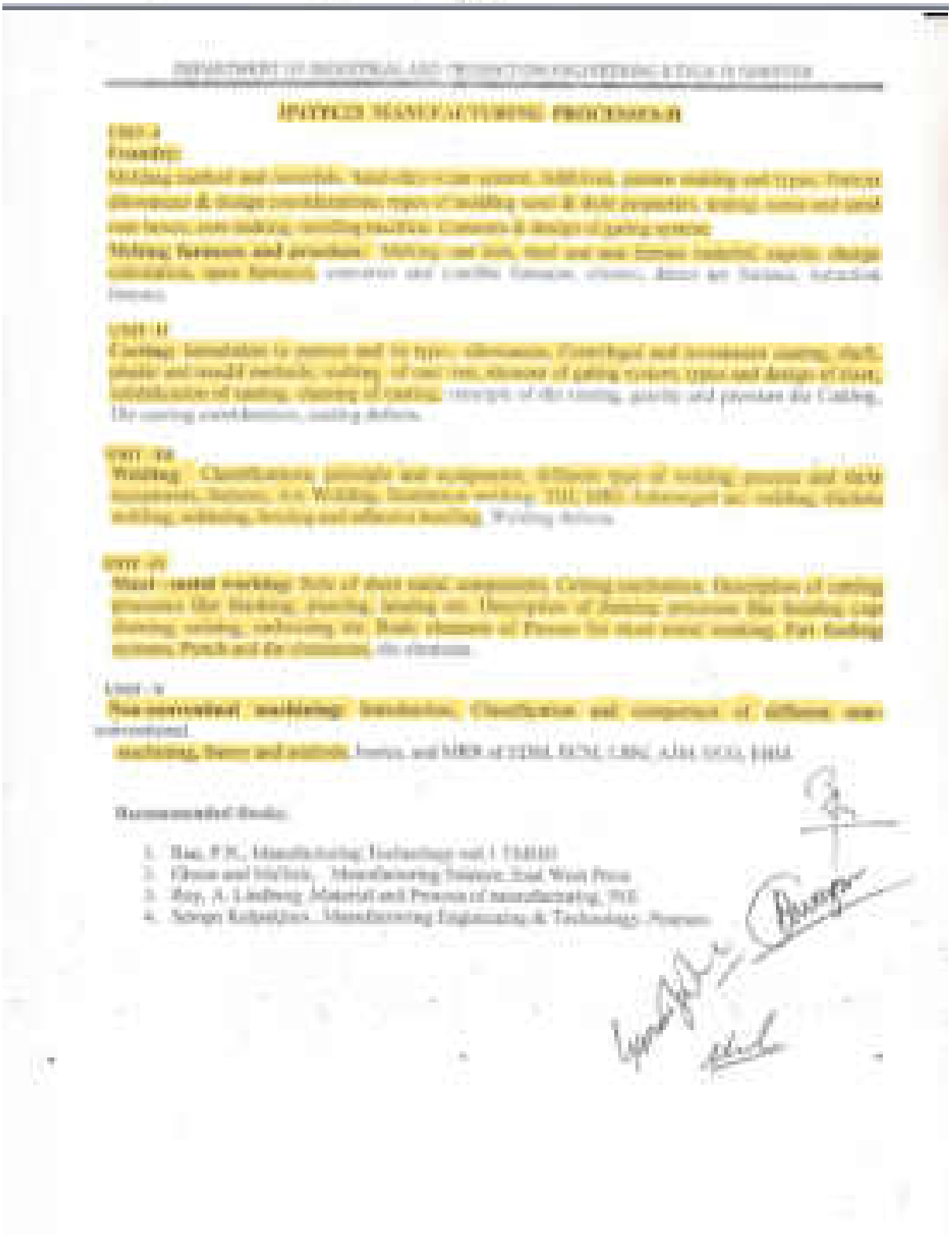
Ergonomics, work space dimension, design of work place, environmental sources & impacts on human work.

Unit-V

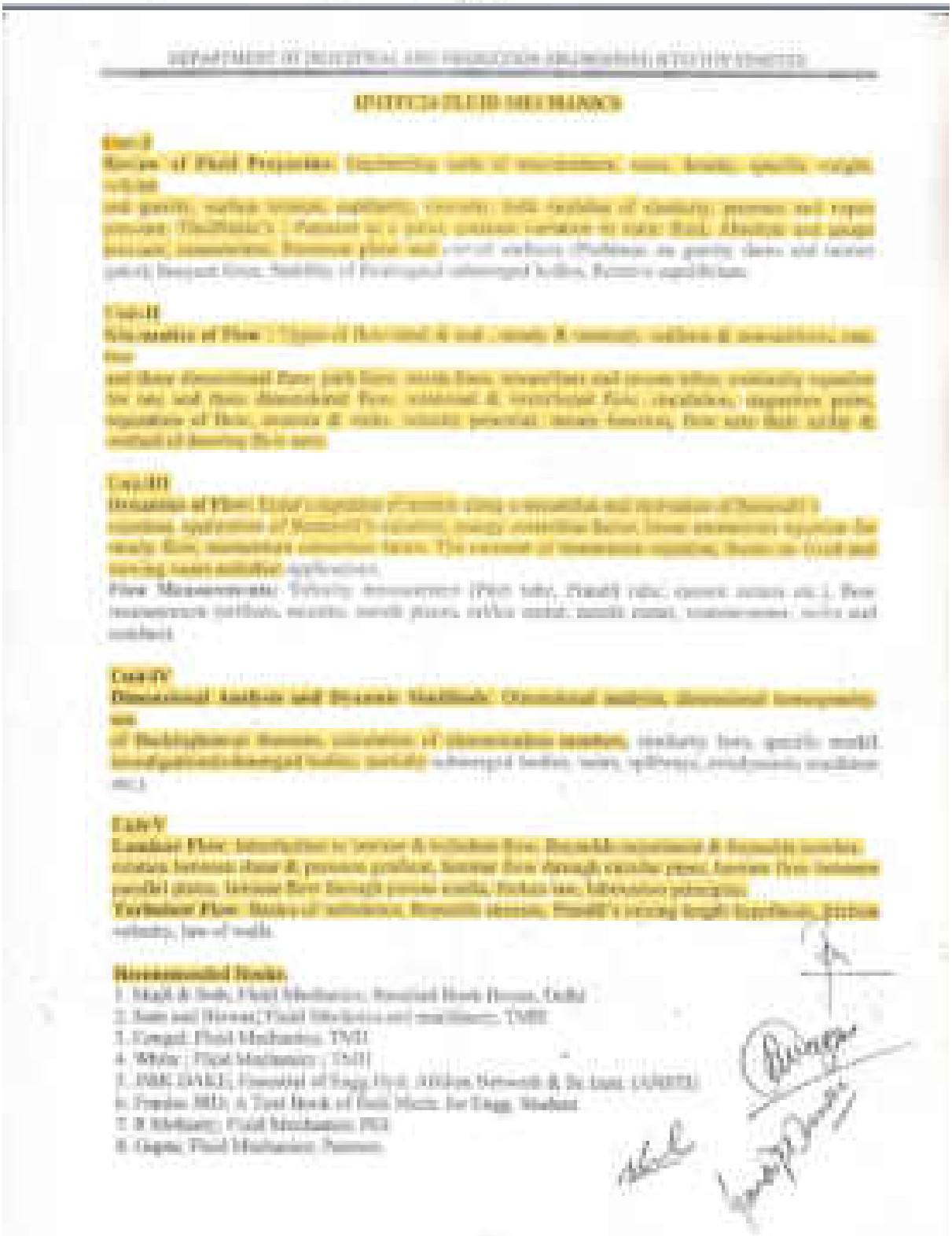
Value engineering: Introduction, concept of value, value analysis approaches, job plan, value area, **Industrial safety**, analysis of cost of accident, hurricane in various fields like fire, electrical shocks, chemical, regulation for safety, plant safety, govt. legislation for safety, safety rules.

Recommended Books:

1. I.L.O., "Introduction to work study", Oxford Press.
2. Mundel, "Motion and time study", Prentice Hall India.
3. Ralph M. Barnes, "Motion and Time Study", John Wiley and sons.
4. Industrial Engineering by M.I.Khan, New Age International Publication.



Courses Focus on Employability/Entrepreneurship/Skill Development Criteria – I (1.1.3)



APPLIED FLUID MECHANICS

Unit-I

Unit-II

Unit-III

Unit-IV

Unit-V

Recommended Books

1.
2.
3.
4.
5.
6.
7.
8.

[illegible] OCCUPATIONAL HEALTH AND SAFETY (Elective)

UNIT-I

Introduction, Environmental law, Legal aspect of [illegible] ordinance and amendment,Environmental issues and [illegible] levels, Health and safety law, common Safety[illegible] outbreak, abuse injuries, Health and safety at work, the principle legal requirements, Healthand safety and Industrial relation law.

UNIT-II

Health and safety Management, Safety Management and safety, Investigation reporting and recording of accidents, Health and safety inspection, Comprehensive Hygienic assessment, Principles of evaluating workers exposure, Risk assessment in the work place, Hygiene,accidents and prevention, Health and safety training and communication, Air [illegible] in [illegible] Principles of accident prevention, safe systems of work, Surveys and audits.

UNIT-III

Occupational Health and Hygiene: The organization of working environment, ventilation, lighting and conditions, welfare amenity provision, cleaning and hygiene, Toxicology and health, Occupational disease and conditions, Occupational exposure, OHS, Psychosocial factors, Physiological and psychological parameters, Occupational health practice, Noise and vibration, Dust and fumes, radiation and radiological protection, personal protection, Occupational hygiene practice, prevention and control strategies in occupational hygiene, manual handling, first aid, human factor and safety, mine safety technology.

UNIT-IV

Assessment of Exposure: Measurement of noise and vibration exposure, Noise and vibration assessment, Dust [illegible] monitoring, Risk exposure and employees health, Work Posture, Musculoskeletal disorders, Stress factors, Lifting Equipment, Maximum acceptable weight limits, Occupational Asthmatic, Cardiovascular health, Occupational determinants of heart rate variability, Ergonomic functions and ergonomic health.

UNIT-V

Government schemes and issues related to health and employment, Policies of government in mental context in Chhattisgarh state.

Recommended Books:

1. Jeremy W. Hayden, "Handbook of Health and safety Practice" Pearson Publishing
2. Dharmendra S Sengar, "Environmental law" Prentice Hall of India, New Delhi
3. Malcolm J Crocker, "Noise and Noise Control" CRC Press.
4. Mazid Mallik, " Chemist Guide to outflow Assessment Tests" Kalyani Academic Publishers
5. Mazek Mallik,"How one sensitivity" Pearson Publishing Co. NY
6. Cyril M Harris, "Handbook of Noise control" McGraw-Hill Book Company, NY
7. Maryanne Mallitty, "Occupational Audiometry" Butterworth-Heinemann,Imprint of Elsevier

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING, B.TECH. V SEMESTER

SPECIFIC BUSINESS COMMUNICATION AND PRESENTATION SKILL (Elective)

Unit- I

Business communication meaning, Role of communication in information age, content and meaning of communication, skills necessary for technical communication, Communication in a technical organization, Service to the process of course and role and skills

Unit -II

Style and organization in technical communication meaning, Listening, speaking, reading and writing as skills, Objectivity, clarity, precision as defining features of technical communication, Various types of business letting, Letters, memos, forms, notices, Language and format of various types of business letters, Language and style of reports, Report writing, contents, Analysis of a sample report

Unit -III

Communication and personality development meaning, Psychological aspects of communication, Logistics as a part of communication, Emotional Intelligence, Politeness and Etiquette in communication, Cultural factors that influence communication, Mechanisms to be avoided in communication, Language and persuasion, Language and conflict resolution

Unit -IV

Language Laboratory emphasizing Listening and comprehension skills, Reading skills, Sound Structure of English and intonation patterns

Unit -V

Oral Presentation and professional speaking meaning, Basics of English pronunciation, Elements of effective presentation, Body Language and use of voice during presentation, Connecting with the audience during presentation, Projecting a positive image while speaking, Planning and preparing a model presentation, Organizing the presentation in text thoughtfulness and content, Basics of public speaking, Preparing for a speech.

Recommended Books:

1. Fred Luthans, *Organizational Behaviour*, McGraw Hill
2. Lesikar and petit, *Report writing for Business*
3. M. Ashraf Rizvi, *Effective Technical Communication*, McGraw Hill
4. Wallace and Masters, *Personal Development for Life and Work*, Thomson Learning
5. Fathabullah, T. M. *Communication skills for Technical Students*
6. Michael Markham, John Woods, *The Business Intern Handbook*
7. Doris A. Murphy, *Effective Business Communication*
8. *MLA Handbook for Writers of Research Papers*

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & FICS IV SEMESTER

[illegible] BUSINESS ETHICS AND CORPORATE GOVERNANCE (Elective)

UNIT-I
Introduction: Corporation, definition and characteristics, history of corporate form and models, corporate objectives, corporations and government, governance, corporate governance, definition, perspectives.

UNIT-II
Theoretical Foundations of Corporate Governance: Notion of meeting of interest, property rights theory, notion of investors, agency theory, Profit and Income theory, concept of separation of ownership and control, shareholder, stakeholder tables.

UNIT-III
Effect of Governance in Organizational Owners, ownership structure, types of owners, ownership vs. control, board of directors, types of directors, board roles and board structures, board operations, executive management, role of CEO, successor planning, management myopia, institutionalisation, types, categories, features and role.

UNIT-IV
Work Ethics: Values and ethics, model of management in the global world, political governance, need for values in global change, better perspective, values for managers, feasible approach for managers in decision making.

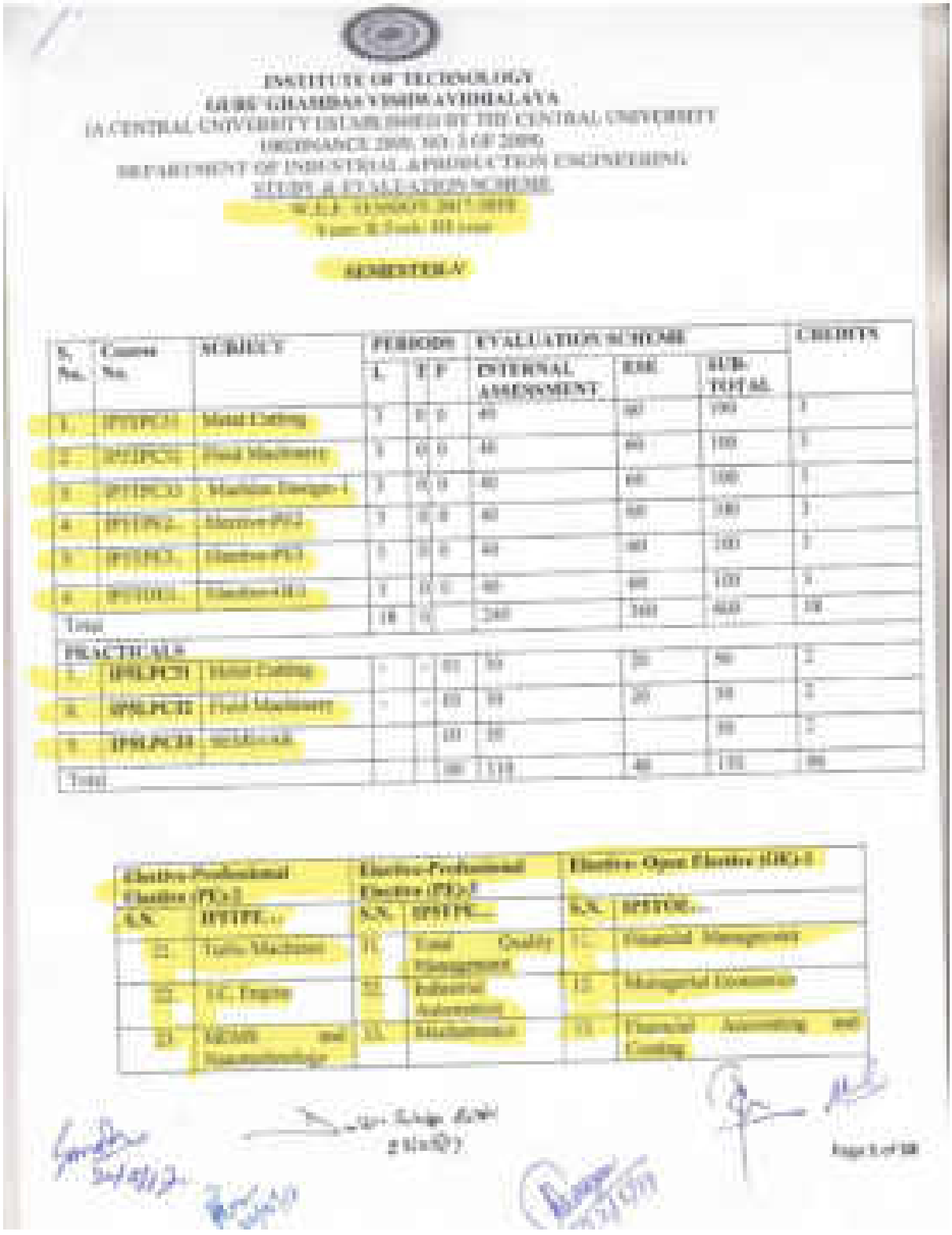
UNIT-V
Business Ethics and CSR: Corporation as a social institution, accountability and responsibility, relevance of rights between firm reporting to CSR, order of conduct, applications of ethical theories to decision making, ethical issues related to employment, healthcare and advertisement.

Recommended Books:

1. Prasanna B. Mallia, Corporate Governance: Concept, Evolution and India Story, Routledge, 2010.

2. Sahi, Business Ethics: Concepts and Cases, Tata McGraw Hill, 1998.

3. Robert Monks, Nell Minow, Corporate Governance, Wiley Publications, 2008.



INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY
ORDINANCE 2009, NO. 3 OF 2009)
DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
STUDY & EVALUATION SCHEME

SEMESTER-V

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IPSTPC01	Metal Cutting	3	0	0	40	60	100	3
2.	IPSTPC02	Metal Machining	3	0	0	40	60	100	3
3.	IPSTPC03	Machine Design-I	3	0	0	40	60	100	3
4.	IPSTPE2..	Elective-PE2	3	0	0	40	60	100	3
5.	IPSTPE3..	Elective-PE3	3	0	0	40	60	100	3
6.	IPSTOE1..	Elective-OE1	3	0	0	40	60	100	3
Total			18	0		240	360	600	18
PRACTICALS									
7.	IPSLPC01	Metal Cutting	-	-	03	50	50	50	2
8.	IPSLPC02	Metal Machining	-	-	03	50	50	50	2
9.	IPSLPC03	MINI PROJECT			03	50		50	2
Total					09	150	100	150	06

Elective-Professional Elective (PE)-2		Elective-Professional Elective (PE)-3		Elective- Open Elective (OE)-1	
S.N.	IPSTPE...	S.N.	IPSTPE...	S.N.	IPSTOE...
01.	Tribo Mechanics	01.	Total Quality Management	01.	Financial Management
02.	I.C. Engine	02.	Industrial Automation	02.	Managerial Economics
03.	MEMS and Nanotechnology	03.	Mechatronics	03.	Financial Accounting and Costing

UNIT-I

Basic concepts - Definitions and classification of metal cutting and tools, geometry of single point and multipoint cutting tools, tool various angles of cutting tools and their functions, factors affecting tool geometry. Cutting tools nomenclature system, orthogonal and oblique cutting, cutting tool materials.

Types of chips- continuous, discontinuous and serrated built up edge and their formation and features.

UNIT-II

Principal of metal cutting – Elements of machining, mechanism of chip formation, forces on the chips, merchant theory and other theories of metal cutting, relation and study in chips, shear and strain rate, power and energy calculations.

Theory of multipoint machining- mechanism of drilling, machining times, torque and thrust, power calculation in drilling , milling, and broaching.

UNIT-III

Heat generation and cutting temperature in machining- causes and sources of heat in cutting, heat distribution, their measurement and their types and working.

Cutting fluids- functions characteristics and types of cutting fluids and their applications, criteria for selection of cutting fluids.

Cutting tool materials- requirements, types and characteristics of various cutting tool materials, comparison and selections of cutting tools.

UNIT-IV

Tool failures and tool life – mechanism of tool failure, types of tool failure, tool wear and types, tool life curve, its measurement , taylors tool life equations , relationship between tool life cutting speed, feed, depth of cut, factors affecting tool life

Control of chips and chip breakers -methods of chip breaking, design principal of simple and form chip breakers, working principal of chip breakers, effect of chip breaking.

UNIT-V

Machinability -definitions, evaluations , factors affecting machinability, machinability index.

Economics of machining – cost analysis and optimization of machining, various parameters for calculation of machining cost.

Text Books:

1. Manufacturing Technology Vol. II P.N. Rao TMH
2. Manufacturing Science, Ghosh Mallick, E.W.P.

Page 2 of 10

UNIT - I

Boundary Layer Theory: Boundary Layer Definition and Characteristics, Momentum Equation, Laminar and Turbulent Boundary Layer, Total Drag, Separation and Control.

Flow Around Submerged Bodies: Force Exerted by Flowing Fluid on a Body; Drag and Lift, Stream Lined and Bluff Body, Drag on Sphere and Cylinder, Circulation and Lift on Circular Cylinder, Lift on an Air Foil.

UNIT – II

Impact of Free Jets: Impulse Momentum Principle, Force Exerted by the Jet on Stationary Flat and Curved Plate, Hinged Plate, Moving Plate and Moving Curve Vanes, Jet Propulsion of Ships.

Impulse Turbine: Classification of Turbine, Impulse Turbine, Pelton wheel, Construction, Working, Work Done, Head Efficiency and Design Aspects, Governing of Impulse Turbine.

UNIT – III

Reaction Turbine Radial Flow Reaction Turbine, Francis Turbine, Construction, Working, Workdone, Efficiency, Design Aspect, Advantages & Disadvantages over Pelton Wheel.

Axial Flow Reaction Turbine: Propeller and Kaplan Turbine, Bulb or Tubular Turbine, Draft Tube, Specific Speed, Unit Quantities, Cavitation, Degree of Reaction, Performance Characteristics, Surge Tanks, Governing of Reaction Turbine.

UNIT-IV

Centrifugal Pumps: Classification of Pumps, Centrifugal Pump, Construction, Working, Work Done, Heads, Efficiencies, Multistage Centrifugal Pump, Pump in Series and Parallel, Specific Speed, Characteristic, Net Positive Suction Head, Cavitation.

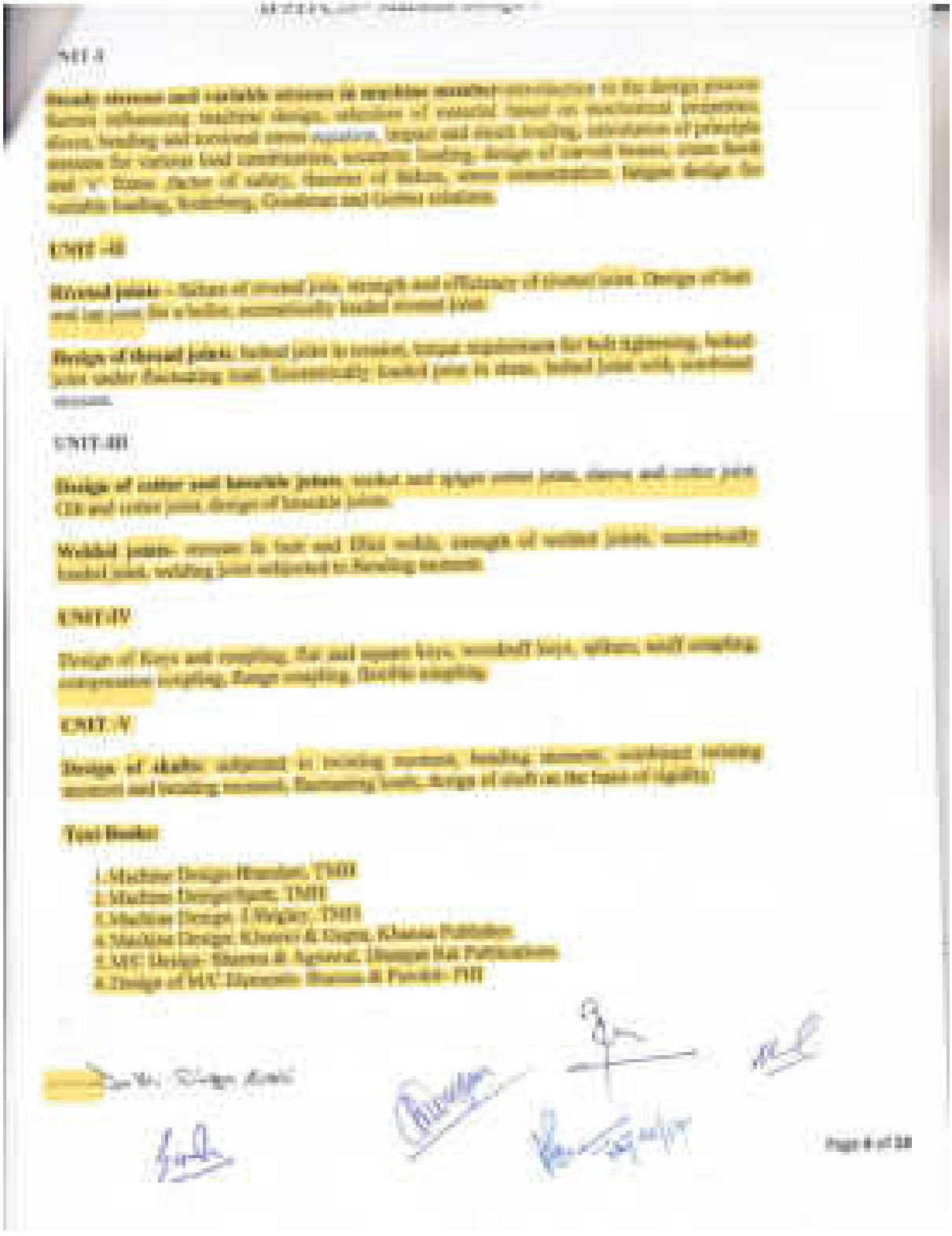
UNIT – V

Reciprocating Pumps: Classification, Components and Working, Single Acting and Double Acting, Discharge, Work done and Power Required, Coefficient of Discharge, Indicator diagram, Air Vessels.

Fluid system: Hydraulic Accumulator, Hydraulic Intensifier, Hydraulic Press, Hydraulic Crane, Hydraulic Lift, Hydraulic Ram, Hydraulic Coupling, Hydraulic Torque Converter, Air Lift Pump, Jet Pump.

Text Books:

1. Mechanics of Fluid – Massey B.S. – English Language Book Society (U.K.)
2. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som & G. Biswas – TMGH
3. "Fluid Mechanics & Machinery" by Agarwal ,TMGH.
4. "Fluid Mechanics & Machinery" by Kothandaraman & Rudra, Moorthy,New Age Publication.



UNIT-I

Steady stresses and variable stresses in machine member-introduction to the design process factors influencing machine design, selection of material based on mechanical properties, stress, bending and torsional stress equation, impact and shock loading, calculation of principle stresses for various load combination, soderberg loading, design of curved beams, crane hook and 'V' frame, factor of safety, theories of failure, stress concentration, fatigue design for variable loading, Soderberg, Goodman and Gerber relations.

UNIT -II

Riveted joints – failure of riveted joint, strength and efficiency of riveted joint. Design of bolt and lap joint for a bolter, eccentrically loaded riveted joint.

Design of thread joints: bolted joint in tension, torque requirement for bolt tightening, bolted joint under fluctuating load, Eccentrically loaded joint in shear, bolted joint with combined stresses.

UNIT-III

Design of cotter and knuckle joints: socket and spigot cotter joint, sleeve and cotter joint CIB and cotter joint, design of knuckle joints.

Welded joints- stresses in butt and fillet welds, strength of welded joints, eccentrically loaded joint, welding joint subjected to Bending moment.

UNIT-IV

Design of Keys and coupling, flat and square keys, woodruff keys, splines, muff coupling, compression coupling, flange coupling, flexible coupling.

UNIT -V

Design of shafts: subjected to twisting moment, bending moment, combined twisting moment and bending moment, fluctuating loads, design of shaft on the basis of rigidity.

Text Books:

1. Machine Design-Bhandari, TMH
2. Machine Design-Spott, TMH
3. Machine Design- J Negley, TMH
4. Machine Design- Khanna & Gupta, Khanna Publisher
5. M/C Design- Sharma & Agrawal, Dhanpat Rai Publications
6. Design of M/C Elements- Sharma & Purohit- PHI

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BSTPE23 - Turbo Machinery

UNIT-I

Nozzles & Diffusers: Nozzles & Diffuser types, their efficiencies, critical pressure & velocity, relationship between area, velocity & pressure in nozzle flow.

Steam Turbine Types: Steam turbine principal of operation of steam turbine, types, Impulse turbine, compounding of steam turbine pressure compounded, velocity compounded and pressure velocity compounded impulse turbine.

Velocity diagram for impulse turbines: Force on the blade and work done, blade or diagram efficiency, gross stage efficiency, influence of ratios of blade to steam speed, on blade efficiency in a single stage impulse turbine, Impulse blade section, choice of blade angle.

UNIT -II

Impulse-reaction turbine: Velocity diagrams, degree of reaction, Impulse-Reaction turbines with similar blade sections and half degree of reaction (parson's turbine) Height of reaction, Blade section.

Energy losses in steam turbine internal and external losses in steam turbine.

UNITS -III

Nozzle points Losses & Reheat factors: Factor stage efficiency of impulse turbine, stage error losses of an impulse turbine, state point locus for multistage turbine reheat factor, internal efficiency, overall efficiency, relative efficiency, Design procedures of impulse & reaction reaction turbine.

Governing of steam turbine: Throttle governing, nozzle governing, bypass governing combination of throttle and nozzle governing and combination of bypass and throttle governing, Effect of governing on the performance of steam turbine.

UNIT -IV

Gas turbine: Classification of Gas turbine, simple open cycle gas turbine, Ideal and actual Brayton cycle for gas turbine, Optimum pressure ratios for maximum specific output in actual gas turbine, Regeneration, reheat and their cooling and effect of these modification on efficiency and output, closed cycle gas turbine.

UNIT -V

Turbo compressors: Introduction, classification of Centrifugal Compressor: Components working, velocity diagram, calculations of power and efficiencies, Slip factor, surging and choking, power and efficiencies.

Axial Flow Compressor: Construction and working, velocity diagram, calculation of power and efficiencies, Degree of reaction, work done factor, stalling, comparison of centrifugal and axial flow compressors.

Books:

1. Steam and Gas Turbine – R. Yadav by C.P.H. Publication, Allahabad.
2. Turbine, Compressors and Fans – S.M. Yahya – TMH.
3. Gas Turbine – V. Ganesban – TMH.
4. Fundamentals of Turbo Machinery- Venkatesa, PHI.

IPHYE22 - Internal Combustion Engine

UNIT-I

Introduction of internal combustion engines, classification of I.C. engines, engines components, basic engine nomenclature, four stroke S.I. and C.I. engine, two stroke engines, comparison of two stroke and four stroke engines, comparison of S.I. and C.I. engines, applications of IC engines.

Air Standard Cycle: Otto cycle, diesel cycle, dual cycle, comparison between otto, diesel and dual cycles, Sabatier cycle and actual cycles, effect of variable specific heats and dissociation on indicator diagram.

UNIT-II

Combustion in S.I. Engines: Flame development and its propagation, ignition lag, effect of engine parameters on ignition delay, pre-ignition, knocking in S.I. engines, variables affecting knock, combustion chambers.

Carburetor: Principle of carburetion, elementary air carburetor, parameters affecting carburetion, air-fuel ratio/mixture requirements for air-fuel ratio.

Fuel Ignition System: Battery and coil ignition system, magneto ignition system, firing order, spark advancing.

Combustion in S.I. Engines: Flame development and propagation, ignition lag, effect of air density, temperature, engine speed, turbulence, and ignition energy, physical and chemical nature of detonation, effect of engine and fuel variable on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., Additive of dopes, pre-ignition, its causes and remedy, octane treatment of various types of combustion chambers, valve timing and firing order.

UNIT-III

Combustion in C.I. Engines: Combustion phenomenon in C.I. engines, p - v diagram and their study for various stage of combustion, delay period, detonation in C.I. engines, parameters affecting detonation.

Fuel Injection System: Air and solid injection, fuel pump and injectors.

UNIT-IV

Engine Friction and Lubrication: Total engine friction, blow by losses, pumping losses, factors affecting engine friction, mechanism of lubrication, lubrication system.

Cooling System: Forces and cylinder temperature distribution, parameters affecting engine heat transfer, principles and various methods of cooling.

Two Stroke Engine: Constructional details, scavenging parameters, analysis and performance of scavenging systems, advantages and disadvantages of two stroke engines.

Ch- V

Supercharging: effect of altitude on volumetric strength and output of SI engines, low and high pressure supercharging, methods, gas turbo-charging, supercharging of two stroke engines.

Engine friction and lubrication, Engine cooling systems

Text Books:

1. Mathur M.L. and R.P. Sharma, A Course in IC Engines, Laxmi Publications
2. Ganesan V., Internal Combustion Engines, TMGH Publications
3. Taylor C.F., Internal Combustion Engines, Theory and Practice
4. Stone, Richard, Introduction to IC Engine
5. Fundamentals of I.C. Engine- Gupta, PHI

IPSTPEC23 - MEMS and Nanotechnology

UNIT: I

Introduction: Definition of micro electro mechanical systems (MEMS), micro sensor, micro actuators, microelectronic fabrications, mechanical thermal and magnetic MEMS, radio frequency (RF) MEMS, MEOMS, MOEMS, BIOMEMS design considerations.

Micromachining, photolithography, structural and sacrificial materials, pattern of lithography, Thin film deposition, and its development process, LPCVD, PECVD, Impurity doping, etching, problems with bulk micromachining, vapour bonding, LIGA.

UNIT: II

Process modelling and properties of material: Introduction and basic modelling elements in mechanical, thermal, fluid systems, Translational and rotational parts mechanical systems, hybrid systems, analogy between mechanical and electrical systems.

Passive components and systems: System on a chip, passive electronics systems, passive mechanical systems.

UNIT: III

Mechanical sensors and actuators- Introduction, principle, micro plates, capacity impacts, piezoelectric materials and their properties, MEMS generation

Thermal sensor and actuators – Introduction, thermocouple probe, micro hot plate gas sensors, micro thermo vessels, shape memory alloys.

UNIT: IV

Magnetic sensors and actuators: Different types and principals.

RF MEMS –introduction, RF based communication systems, MEMS inductors, and tuner filter, Resonator.

UNIT:V

NANOTECHNOLOGY – Introduction, nanotechnology materials, fullerenes, doping CNT, SWCNT, MWCNT, development and application of CNT.

Text Books

1. MEMS- Marquis, McGraw Hill
2. MEMS & MOEMS Technology & Application- Rai Choudhary, PHI.

IPSTPE31 - Total Quality Management

UNIT - I

Basic concepts of Quality: Inspection definition of quality, quality control cost of quality, Value of quality, Statistical Quality Control, Need and advantages of SQC

Frequency Distribution: Variables & attributes, quality characteristics, Theory of control charts, control chart for variable X & R chart, Control chart for attributes p, np, C, Chart & process capability

UNIT - II

Quality Assurance: Quality assurance Manual, Quality Circle, characteristics of quality circle and the process of operation of quality circle, quality Policy & procedure & objectives

Acceptance Sampling: Concept of sampling, O-C curve & its construction, Sampling plans, single, double & multiple sampling plans

UNIT - III

Contribution of Various Quality Management Gurus: Juran Trilogy, Deming's 14 Points, P-D-C-A Wheel, Taguchi's philosophy, Design of experiments, old and new Seven QC Tool of Quality, Philip Crosby's zero defect, seven types of waste, F/u Quality function deployment

UNIT - IV

Introduction to ISO 9000: Various models of ISO 9000, Clauses of 9000, Total Quality Control, Total Quality Management, Tool for TQC & TQM, Kaizen, 6 sigma quality, procedure of six sigma, TQM and Six Sigma

UNIT - V

Reliability: Definitions, Bathtub curve, design for reliability, Failures & causes of failures, FMECA, Maintainability & Availability, MTBF, Reliability Models, system with components in series & in parallel, mixed arrangement, fault - tree evaluation

Text Books:

1. SQC by Grant & Leavenworth - Tata Mc. Hill
2. Quality Planning & Analysis by Juran & Gryna - Tata Mc. Hill
3. Total Quality Control By A. Feigenbaum - Mcgraw Hill
4. SQC by M Mahajan - Dhanpat rai publication
5. Total Quality Management - Beckerfield Tata Mc. Hill
6. Total Quality Management - Parsons characteristic (LowPearson Education)
7. Total Quality Management - Krishnaiya-PHI
8. Total Quality Management - Fuguchi & Samuel-PHI

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IPTFEE32 - Industrial Automation

UNIT-I

Automation: Definition; Automation in production systems; Automation principles and strategies; Basic elements of an automated system; Advanced automation functions; Levels of automation; Types of automation; Benefits and Impact of Automation in Manufacturing and Process Industries; Architecture of Industrial Automation Systems.

UNIT –II

Pneumatic Control Systems: Overview of different types of valves and Actuators in Pneumatics, their applications and their ISO symbols; Design of Pneumatic circuits using Cascade method and Shift register method (up to 3 cylinders); Design of Electro-Pneumatic Circuits using single solenoid and double solenoid valves with and without grouping; Design of Pneumatic circuits using PLC Control (ladder programming only) and up to 3 cylinders) with applications of Timers and Counters and concept of Flag and latching.

UNIT –III

Hydraulic Control Systems: Overview of different types of valves, Actuators and Accumulators used in GI hydraulic circuits, their applications and their ISO symbols; Basic hydraulic circuits involving linear and rotary actuators (No sequential circuits).

Fundamental concepts of digital and servo hydraulic controls; Comparison between proportional, digital and servo hydraulic control systems.

Digital logic: Number systems; Logic Gates; Boolean Algebra; Simplification of Boolean expressions using Karnaugh Maps.

UNIT –IV

Microprocessors and Microcontrollers (Only basic understanding and applications): Concept of Microprocessor based control and its applications; Parts of a Microprocessor system with block diagram of the general form of a microprocessor system; Data bus, Address bus and Control Bus; General internal Architecture of a Microprocessor; Functions of constituent parts such as ALU, Various Registers and the Control unit; Difference between a Microprocessor and a Microcontroller; General Block diagram of Microcontroller.

UNIT-V

Sensors and Transducers: Fundamentals of displacement, position and Proximity Sensors; Velocity and Motion Sensors; Force and Fluid Pressure Sensors; Liquid level and Flow sensors; Temperature and light Sensors; Control of stepper motors.

Text Books:

1. Industrial Production & Automation- Mikell P. Groover, PHI.
2. Automation Production System and CIM- Mikell P. Groover, PHI

IPEEP33 - Mechatronics

UNIT-I

Introduction to Mechatronics: Sensors and actuators types, selection and interfacing. Digital electronics and microprocessors in Mechatronic systems. Mechatronic systems modelling, Analysis and control of analog, digital and hybrid systems. Mechatronic system design principles.

UNIT-II

Introduction to Mechatronics System: Measurement system control system mechatronics approach.

Sensors and Transducers: Introduction performance terminology displacement, position and proximity, velocity and motion, Fluid pressure, temperature sensors, light sensors selection of sensors signal processing.

UNIT-III

Microprocessor: Introduction architecture, pin configuration, instruction set, programming of Microprocessor using 8085 instructions, interfacing input and output devices, interfacing D/A converters and A/D converters, applications, temperature control, stepper motor control, traffic light controller.

UNIT-IV

Programmable Logic Controller: Introduction, basic structure, Input/Output processing, programming, Mnemonics, Timers, Internal relays and Counters, Data handling, Analog input/output selection of a PLC.

UNIT-V

Design and Mechatronics: Stages in Designing Mechatronic systems, Traditional and Mechatronic design, possible design solutions, case studies of mechatronic systems, pick and place robot, automatic car park systems, engine management system.

Text Books:

1. HMT Ltd, "Mechatronics", Tata McGraw Hill Publishing Co Ltd, 1998.
2. Bradley D.A., Dawson D., Buru N.C. and Loader A.J., "Mechatronics", Chapman and Hall, 1993.
3. Gaonkar Ramesh S "Microprocessor Architecture, programming and Applications", Wiley Eastern, 1997.
4. Mechatronics- Singh & Joshi-PHI

IPSTOE11 - Financial Management

UNIT -I

Introduction: Scope and objectives, organization of finance function, Time value, risk and return and valuation of assets, valuation of long term securities various model of pricing.

UNIT -II

Statement of changes in financial position: Sources and uses of working capital, cash flow statement, balance sheet, profit loss account and its process.

Financial ratio analysis: Meaning, types, importance and limitations, calculation of various ratios.

UNIT -III

Capital budgeting: Principals, techniques, various methods of capital budgeting, Concept and measurement of cost and capital, and various approaches for measurement of cost of capital and computation.

Analysis of risk and uncertainty: various approaches for risk evaluation.

UNIT -IV

Theory of working capital management: Concept and definition of gross working capital and net working capital, trade off between profitability and risk.

UNIT -V

Operating financial and combined leverage: Introduction, definition and concept and various approaches.

Text Books:

1. Financial Management by Khan and Jain, TMGH
2. Financial Management by Kuchhal, Vikas Publication
3. Financial Management: Pandit Shah (Wiley India Pvt. Ltd)

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IPSTHCE12 - Managerial Economics

UNIT-I

Introduction to Managerial Economics, Different Area of Managerial Economics, Micro and Macro Economics, Nature and Scope of Managerial Economics: Demand Analysis, Law of Demand and its Exceptions, Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand, Supply Analysis, Law of Supply, Elasticity of Supply: Definition, Types, Measurement and Significance of Elasticity of Supply.

UNIT-II

Law of Return, Revenue Analysis, Theory of Production and Cost Analysis: Production Function, Cobb-Douglas Production Function, Iso-Quant/Iso-Cost, Production Function, Linear Programming.

Cost Analysis: Cost Concept, Opportunity Cost, Fixed Vs Variable Cost, Explicit Costs Vs Implicit Costs, Out of Pocket Costs Vs Imputed Costs, Break-even Analysis (BEA) - Determination of Break-even Point (Simple Problems) - Managerial Significance and Limitations of BEA.

UNIT-III

Introduction to Market & Pricing: Pollution: Elements of Market , Types of Market, Concept of Market, Classification of Market based on the nature of competition, Types of Competition, Features of Perfect Competition, Factors of Imperfect Competition, Monopoly and Monopolistic Competition, Price-Output Determination in case of Perfect Competition and Monopoly.

Objectives and Policies of Pricing: Introduction, Full Cost or Cost plus Pricing, Differential Pricing, Going Rate Pricing, Marginal Cost Pricing, Trade Association Pricing, Loss Leadership Pricing, Administered Pricing.

UNIT-IV

Forms of Business Organization: Introduction, Definition, Essential Elements of Good Organization, Principles of Organization, Formal and Informal Organization, Organization Structure, Concept of Ownership Organization, Types of Ownership: Partnership, Joint Stock Company, Types of Joint Stock Company, Co-Operative Organizations, Public Sector Organizations.

Capital and Capital Budgeting: Capital and Its Classifications, Need of Working Capital and Its Assessment, Factors Affecting Working Capital, Fundamental of Accounting, Types of Capital, Method and Sources of Raising Finance, Nature and Scope of Capital Budgeting, Features of Capital Budgeting Proposals, Method of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (Simple Problems).

UNIT-V

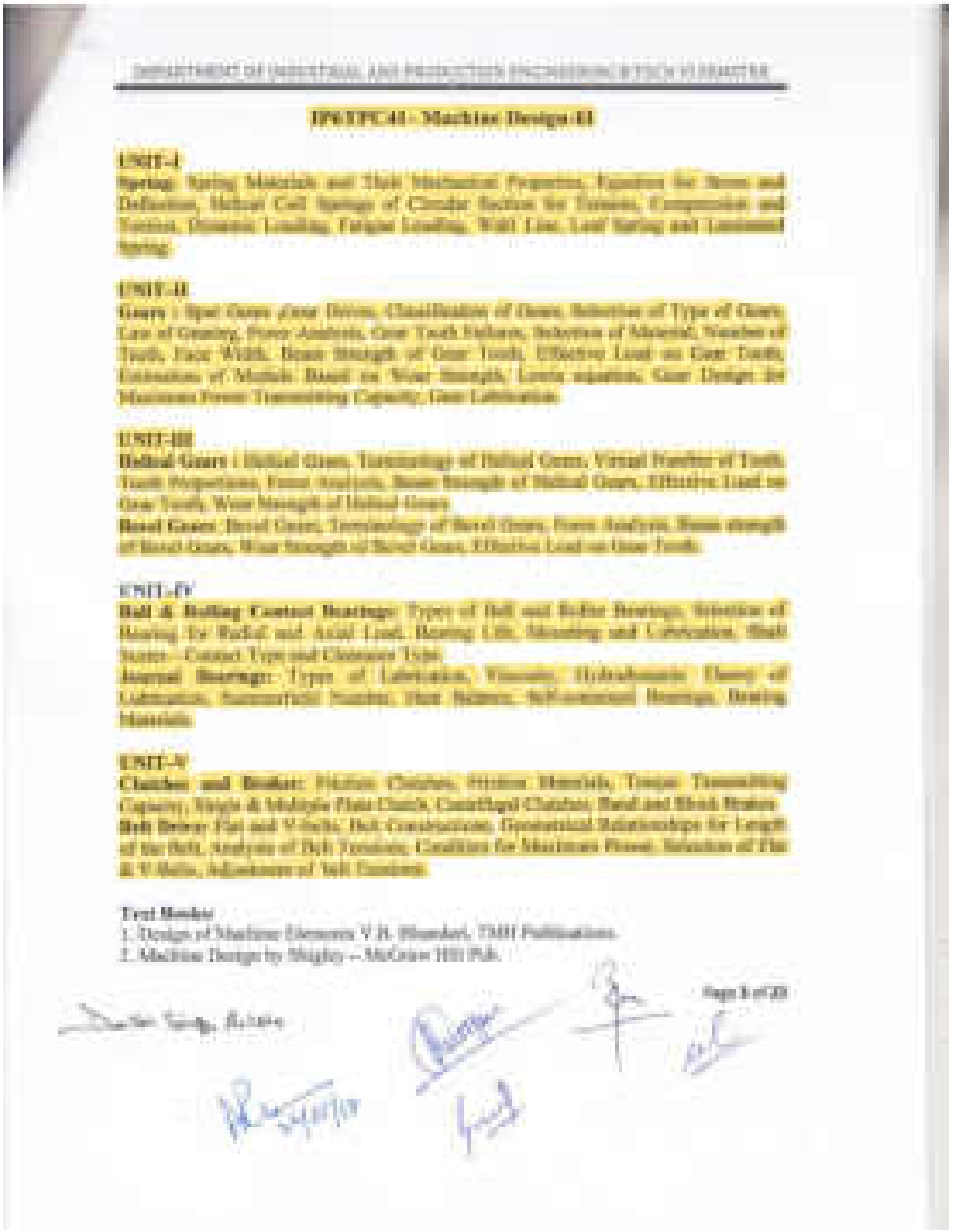
Fundamental of Financial Accounting: Nature of Accounting, Important Accounting Terminology, Accounts and Types of Accounts, Rules of Debit and Credit, System of Book-Keeping: Book of Accounts, Journal, Ledger, Trial Balance, Final Accounts, Trading Account, Profit and Loss Account and Balance Sheet.

Financial Analysis Through Ratios: Classification of Financial Ratios, Liquidity Ratios, Coverage Ratios, Activity Ratios, Profitability Ratios, Current Ratio, Acid Test Ratio, Debt Equity Ratio, Assets Coverage Ratio, Debt Service Coverage Ratio, Inventory Turnover Ratio, Debtor Velocity Ratio, Creditor Velocity Ratio, Gross Profit Ratio, Net Profit Ratio, Return on Equity Ratio.

Text Books:

1. Managerial Economics by Vegouli Mahadeswari, PHI
2. Managerial Economics By Joel Dean, PHI
3. Managerial Economics By Craig H. Peterson, W. Cris Lewis, Sudhir K. Jain
4. Financial Accounting For Management By Ambrish Gupta, Pearson Education
5. Managerial Economics By H. Craig Peterson & W. Cris Lewis, PHI
6. Managerial Economics By Shana Ramachandran, Oxford University Press
7. Managerial Economics and Financial Analysis By Aryasri, TMH

Note: After the completion of seventh session, students will have to join industrial training of eleven consecutive 6 weeks (Six) week and 8 hours a day) in industry. The presentation and report on this will be given in 7th sem during defined schedule by Head of Department. The due credit will be awarded in 7th semester.



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING BTECH VI SEMESTER

IPE/TPC/41 : Machine Design-II

UNIT-I
Springs: Spring Materials and their Mechanical Properties, Equations for Stress and Deflection, Helical Coil Springs of Circular Section for Tension, Compression and Torsion, Dynamic Loading, Fatigue Loading, Wahl Line, Leaf Spring and Laminated Spring.

UNIT-II
Gears : Spur Gears gear Drives, Classification of Gears, Selection of Type of Gears, Law of Gearing, Force Analysis, Gear Tooth Failure, Selection of Material, Number of Teeth, Face Width, Beam Strength of Gear Teeth, Effective Load on Gear Teeth, Estimation of Module Based on Wear Strength, Lewis equation, Gear Design for Maximum Power Transmitting Capacity, Gear Lubrication.

UNIT-III
Helical Gears : Helical Gears, Terminology of Helical Gears, Virtual Number of Teeth, Tooth Proportions, Force Analysis, Beam Strength of Helical Gears, Effective Load on Gear Teeth, Wear Strength of Helical Gears
Bevel Gears: Bevel Gears, Terminology of Bevel Gears, Force Analysis, Beam strength of Bevel Gears, Wear Strength of Bevel Gears, Effective Load on Gear Teeth.

UNIT-IV
Ball & Rolling Contact Bearings: Types of Ball and Roller Bearings, Selection of Bearing for Radial and Axial Load, Bearing Life, Mounting and Lubrication, Shaft Seals – Contact Type and Clearance Type.
Journal Bearings: Types of Lubrication, Viscosity, Hydrodynamic Theory of Lubrication, Sommerfeld Number, Heat Balance, Self-contained Bearings, Bearing Materials.

UNIT-V
Clutches and Brakes: Friction Clutches, Friction Materials, Torque Transmitting Capacity, Single & Multiple Plate Clutch, Centrifugal Clutches, Band and Block Brakes.
Belt Drives: Flat and V-belts, Belt Construction, Geometrical Relationships for Length of the Belt, Analysis of Belt Tensions, Condition for Maximum Power, Selection of Flat & V-Belts, Adjustment of Belt Tensions.

Text Books:
1. Design of Machine Elements V.B. Bhandari, TMH Publications.
2. Machine Design by Shigley – McGraw Hill Pub.

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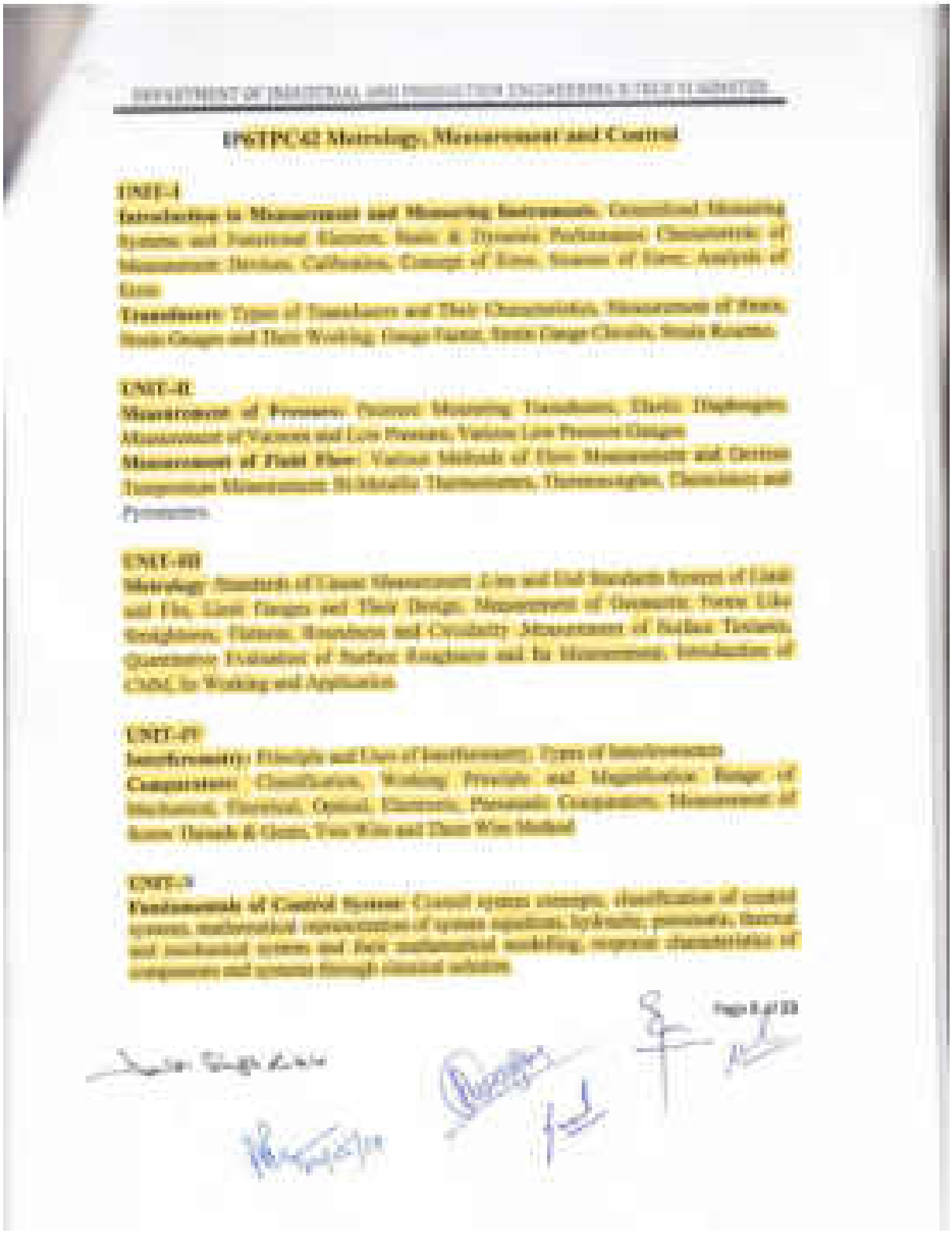


DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & TECHNOLOGIES

INPTPC42 Metrology, Measurement and Control

UNIT-I

Introduction to Measurement and Measuring Instruments: Generalized Measuring System and Functional Elements, Static & Dynamic Performance Characteristic of Measurement Devices, Calibration, Concept of Error, Sources of Error, Analysis of Error.

Transducers: Types of Transducers and Their Characteristics, Measurement of Force, Strain Gauges and Their Working, Gauge Factor, Strain Gauge Circuits, Strain Rosettes.

UNIT-II

Measurement of Pressure: Pressure Measuring Transducers, Elastic Diaphragms, Measurement of Vacuum and Low Pressure, Various Low Pressure Gauges

Measurement of Fluid Flow: Various Methods of Flow Measurement and Devices, Temperature Measurement by Metallic Thermometers, Thermocouples, Thermistors and Pyrometers.

UNIT-III

Metrology: Standards of Linear Measurement, Line and End Standards, System of Limits and Fits, Limit Gauges and Their Design, Measurement of Geometric Forms Like Straightness, Flatness, Roundness and Circularity, Measurement of Surface Textures, Quantitative Evaluation of Surface Roughness and Its Measurement, Introduction of CMM, Its Working and Applications.

UNIT-IV

Interferometry: Principle and Uses of Interferometry, Types of Interferometers

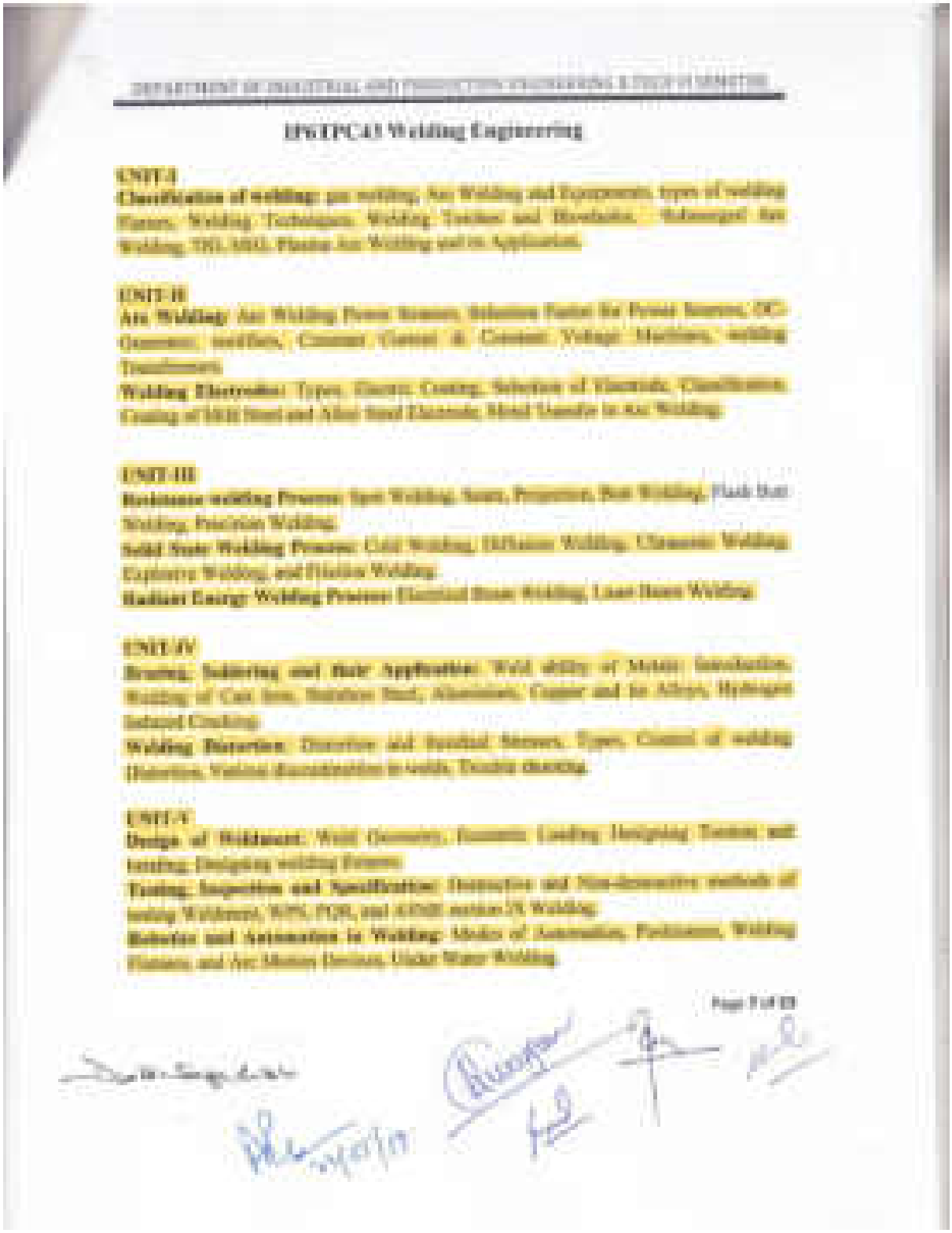
Comparators: Classification, Working Principle and Magnification, Range of Mechanical, Electrical, Optical, Electronic, Pneumatic Comparators, Measurement of Screw Threads & Gears, Two Wire and Three Wire Method

UNIT-V

Fundamentals of Control System: Control system concepts, classification of control systems, mathematical representation of system equations, hydraulic, pneumatic, thermal and mechanical systems and their mathematical modelling, response characteristics of components and systems through classical solutions.

Text Books:

1. Beckwith and Buck, Mechanical Measurements
2. Jain RK Instrumentation
3. Raven II Automatic Control Engineering
4. Donal P Eckman Automatic Process Control
5. Nakra & Chaudhary Instrumentation Measurement & Analysis
6. Nakra BC Theory & Application of Automatic Controls
7. Cooper Albert D Modern Electric Instrumentation PHI



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH IV SEMESTER

IPGTPC43 Welding Engineering

UNIT-I
Classification of welding: gas welding, Arc Welding and Equipments, types of welding flames, Welding Techniques, Welding Torches and Blowpipes, Submerged Arc Welding, TIG, MIG, Plasma Arc Welding and its Applications.

UNIT-II
Arc Welding: Arc Welding Power Sources, Selection Factor for Power Sources, DC-Generator, rectifiers, Constant Current & Constant Voltage Machines, welding Transformers.
Welding Electrodes: Types, Electric Coating, Selection of Electrode, Classification, Coating of Mild Steel and Alloy Steel Electrode, Metal Transfer in Arc Welding.

UNIT-III
Resistance welding Process: Spot Welding, Seam, Projection, Butt Welding, Flash Butt Welding, Precision Welding.
Solid State Welding Process: Cold Welding, Diffusion Welding, Ultrasonic Welding, Explosive Welding, and Friction Welding.
Radiant Energy Welding Process: Electrical Beam Welding, Laser Beam Welding.

UNIT-IV
Brazing, Soldering and their Application: Weldability of Metals, Introduction, Welding of Cast Iron, Stainless Steel, Aluminium, Copper and its Alloys, Hydrogen Induced Cracking.
Welding Distortion: Distortion and Residual Stresses, Types, Control of welding Distortion, Various Concentration in welds, Residue shrinking.

UNIT-V
Design of Weldment: Weld Geometry, Economic Loading, Designing Tension and bending, Designing welding Frames.
Testing, Inspection and Specification: Destructive and Non-destructive methods of testing Weldments, WPS, PQR, and ASME section IX Welding.
Robotics and Automation in Welding: Modes of Automation, Positioners, Welding Fixtures, and Arc Motion Devices, Under Water Welding.

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DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

Text Books:

1. American Welding Society, Hand Book VII Edition Vol. II.
2. Nadkarni S.V., Modern Arc Welding.
3. Welding Engg., Little, TMHH.
4. Khanna O.P., Welding Technology, Dhanpat Rai & Sons.
5. Parmar R.S., Welding Processes & Technology, Khanna Publishers.
6. Parmar R.S., Welding Engg. & Technology, Khanna Publishers.
7. P.N.Rao, Manufacturing Technology Vol-1, TMH

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING (ITEM II SEMESTER)

IP6TPE41 - Materials Management

UNIT-I

Introduction: Definition and scope, concept of integrated materials management, materials research, materials planning and budgeting, codification, standardization.

Purchasing: Objective and function of purchasing department, purchasing procedure, negotiation, and source selection.

UNIT-II

Types of purchasing, buying material commodities, purchasing under uncertainty, purchasing of capital equipment, international purchasing, public buying, legal concept in buying, insurance buying, price forecasting.

UNIT- III

Stores management, stores system and procedure, furnishing material control, stores accounting and stock verification, checkers, surplus and scrap management.

UNIT-IV

Basic inventory system: concept of inventory, types of inventory, relevant costs of inventory, economic order quantity, inventory control techniques, basic models of inventory.

Spare parts management: definition of spares and its classification, MUSIC-3D, view of spares, multi solution spares forecasts.

UNIT-V

Value analysis: value importance, normal degree value analysis applied to purchase, organizing for value analysis, cost analysis and value analysis aid purchase research, financial and process selection in VE design, material, process & supplier decisions.

Text Books:

1. Materials Management an integrated approach, Gopalakrishnan.P & Sundarsan.M (2002) Prentice Hall India Limited, New Delhi.

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DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

2. Materials Management Text and Cases, Chitale A.K. & Gupta R.C. (2000) Prentice Hall India Limited, New Delhi.
3. Maintenance and Spare parts Management, Pathak () Prentice Hall India Limited, New Delhi.
4. Production and Operations Management, Chary S.N. ( ) Tata McGraw Hill.
5. Material management: An integrated approach, Datta ()

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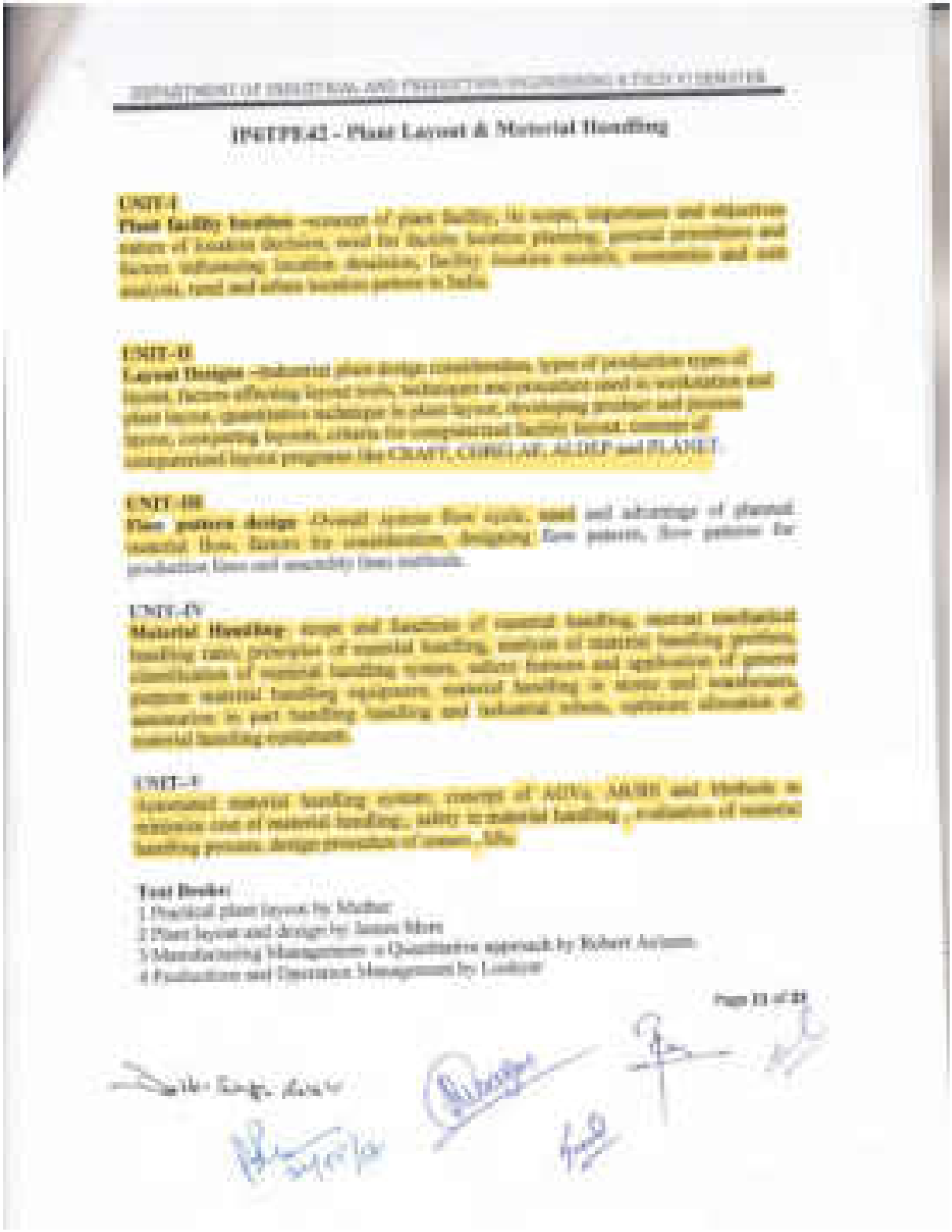

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & FIELD VISIBILITY

IP6TPE42 - Plant Layout & Material Handling

UNIT-I
Plant facility location –concept of plant facility, its scope, importance and objectives nature of location decision, need for facility location planning, general procedures and factors influencing location decision, facility location models, economics and cost analysis, rural and urban location patterns in India.

UNIT-II
Layout Designs –industrial plant design considerations, types of production types of layout, factors affecting layout tools, techniques and procedure used in workstation and plant layout, quantitative techniques in plant layout, developing product and process layout, comparing layouts, criteria for computerized facility layout, concept of computerized layout programs like CRAFT, CORELAP, ALDEP and PLANET.

UNIT-III
Flow pattern design -Overall system flow cycle, need and advantage of planned material flow, factors for consideration, designing flow patterns, flow patterns for production lines and assembly lines methods.

UNIT-IV
Material Handling- scope and functions of material handling, material mechanical handling rates, principles of material handling, analysis of material handling problem, classification of material handling systems, salient features and application of general purpose material handling equipment, material handling in stores and warehouses, automation in part handling handling and industrial robots, optimum allocation of material handling equipment.

UNIT-V
Automated material handling system, concept of AGVs, AR/RS and Methods to minimize cost of material handling, safety in material handling, evaluation of material handling process, design procedure of conveyors, ARs

Text Books:
1 Practical plant layout by Mother
2 Plant layout and design by James Moore
3 Manufacturing Management: a Quantitative approach by Robert Aucamp
4 Production and Operation Management by Lockyer

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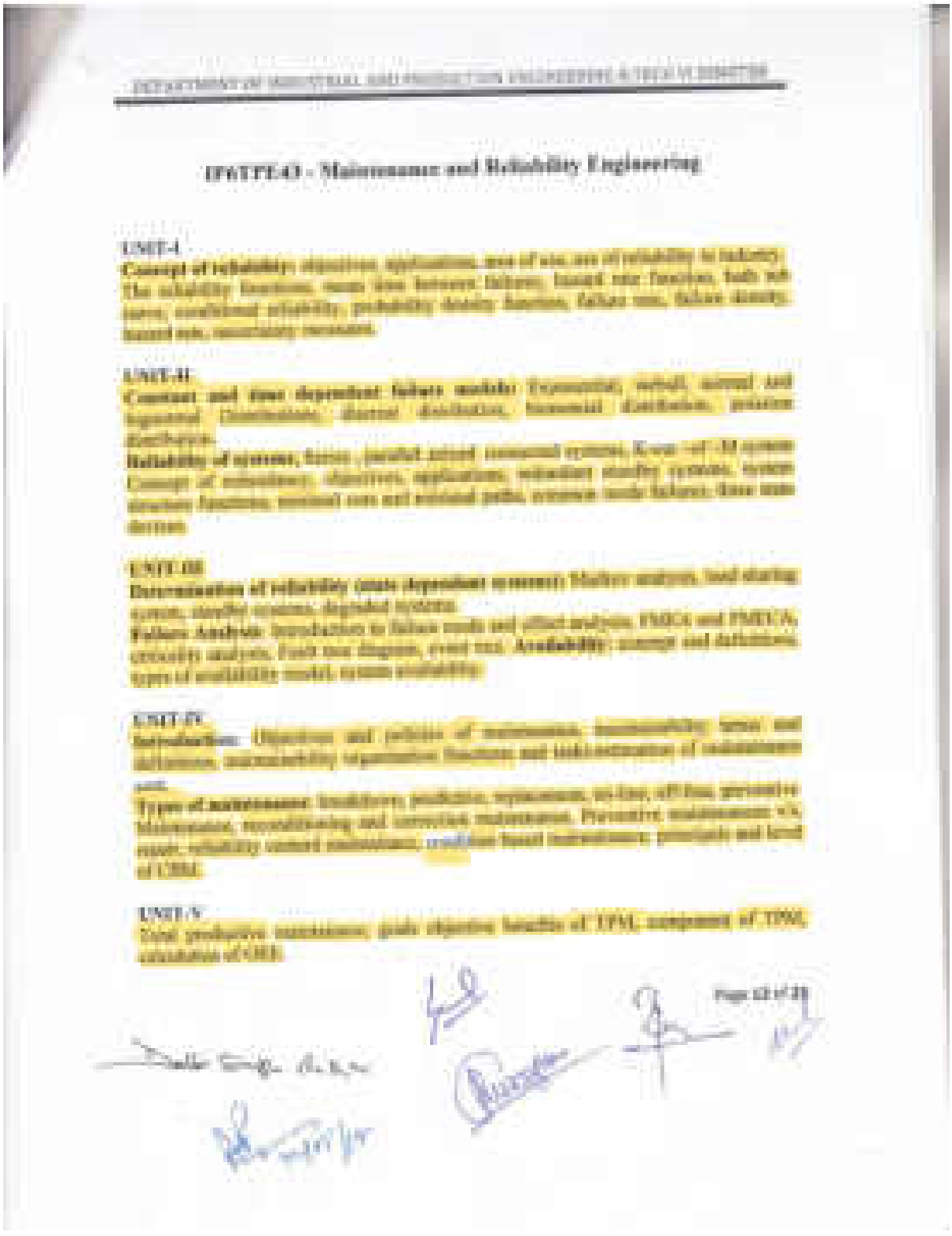
DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & TECH VI SEMESTER

IP6TPE43 - Maintenance and Reliability Engineering

UNIT-I

Concept of reliability: objectives, applications, area of use, use of reliability in industry. The reliability functions, mean time between failures, hazard rate function, bath tub curve, conditional reliability, probability density function, failure rate, failure density, hazard rate, uncertainty measures.

UNIT-II



Constant and time dependent failure models: Exponential, weibull, normal and logarithmic Distributions, discrete distribution, binomial distribution, poisson distribution.

Reliability of systems, Series , parallel, mixed, connected systems, K-out -of -M system Concept of redundancy, objectives, applications, redundant standby systems, system structure functions, minimal cuts and minimal paths, common mode failures, three state devices.

UNIT-III

Determination of reliability (state dependent systems): Markov analysis, load sharing system, standby systems, degraded systems.

Failure Analysis: Introduction to failure mode and effect analysis, FMEA and FMECA, criticality analysis, Fault tree diagram, event tree. **Availability:** concept and definitions, types of availability model, system availability.

UNIT-IV

Introduction: Objectives and policies of maintenance, maintainability, terms and definitions, maintainability organization functions and indoctrination of maintainance cost.

Types of maintenance: breakdown, predictive, replacement, on-line, off-line, preventive Maintenance, reconditioning and corrective maintenance, Preventive maintenance v/s repair, reliability centered maintenance, condition based maintenance, principals and level of CBM.

UNIT-V

Total productive maintenance, goals objective benefits of TPM, component of TPM, calculation of OEE.

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DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

Training for maintenance personal, objective and level of training, types of training methodology, evaluation of maintenance department.

Text Books:

1. Dhillon B.H. "*Principles of Planned Maintenance*", McGraw Hill, New York, 2001.
2. Ebeling, CE. "An introduction to Reliability and Maintainability Engineering" Tata Mcgraw Hill.
3. Srinath L.S "Reliability Engineering", Affiliated East West Press Limited, New Delhi, 2002.
4. Dhillon B.S. "Engineering Maintainability", Prentice Hall of India, New Delhi, 2000.
5. Maintenance and spare parts management by P. Gopal krishnan PHI.

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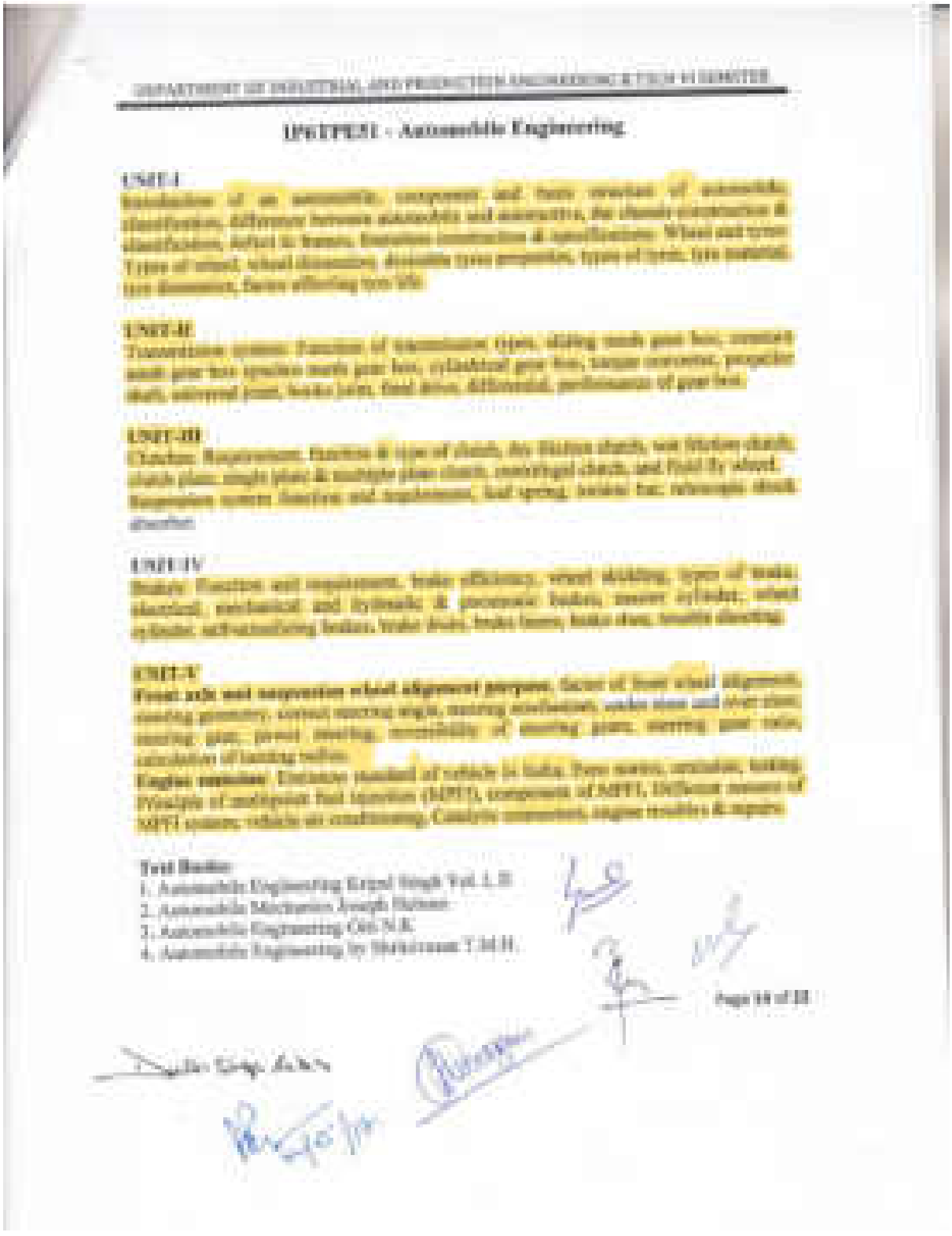

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & TECH VI SEMESTER

IP6TPE51 - Automobile Engineering

UNIT-I
Introduction of an automobile, component and basic structure of automobile, classification, difference between automobile and automotive, the chassis construction & classification, defect in frames, frameless construction & specifications. Wheel and tyres Types of wheel, wheel dimensions, dissimilar tyres properties, types of tyres, tyre material, tyre dimensions, factors affecting tyre life.

UNIT-II
Transmission system: Function of transmission types, sliding mesh gear box, constant mesh gear box, synchro mesh gear box, cylindrical gear box, torque converter, propeller shaft, universal joint, hooks joint, final drive, differential, performance of gear box.

UNIT-III
Clutches: Requirement, function & type of clutch, dry friction clutch, wet friction clutch, clutch plate, single plate & multiple plate clutch, centrifugal clutch, and fluid fly wheel. Suspension system function and requirement, leaf spring, torsion bar, telescopic shock absorber.

UNIT-IV
Brakes: Function and requirement, brake efficiency, wheel skidding, types of brake: electrical, mechanical and hydraulic & pneumatic brakes, master cylinder, wheel cylinder, self-actuating brakes, brake drum, brake lines, brake shoe, brake shoe, brake shoe.

UNIT-V
Front axle and suspension wheel alignment purpose, factor of front wheel alignment, steering geometry, correct steering angle, steering mechanism, under steer and over steer, steering gear, power steering, reversibility of steering gears, steering gear ratio, calculation of turning radius.
Engine emission: Emission standard of vehicle in India, Euro norms, emission, testing. Principle of multipoint fuel injection (MPFI), component of MPFI, Different sensors of MPFI system, vehicle air conditioning, Catalytic converters, engine troubles & repairs.

Text Books:
1. Automobile Engineering Kripal Singh Vol. I, II
2. Automobile Mechanics Joseph Heitner
3. Automobile Engineering Giri N.K.
4. Automobile Engineering by Shrikrishnan T.M.H.

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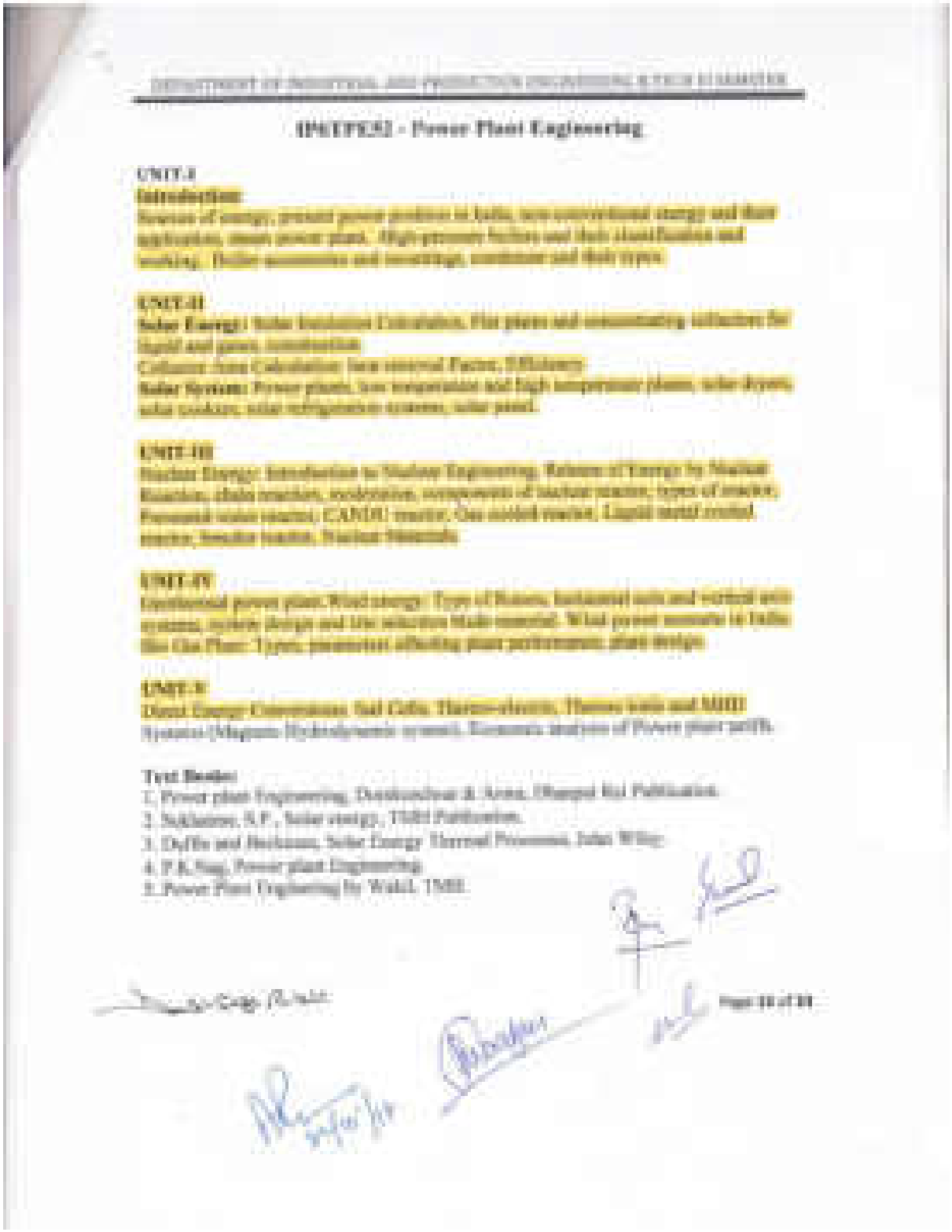


IPEEPE52 - Power Plant Engineering

UNIT-I

Introduction:

UNIT-II

Solar Energy:

UNIT-III

Nuclear Energy:

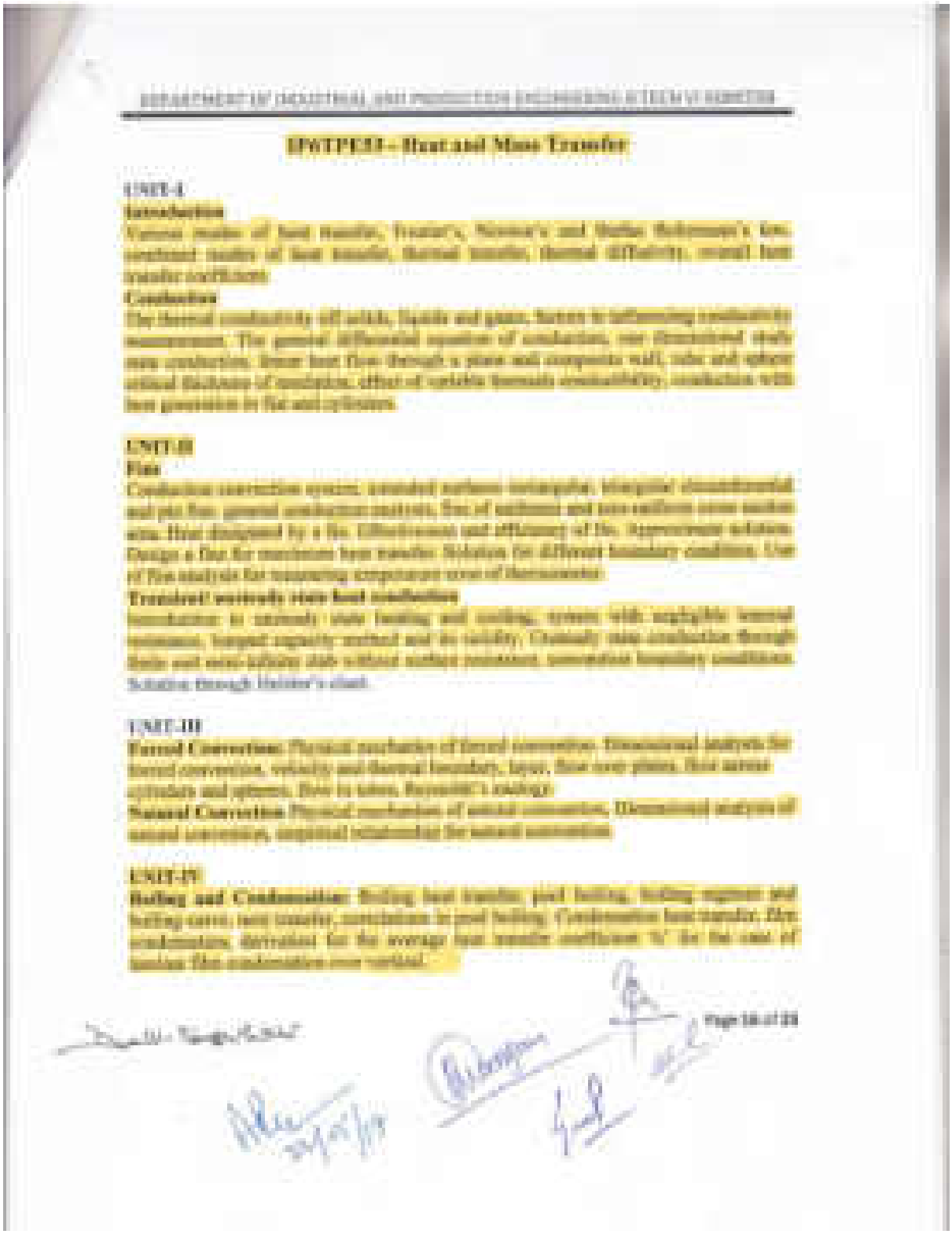
UNIT-IV

Unconventional power plant.

UNIT-V

Text Books:

1. Power plant Engineering, Domkundwar & Arora, Dhanpat Rai Publication.
2. Sukhatme, S.P., Solar energy, TMH Publication.
3. Duffie and Beckman, Solar Energy Thermal Processes, John Wiley.
4. P.K.Nag, Power plant Engineering.
5. Power Plant Engineering by Weikl, TMH.



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

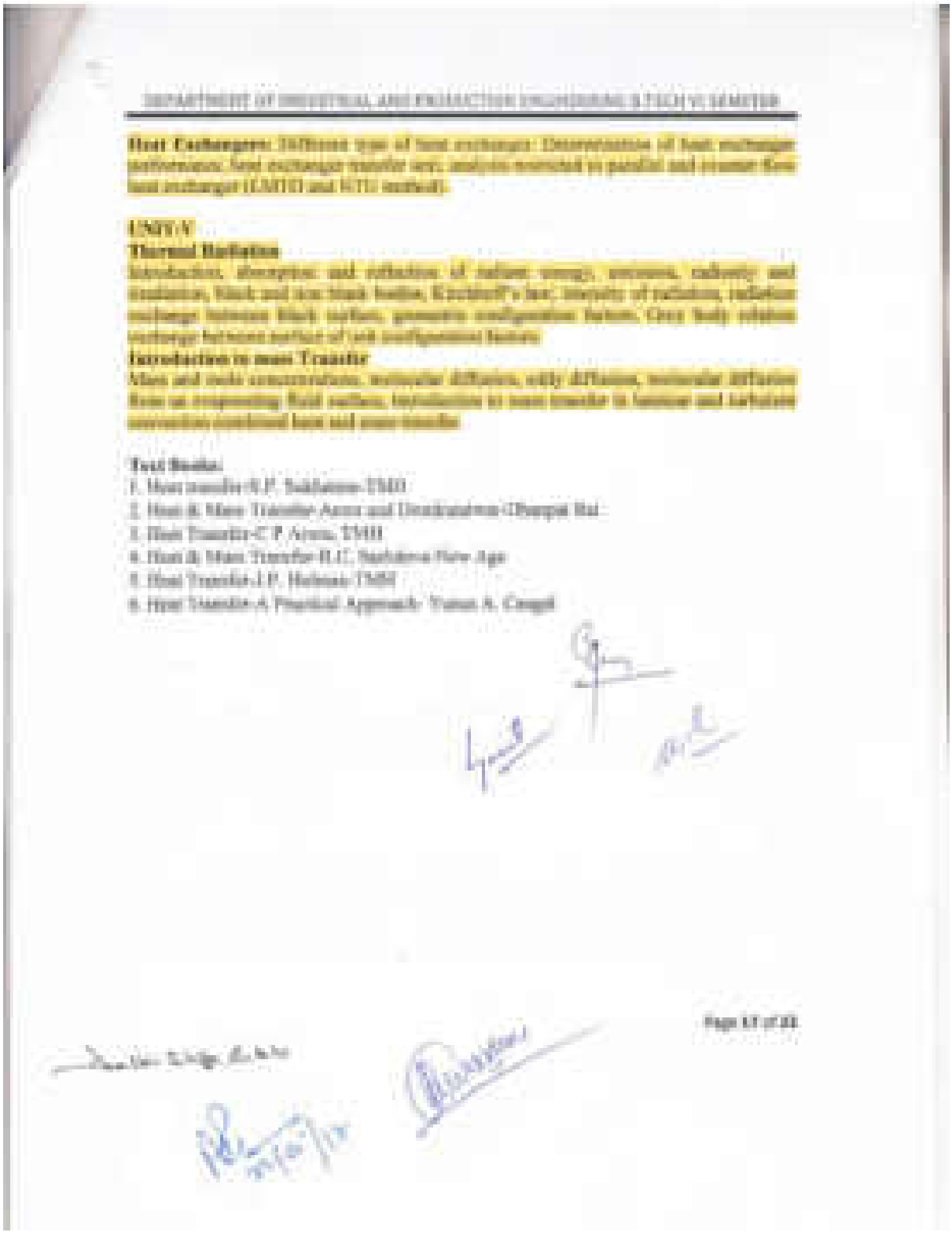
IPWTPE33 – Heat and Mass Transfer

UNIT-I
Introduction
Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzmann's law, combined modes of heat transfer, thermal diffusivity, overall heat transfer coefficient.
Conduction
The thermal conductivity of solids, liquids and gases, factors to influencing conductivity measurement. The general differential equation of conduction, one dimensional steady state conduction, linear heat flow through a plane wall composite wall, tube and sphere critical thickness of insulation, effect of variable thermals conductivity, conduction with heat generation in flat and cylinders.

UNIT-II
Fins
Conduction convection system, extended surfaces rectangular, triangular circumferential and pin fins, general conduction analysis, fins of uniform and non-uniform cross section area. Heat dissipated by a fin, Effectiveness and efficiency of fin, Approximate solutions. Design a fin for maximum heat transfer. Solution for different boundary conditions. Use of Fin analysis for measuring temperature error of thermometer.
Transient unsteady state heat conduction
Introduction to unsteady state heating and cooling, system with negligible internal resistance, lumped capacity method and its validity, Unsteady state conduction through finite and semi-infinite slab without surface resistance, convection boundary conditions. Solution through Heisler's chart.

UNIT-III
Forced Convection: Physical mechanism of forced convection, dimensional analysis for forced convection, velocity and thermal boundary layer, flow over plates, flow across cylinders and spheres, flow in tubes, Reynolds's analogy.
Natural Convection Physical mechanism of natural convection, Dimensional analysis of natural convection, empirical relationship for natural convection.

UNIT-IV
Boiling and Condensation: Boiling heat transfer, pool boiling, boiling regimes and boiling curve, heat transfer correlations in pool boiling. Condensation heat transfer, film condensation, derivation for the average heat transfer coefficient 'h' for the case of laminar film condensation over vertical.



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

Heat Exchangers: Different type of heat exchanger, Determination of heat exchanger effectiveness, heat exchanger transfer unit, analysis restricted to parallel and counter flow heat exchanger (LMTD and NTU method).

UNIT-V

Thermal Radiation

Introduction, absorption and reflection of radiant energy, emissive, radiosity and irradiation, black and non black bodies, Kirchhoff's law, intensity of radiation, radiation exchange between black surface, geometric configuration factors, Gray body relation exchange between surface of unit configuration factors

Introduction to mass Transfer

Mass and mole concentrations, molecular diffusion, eddy diffusion, molecular diffusion flow on evaporating fluid surface, introduction to mass transfer in laminar and turbulent convection combined heat and mass transfer

Text Books:

1. Heat transfer-S.P. Sukhatme-TMH
2. Heat & Mass Transfer-Arora and Domkundwar-Dhanpat Rai
3. Heat Transfer-C.P. Arora, TMH
4. Heat & Mass Transfer-R.C. Sachdeva-New Age
5. Heat Transfer-J.P. Holman-TMH
6. Heat Transfer-A Practical Approach- Yunus A. Cengel

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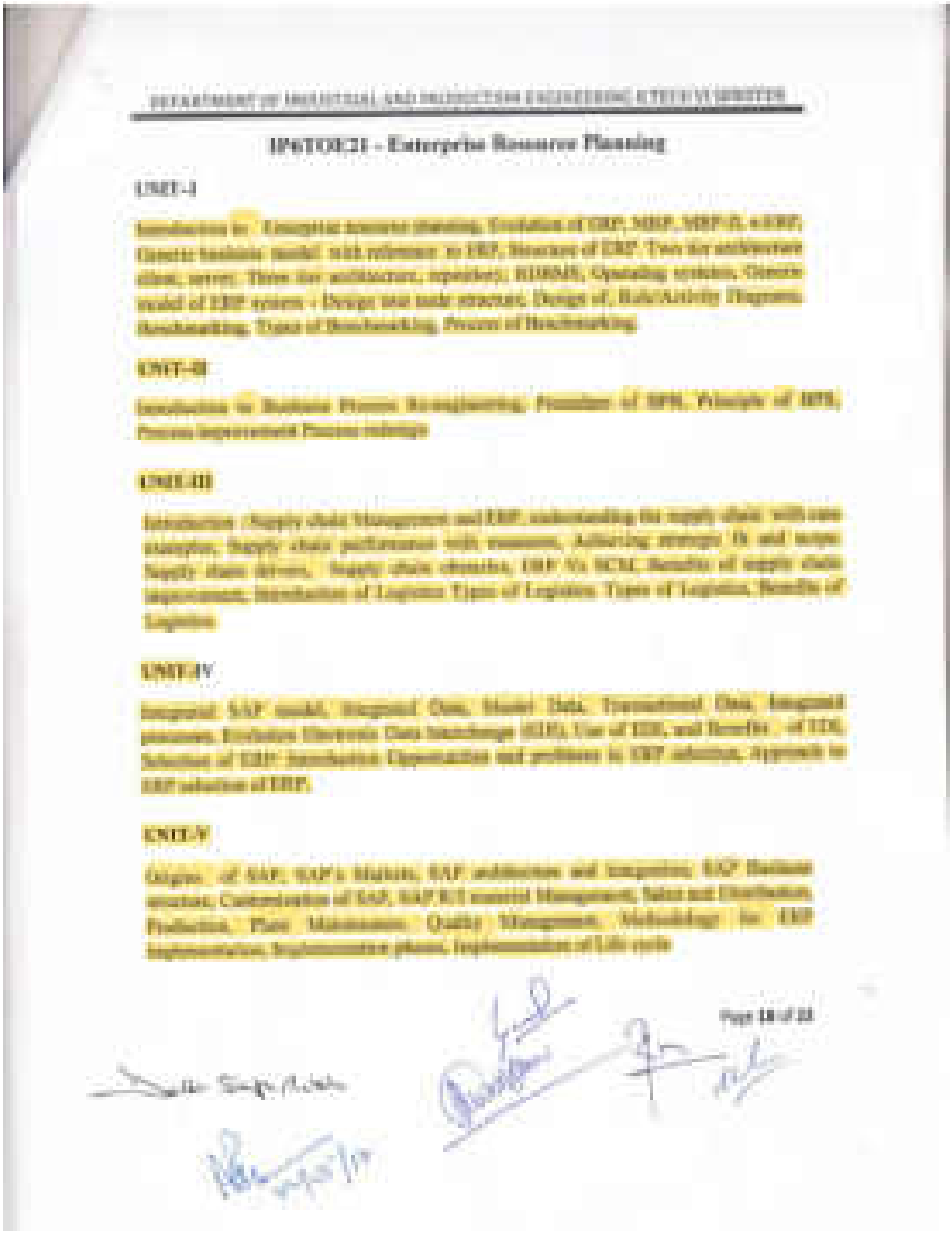

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

IPETOEC21 – Enterprise Resource Planning

UNIT-I

Introduction to Enterprise resource planning, Evolution of ERP, MRP, MRP II, e-ERP, Generic business model with reference to ERP, Structure of ERP, Two tier architecture client, server, Three tier architecture, repository, RDBMS, Operating systems, Generic model of ERP system - Design one node structure, Design of, Role/Activity Diagrams, Benchmarking, Types of Benchmarking, Process of Benchmarking.

UNIT-II

Introduction to Business Process Re-engineering, Principles of BPR, Principle of BPI, Process improvement, Process redesign

UNIT-III

Introduction - Supply chain Management and ERP, understanding the supply chain with case examples, Supply chain performance with measures, Achieving strategic fit and scope, Supply chain drivers, Supply chain obstacles, ERP Vs SCM, Benefits of supply chain improvement, Introduction of Logistics Types of Logistics, Types of Logistics, Benefits of Logistics

UNIT-IV

Integrated SAP model, Integrated Data, Master Data, Transactional Data, Integrated processes, Evolution Electronic Data Interchange (EDI), Use of EDI, and Benefits of EDI, Selection of EDI, Introduction Opportunities and problems in ERP selection, Approach to ERP selection of ERP.

UNIT-V

Origins of SAP, SAP's Modules, SAP architecture and integration, SAP Business structure, Customization of SAP, SAP R/3 material Management, Sales and Distribution, Production, Plant Maintenance, Quality Management, Methodology for ERP implementation, Implementation phases, Implementation of Life cycle

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Text Books:

1. Enterprise Resource Planning: Theory and practice by Rahul V. PHI Publication.
2. Enterprise Resource Planning: Concepts and practice by V.K. Garg, TMH Publication.
3. Enterprise Resource Planning by Alexis Leon, McGraw-Hill Publication

IP6TOE22 - Management Information System

UNIT-I

Organization & Types, Decision Making, Cost & value of information, Introduction to information in business, types of information system, need, importance, scope and characteristics of information system, Component of information system, developing information system.

MIS concept evaluation and characteristics structure of MIS, MIS v/s data processing, MIS and DSS

UNIT-II

Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria, Tool and Techniques of MIS- dataflow diagrams, flow chart etc.

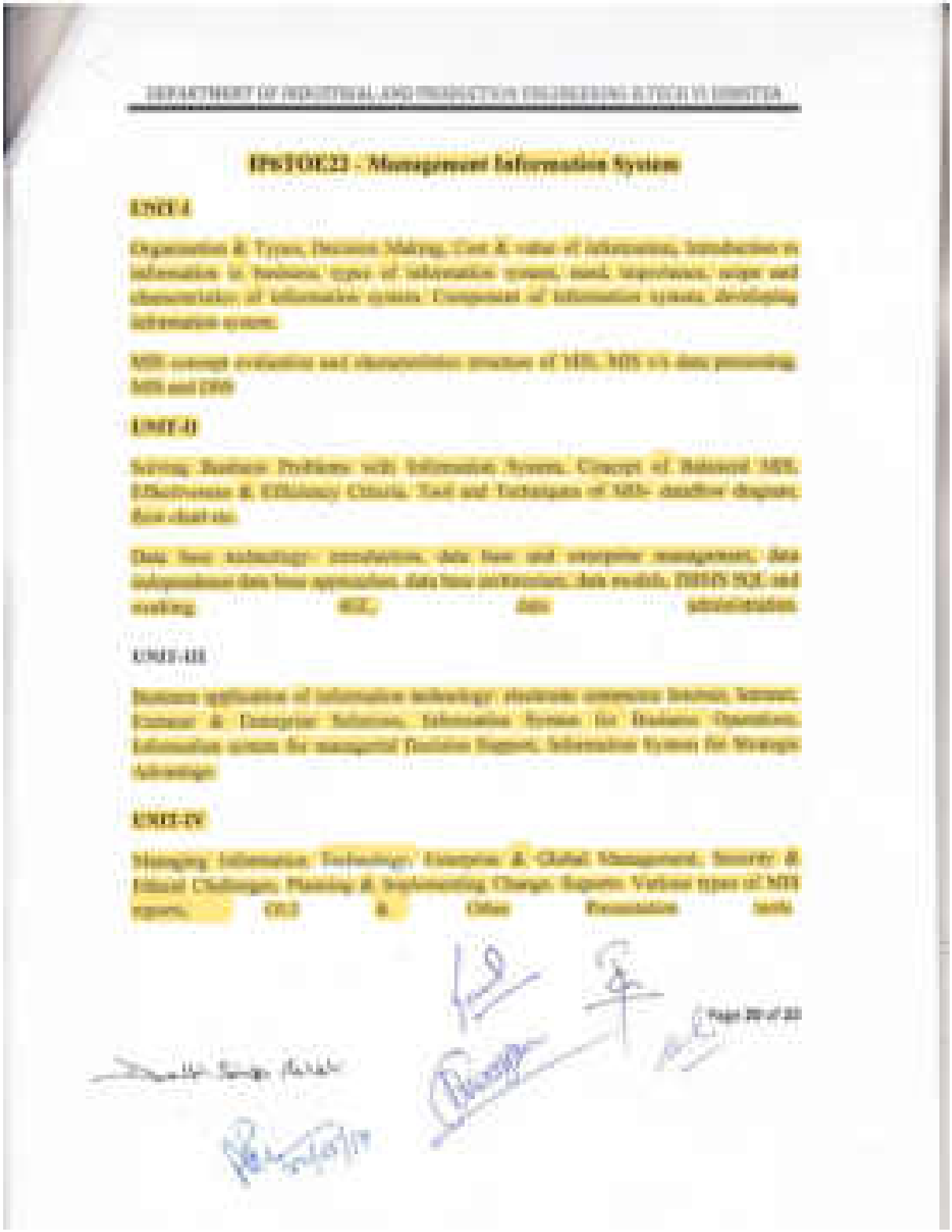
Data base technology: introduction, data base and enterprise management, data independence, data base approaches, data base architecture, data models, DBMS SQL and working RGL, data administration.

UNIT-III

Business application of information technology: electronic commerce, Internet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

UNIT-IV

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change, Reports: Various types of MIS reports, GUI & Other Presentation tools.



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

IPE310E23 - Management Information System

UNIT-I

Organization & Types, Decision Making, Cost & value of information, Introduction to information in business, types of information system, need, importance, scope and characteristics of information system, Component of information system, developing information system.

MIS concept evaluation and characteristics structure of MIS, MIS v/s data processing, MIS and DSS

UNIT-II

Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria, Tool and Techniques of MIS- decision diagram, flow chart etc.

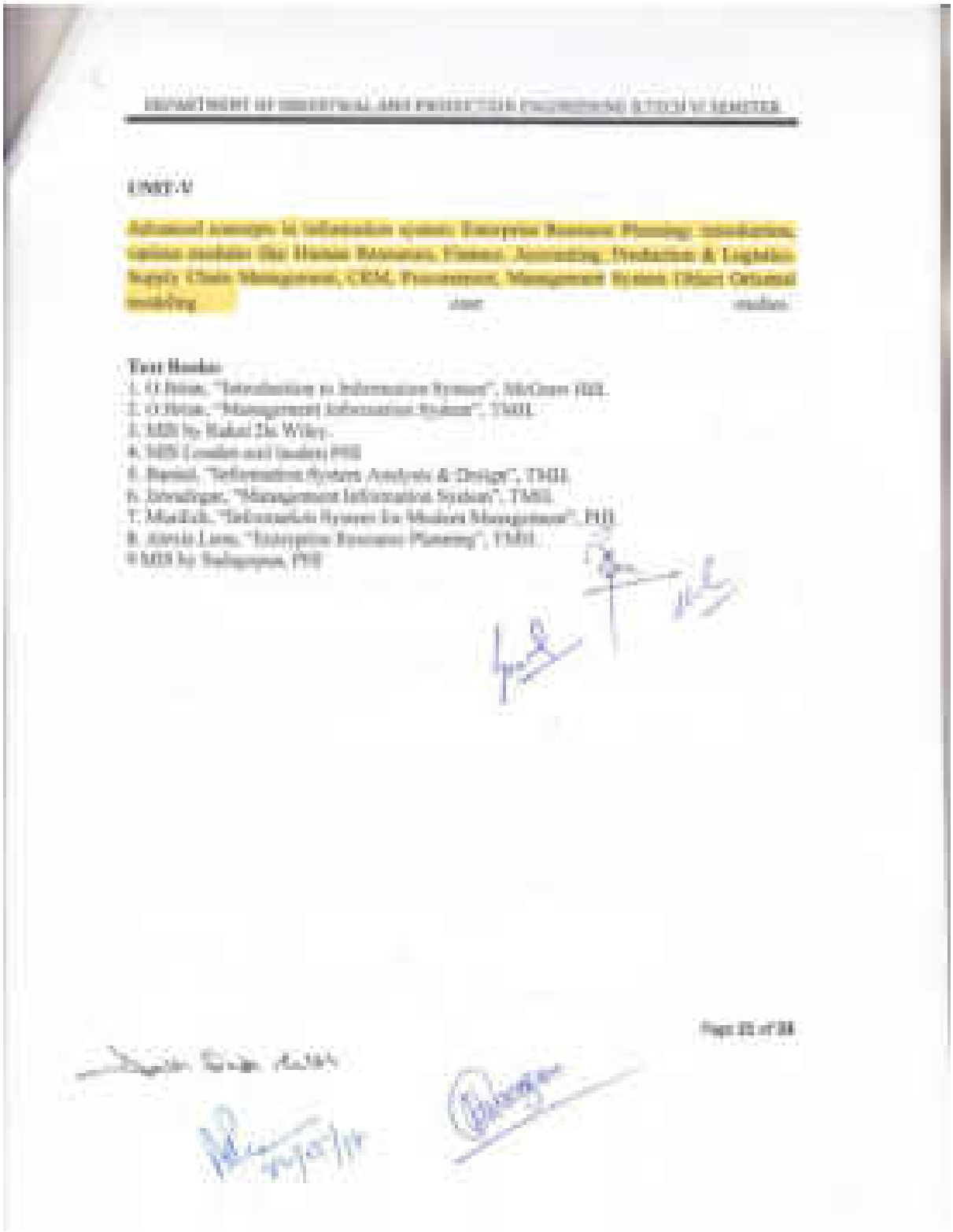
Data base technology: introduction, data base and enterprise management, data independence data base approaches, data base architecture, data models, DBMS SQL and working RDE, data administration

UNIT-III

Business application of information technology: electronic commerce business, Internet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage

UNIT-IV

Managing Information Technology: Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change, Reports: Various types of MIS reports, OLS & Other Presentation tools



DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

UNIT-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resource, Finance, Accounting, Production & Logistics, Supply Chain Management, CRM, Procurement, Management System Object Oriented modeling. case studies.

Text Books:

1. O Brien, "Introduction to Information System", McGraw Hill.
2. O Brien, "Management Information System", TMH.
3. MIS by Rahul De Wiley.
4. MIS [author and location] PHI.
5. Bansal, "Information System Analysis & Design", TMH.
6. Jawadekar, "Management Information System", TMH.
7. Murdick, "Information System for Modern Management", PHI.
8. Alexis Leon, "Enterprise Resource Planning", TMH.
9. MIS by Sadagopan, PHI

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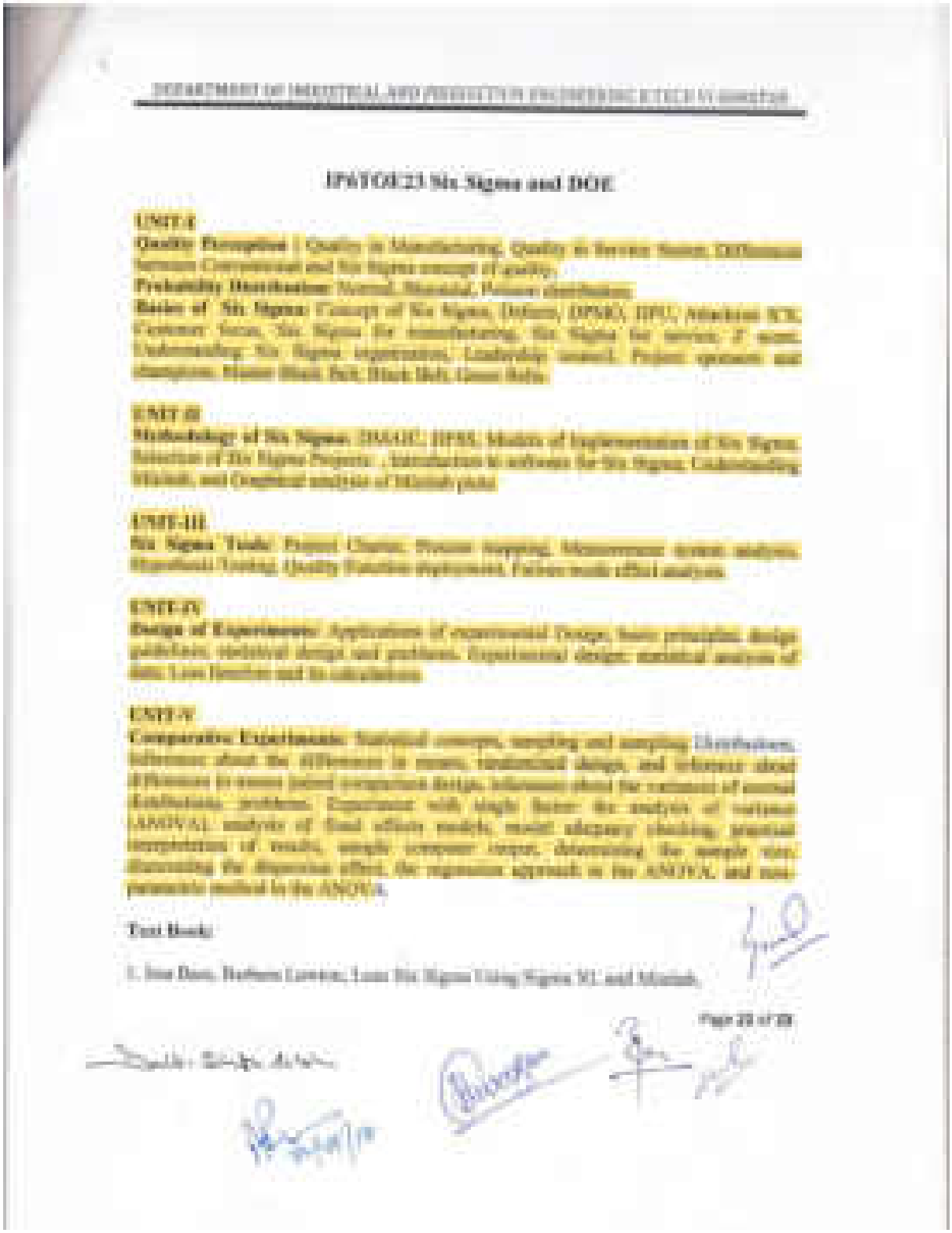

DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING B.TECH VI SEMESTER

IPBTOE23 Six Sigma and DOE

UNIT-I
Quality Perception | Quality in Manufacturing, Quality in Service Sector, Difference between Conventional and Six Sigma concept of quality,
Probability Distribution Normal, Binomial, Poisson distribution
Basics of Six Sigma Concept of Six Sigma, Defects, DPMO, DPU, Attributes SCS, Customer focus, Six Sigma for manufacturing, Six Sigma for service, 5' score, Understanding Six Sigma organization, Leadership council, Project sponsors and champions, Master Black Belt, Black Belt, Green Belts

UNIT-II
Methodology of Six Sigma: DMAIC, IDES, Models of Implementation of Six Sigma, Selection of Six Sigma Projects , Introduction to software for Six Sigma, Understanding Minitab, and Graphical analysis of Minitab plots

UNIT-III
Six Sigma Tools: Project Charter, Process mapping, Measurement system analysis, Hypothesis Testing, Quality Function deployment, Failure mode effect analysis

UNIT-IV
Design of Experiments: Applications of experimental Design, basic principles, design guidelines, statistical design and problems, Experimental design: statistical analysis of data, Loss function and its calculations

UNIT-V
Comparative Experiments: Statistical concepts, sampling and sampling Distributions, Inferences about the differences in means, randomized design, and inferences about differences in means paired comparison design, inferences about the variances of normal distributions, problems, Experiment with single factor: the analysis of variance (ANOVA), analysis of fixed effects models, model adequacy checking, practical interpretation of results, sample computer output, determining the sample size, discovering the dispersion effect, the regression approach to the ANOVA, and non-parametric method in the ANOVA.

Text Books:

1. Jiju Dass, Barbara Lawton, Lean Six Sigma Using Sigma XL and Minitab,

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DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING & TECH SYSTEMS

1.a. Tata McGraw-Hill, 2010.
2. DOE by Phillip Ross PHI.
3. P. Pande and L. Holpa, What is Six Sigma, 1.e. Tata McGraw-Hill, 2002.
4. P. Pande, The Six Sigma Way, 1.e. Tata McGraw-Hill, 2003.
5. R. Cavanagh, R. Neuman, P. Pande, What is Design for Six Sigma, 1.e. Tata McGraw- Hill, 2005.
6. SIX SIGMA by KK BHOTE McGraw-hill.
7. D.C. Montgomery, Design and Analysis of Experiments, 8th Edition, John Wiley.

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INSTITUTE OF TECHNOLOGY (SCHOOL OF ENGINEERING & TECHNOLOGY)
GURU GHASIDAS VISHWAVIDYALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO. 9 OF 2009)
DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
[AS PER NEP 2020]
W.E.F. SESSION 2018-2019
Years B. Tech. IV Year

SEMESTER-VIII

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB TOTAL	
1	IP18DC81	Principles of Management	4	0	0	40	60	100	4
2	IP18DC82	Production Planning and Control	3	1	0	40	60	100	4
3	IP18DC83	CAD/CAM	3	1	0	40	60	100	4
4	IP18DE8A	Elective-DE8	3	0	0	40	60	100	3
5	IP18DE8-	Elective-DE8	3	0	0	40	60	100	3
Total			16	2	0	200	300	500	18
PRACTICALS									
6	IP18DC85	CAD/CAM lab	-	-	2	50	50	100	2
7	IP18DC86	Seminar on Summer Training (Advan in Mech*)	-	-	2	50	-	50	2
8	IP18DC88	Minor Project	-	-	4	50	-	50	2
Total			-	-	10	150	50	200	6
Grand Total			16	2	10	350	350	700	24

Elective Open Elective (OE) - I		Elective Professional Elective (PE) - II	
S.N.	BPT-OE02-	S.N.	BPT-PE02-
01	Product Design & Development	01	Machine Tool Design
02	Entrepreneurship Development	02	Refrigeration And Air Conditioning
03	Strategic Management	04	Composites Materials & Technology

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
[illegible]	[illegible]	[illegible]	4	-	-	4	[illegible]

PRINCIPLES OF MANAGEMENT

UNIT-I

[illegible]

UNIT-II

[illegible]

UNIT-III

[illegible]

UNIT-IV

[illegible]

UNIT-V

[illegible]

Text Books

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. Organizational Behavior, Stephen P. Robbins, PHI
6. Organization and Management, Agrawal R.D. TMH,Principles of Management, Terry & Franklin, Richard – Irwin

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B.TECH VII Sem.	[illegible]	Production Planning And Control	[illegible]	[illegible]	[illegible]	[illegible]	Max Marks-[illegible] Min. Marks-Duration-[illegible]

PRODUCTION PLANNING AND CONTROL

UNIT - I

Introduction: Introduction to various Types of Production System: Viz. Mass Production, Job Shop, Small Production System, Continuous Production System, Concept of Production and Operation Management, Objective & Functions of PPC.

Forecasting: Time factor method, moving average, weighted average, Trend, Seasonality, Regression Technique, Delphi Method.

UNIT - II

Aggregate Planning: Definition, Strategies, Pure and mixed strategies methods.

Master Production Schedule: Objective and functions, Design of MPS, Bill of Materials.

Material Requirement Planning: Objectives, Functions, MRP, MRP-II, Limitations.

Capacity Requirement Planning: Definition, Objectives, Process of CRP, Process Sheet, Rough Cut Capacity Planning, Loading, and Preparation of CRP sheet.

UNIT - III

Scheduling Types: Single Machine Scheduling, Job shop Scheduling, Flow Scheduling.

Sequencing: various priority rules, Line of Balancing, Rank and positional weight method, Kilbridge matrix method.

Facility location and facility location problems: Factors affecting plant locations, single facility location problems and its methods.

Department of Industrial & Production Engineering

Singh Aswini
[illegible]

UNIT - IV

Types of layout: layout design procedure such as CORELAP, CRAFT etc., Material handling system & their classification, principles, JIT & KAIZAN, Implementation & methods of implementation

UNIT-V

Maintenance Management: Types of maintenance strategies, Breakdown and Preventive Maintenance, Predictive and Total Productive Maintenance, Condition monitoring, Individual and group replacement policies, Make or Buy Decisions, concept of original equipment effectiveness

Text Books

1. Production and operation management, O.Nanamchetty, TMH
2. Production and operation management, Ashok Ghosh
3. Production and operation management, Cherry S.N. TMH
4. Production and operations management Theory and practice Mahadevan.B
5. Production and operation management, Joseph G. Monks, TMH
6. Handbook of Material Handling, 10th Hartwood Bedford
7. Operations Management: Design Planning and control for the manufacturing and services Lawrence.P Ritzer, James B. Gilworth Tata Mc Graw Hill
8. Production and Operations management, A.B Ghosh, PHI
9. Production operations management S.N.Dutta, PHI

Department of Industrial & Production Engineering 9

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. II, [illegible]	[illegible]	Computer Aided Design And Manufacturing (CAD/CAM)	3	1	-	4	Max. Marks-80 Min. Marks-Duration-3Hrs

COMPUTER AIDED DESIGN AND MANUFACTURING (CAD/CAM)

UNIT-I

Basics of CAD: Basics Fundamental of Computer Graphics, Principle of computer graphics, Product life cycle, Concept of Computer Aided Design (CAD) and architecture, Hardware and software, Color management, Raster graphics, Graphic primitives, Lines and Circle Drawing algorithms, Software documentation, CAD standards OKS, Opencc, Data exchange standards: IGES, STEP, CALS etc. Communication standards, Standards for exchange images.

UNIT-II

Geometric Modeling of Curves, Surface and Solid: Basics representation of curves, Parametric and non-parametric curves, Mathematical representation of curves, Hermite curves, Bruter curves, B-spline curves and tutorial curves.

Basis of Surface, Techniques of surface modelling, Plane surface, Rule surface, Surface of revolution and sweep, Coons and bi-cubic patches, concept of Bezier and B-spline surfaces, Basic concept of solid modelling techniques, CSG and B-rep method for solid generation.

UNIT - III

Geometric Transformation: Computer Aided Design (CAD) methodology, Coordinate systems, Theory and applications, 2D and 3D geometric transformation, Homogeneous transformation, Concatenation, Assembly modelling, interference of positions and orientation, tolerance analysis, mass property calculations, V-load analysis- Sidden line-surface-solid removal algorithms, shading, rotating, computer animation, Concurrent Engineering.

UNIT - IV

Basics of CAM: Basic concept of numerical control (NC) System, NC coordinate system, NC motion control, Application of NC, concepts of computer numeric control(CNC) system, problems with conventional NC/CNC

Part Programming: Introduction to NC part programming, manual part programming, Computer assisted part programming, Automatically Programming Tool (APT) language, statements and code of APT, programming methods, advantages of CAD/CAM programming

UNIT- V

Advanced Manufacturing System: Concept of distributed numeric control (DNC) system, and its advantages and disadvantages of over NC and CNC, Concept of computer integrated method (CIM), Flexible manufacturing system(FMS), benefits and applications of CIM and FMS, Group Technology(GT), parts classification and coding systems, benefits and applications of GT, automated storage and retrieval system (ASRS), Automated guided vehicle(AGV)

Text Books

1. Principles of Computer Graphics, W. M. Newman and R.F. Sproul, McGraw Hill
2. Computer Graphics, D. Hearn and M.P. Baker, Prentice Hall Inc
3. Production Systems & Automation, Groover, Prentice Hall, India
4. CAD/CAD Theory & Practice-I Zeid & R. Sivasubramanian, TMH
5. CAD/CAM Groover & Zimmer, Prentice Hall, India
6. Computer Graphics & CAD, Rammurthy, T.M.H
7. Industrial Robotics & CIM, Surendra Kumar I.B.H
8. CAD/CAM, P.N.Rao, Prentice Hall, India
9. CAM C.C. Chang & Wang, Pearson
10. Mastering CAD/CAM, Bradley Zeid, Tata McGraw Hill Publishing Co.
11. CAD/CAM Principles, C. McMahon and J. Browne, Pearson Education

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. [illegible]	[illegible]	Product Design & Development	4	-	-	4	Max Marks-40 Min. Marks- Duration 3Hrs

PRODUCT DESIGN & DEVELOPMENT

UNIT-I

Product Design : Definition, Design by evolution, Innovation, essential factors of product design, production-consumption cycle, flow and value addition in the production - consumption cycle, the morphology of design, primary design phases and flow charting, role of allowance, concurrent engineering.

UNIT-II

Product Design practice and Industry : Introduction, product strategies, time to market, analysis of the product, [illegible], standardization, round series, simplification.

Designer: Role, Myth and reality, Industrial design organization, basic design considerations.

Industrial Designer: Problems, procedure for adoption, types of models, Role of aesthetics in product design, functional design practice.

UNIT-III

New products like generation: Modification, Product variants, adding, dropping, Format testing, new products, message, product testing, market tests evaluation, adoption, expansion and Renewing.

Economic factors influencing design: Product value, economic analysis, profit and competitiveness.

Product design for environment: Introduction, importance of DFE, environmental factors, scope of environmental impact, design guidelines for DFE.

[illegible]

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[illegible]

UNIT - IV

Developing product strategy: Benefits of strategy, elements of a product strategy, setting objectives, selection of strategic alternatives, increasing watermarket share, increasing profitability, Design for manufacturing and Design for assembly, Experimental design, Modular versus integral design.

Human Engineering Considerations in product design: Introduction, Anthropometry, Design of controls, The Design of displays, Man/Machine Information exchange.

UNIT -V

Intellectual property systems: Definition, Concept of Intellectual Property, Kinds of Intellectual Property, Economic importance of Intellectual Property, Importance of IPR, TRIPS and its implications.

Trademark: Introduction, Historical development of the concept, Need for Protection, Kinds of Trademarks, and Well known Trademarks. Patents: Historical development, Concepts, Novelty, Utility, Inventiveness/Non-obviousness. Copyrights, Industrial design.

Text Books

1. Chitale A. K. and Gupta R. C.; Product Design and Manufacturing, PHI.
2. Gupta V., Lal G.K. and Reddy; Fundamentals of Design and manufacturing, Narosa Publishing.
3. James Gerrett. Design and technology. (1986). Published by Cambridge University Press.
4. Donald R. Lehman, Russell S. Winer 5th Edition, Product Management TMH.
5. Product Life Cycle Engineering and Management, CEP Lecture notes, Prof R Ravi, IIT Bombay.
6. Karl T. Ulrich and Steven D. Eppinger "Product Design & Development" – 1989 – 1st edition.

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Department of Industrial & Production Engineering

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. & [illegible] Sem.	[illegible]	Entrepreneurship Development	4	-	-	4	Max. Marks-[illegible] Min. Marks-[illegible] Duration-[illegible]

ENTREPRENEURSHIP DEVELOPMENT

UNIT-I

Entrepreneurship Concepts: Concepts of entrepreneurship, Characteristics of successful entrepreneurs, functions of entrepreneurs, Types of entrepreneurs, Distinction between entrepreneur and manager, Growth of entrepreneurship in India and role of entrepreneurship in economic development.

Types of entrepreneurship: Women entrepreneurship, Rural entrepreneurship, Tourism entrepreneurship, Agripreneurship, social entrepreneurship & family business – Factors affecting entrepreneurship growth.

UNIT-II

Entrepreneurship Development: Entrepreneurship development programmes Objectives, contents and evaluation, Small Enterprises: Micro and macro units, scope of micro and small enterprises and their role in economic development – problems of micro and small enterprises – promotional packages.

Types of Business Organization: Sole proprietorship, partnership joint work company, cooperative organization, public sector organization.

UNIT-III

Opportunity / Product Identification: Business opportunities in various sectors, identification of business. Opportunity: idea generation and opportunity selection. Steps in setting up of small business enterprises, Formulation of business plans and project appraisal. Contents of business plans, significance and formulation.

Guide lines for formulating project reports: Methods of project appraisal – economics, financial, market analysis, technical feasibility and managerial competency environmental clearance.

Department of Industrial & Production Engineering

UNIT- IV

Financing of Enterprise: Sources of finance, internal and external resources, capitalization, new issues, short term finance, venture capital, export finance, institutional finance, commercial banks, other financial institutions, institutional support.

Support Institutions: National small industries corporation ltd., small industries development organization, small scale industry board, state small industry development organization, small industries service institutes, district industry centre, technical consultancy organizations

Government policy and taxation: Benefits to small scale industry, tax benefits, incentives and concessions for small scale industries. Government policies for small scale enterprises and industrial policy resolutions.

UNIT- V

Start up Business: Why start a business, key considerations, concept presentation to investors, company considerations, equity considerations, key factors for success

Growth strategies: Growth of enterprises, Objectives of growth, stages and types of growth, expansion diversification, joint ventures, mergers and acquisitions, sub-contracting and financing

Reasons for small industries: Meaning of industrial sickness, causes and symptoms of industrial sickness, causes and consequences, corrective measures for curb sickness, government policies on revival of sick units

E-commerce: Basic concepts, advantages and disadvantages

Text Books

1. Entrepreneurship, Roy, Rajiv, Univ. Press.
2. Entrepreneurship, Hisrich, McGraw Hill
3. Entrepreneurship Development, Khanka, New Age
4. Entrepreneurship Development, Gautam, Thomson Learning
5. Entrepreneurship: Theory & Practices, Kuhl, Wheeler
6. Entrepreneurship Development, Dr. S.S. Khanka S. Chand

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. II. TECH-VII Sem	IPT-TOE-XX	Strategic Management	4	–	–	4	Max Marks-80 Min. Marks- Duration-3Hrs

STRATEGIC MANAGEMENT

UNIT-I

Strategy and Process : Conceptual framework for strategic management, the Concept of Strategy and the Strategy Formation Process | Stakeholders in Business - Vision, Mission and Purpose - Business definition, Objectives and Goals | Corporate Governance and Social responsibility case study.

UNIT-II

Competitive Advantage : External Environment | Porter's Five Forces Model-Strategic Groups Competitive Changes during Industry Evolution- Globalization and Industry Structure | National Context and Competitive advantage Resources-Capabilities and competencies-core competencies-Low cost and differentiation Generic Building Blocks of Competitive Advantage - Distinctive Competencies- Resources and Capabilities-Sustainability of competitive Advantage- Avoiding Rebuttal and sustaining competitive advantage Case study.

UNIT-III

Strategies : The generic strategic alternatives, Stability, Expansion, Retrenchment and Combination Business level strategy, Strategy in the Global Environment, Corporate Strategy, Vertical Integration-Diversification and Strategic Alliances, Building and Restructuring the corporation- Strategic analysis and choice | Environmental Threat and Opportunity Profile (ETOP), Organizational Capability Profile Strategic Advantage Profile, Corporate Portfolio Analysis, SWOT Analysis, GAP Analysis, Mc Kinsey's 7s Framework, GE 9 Cell Model, Distinctive competitiveness, Selection of matrix, Shares Score Card case study.

Department of Industrial & Production Engineering

UNIT- IV

Strategy Implementation & Evaluation : The implementation process, Resource allocation, designing organizational structure-Designing Strategic Control Systems, Matching structure and control to strategy Implementing Strategic change-Politics-Power and Conflict, Techniques of strategic evaluation & control-case study.

UNIT- V

Other Strategic Issues : Managing Technology and Innovation, Strategic issues for Non Profit organizations, Non Business Models and strategies for Internet Economy-case study.

Text Books

1. Thomas L. Wheelen, J.David Hunger and Krish Rangarajan, Strategic Management and business policy, Pearson Education, 11th edition, 2007.
2. Charles W.L.Hill & Gareth R.Jones, Strategic Management Theory, An Integrated approach, Houston, Wiley India,5th edition, 2007.
3. Azhar Kazmi, Strategic Management & Business Policy, Tata McGraw Hill, Third Edition.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. II: 19/20-3/3 Sem.	IPT: TPE...01	Machine Tool Design	3	1	-	4	Max Marks-60 Min. Marks-Duration-3Hrs

MACHINE TOOL DESIGN

UNIT - I

Introduction to machine tool design and mechanism: definitions, classification and general requirement of machine tool, working and auxiliary motions in machine tools, mechanism defining working motion of a machine tools, layout of machine tools.

Regulation of speed and feed rates: objective of speed and feed rate regulation, design of speed box, general recommendation for developing the gearing diagram, determining the number of teeth of gear boxes, mechanical step box regulation of speed and feed rates.

UNIT- II

Design of machine tool structures: function of machine tool structures and their requirements, design criteria for machine tool structures, material of machine tool structures, static and dynamic stiffness, profile of machine tool structures, basic design procedure of machine tool structures, design of bed.

UNIT - III

Design of guide ways and power screws: function and types of guide ways, design of slide ways, design criteria and calculation for slide ways, guide ways operating under liquid friction conditions. Design of accurate slide ways, design of anti-friction guide ways, design of power screws.

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UNIT - IV

Design of spindles and spindle supports: Structure of spindle unit and requirements, material of spindles, effects of machine tool compliance on machining accuracy; design calculation of spindles, design of jigs and fixtures; principle of jigs and fixtures design, locating and clamping, jig bushes, drilling jigs.

UNIT - V

Press work die design: Classification of presses and dies, cutting action in dies, clearance and cutting forces, shear, center of pressure, method of reducing punches; design of blanking dies, drawing die design.

Text Books

1. Machine Tool Design by SK Mehta Tata Mcgraw Publication.
2. Basu, S.K., Design of Machine tool, Allied Publishers, New Delhi.
3. Koenigsberger, F., Design Principles of Metal cutting machine Tools, pergamon Press, Oxford, 1964.
4. Push, V.R., Design of Machine Tools, Mashinostroenie Publishers, Moscow, 1977.
5. Machine Tool Design, vols. I-IV, Mir Publishers, Moscow, 1968.

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. & [illegible]	[illegible]	Refrigeration & Air Conditioning	[illegible]	[illegible]	-	[illegible]	Max Marks-[illegible] Min Marks-[illegible] Duration-[illegible]

REFRIGERATION & AIR CONDITIONING

UNIT – I

Carnot Refrigerator & Heat pump: air refrigeration systems, [illegible] air refrigeration cycle. Air [illegible] & its performance.

Vapour compression refrigeration: simple cycle, [illegible] and [illegible] charts analysis of vapor compression cycle, factors affecting performance of vapor compression cycle, actual vapour compression cycle, multi stage compression system.

UNIT – II

Vapour absorption refrigeration system: description of system components, [illegible] and [illegible] systems. Its analysis & advantages over vapour compression system.

Refrigeration equipment: [illegible] details, capacity, control and performance of compressors, condensers, evaporators, expansion devices, thermostatic expansion valve.

UNIT – III

Production of low temperature – [illegible] system, [illegible] & liquefaction of gases, liquefaction of hydrogen & helium, application of cryogenics.

Nonconventional refrigeration system: [illegible] refrigeration, [illegible] refrigeration system.

Refrigerants: classification, properties & selection of refrigerants.

[illegible]

Department of Industrial & Production Engineering

UNIT – IV

Psychrometrics: Psychrometry and psychrometric properties, psychrometric relations, psychrometric chart and its use, psychrometric processes, human comfort, factors affecting comfort, comfort chart.

Requirements of comfort air conditioning: thermodynamics of human body, comfort chart, factors governing optimum effective temperature.

Cooling load calculations & design of a.c. system: different heat sources, design of air conditioning system, bypass factors, effective sensible heat factor, cooling coils.

UNIT – V

Fluid flow, duct design & air distribution system: various losses in fluid flow, different methods of duct design & arrangement system, air distribution system & ventilation system.

Automobile air conditioning: system, location and layout, components, system maintenance, Car, Railway air conditioning & marine air conditioning.

Text Books

1. Refrigeration and Air Conditioning C. P. Arora : TMH
2. Refrigeration and Air Conditioning – Manohar Prasad – New Age International Pub
3. Refrigeration and Air Conditioning – Arora & Domkundwar – Dhanpat Rai & Sons
4. Refrigeration and Air Conditioning – P.L. Ballaney – Khanna Pub

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IPRPE7 ... 45	Composite Materials and Technology	3	1	-	4	Max Marks-60 Min. Marks- Duration-3Hrs

COMPOSITE MATERIALS AND TECHNOLOGY

UNIT – I

Introduction to Composites Definitions. Typical reinforcements and matrices. Typical properties of fibre composites: mechanical, weight, electrical resistance, etc., compared with "standard" materials. Particular composites. Quality assurance, outline of manufacturing methods. Economic aspects. Dependence of properties on manufacturing route: typical manufacturing defects. Applications. Fibre strengthening. Fibre flaws, critical length, critical volume fraction. Natural composites (wood, bone, etc.)

UNIT – II

Fibres Manufacturing methods Physical and chemical characteristics. Mechanical and other properties of commonly used fibres (carbon, glass, metal and other organics, ceramics). Fibre coating to achieve compatibility with matrix. Use of statistical methods in characterize fibre behaviour. Naturally-occurring (cellulose) fibres. Whisker, typical properties. Manufacturing methods.

UNIT – III

Manufacture of Polymer Matrix Composites Principles of manufacturing: processes, open and closed moulds, including hand and spray (up-up, press, moulding, injection, moulding, resin injection, RIFM, Diameter winding, pultrusion, centrifugal casting, autoclave, prepreg and other "moving" materials, etc. Machine methods for manufacture of composites. Casting, drilling and other finishing operations.

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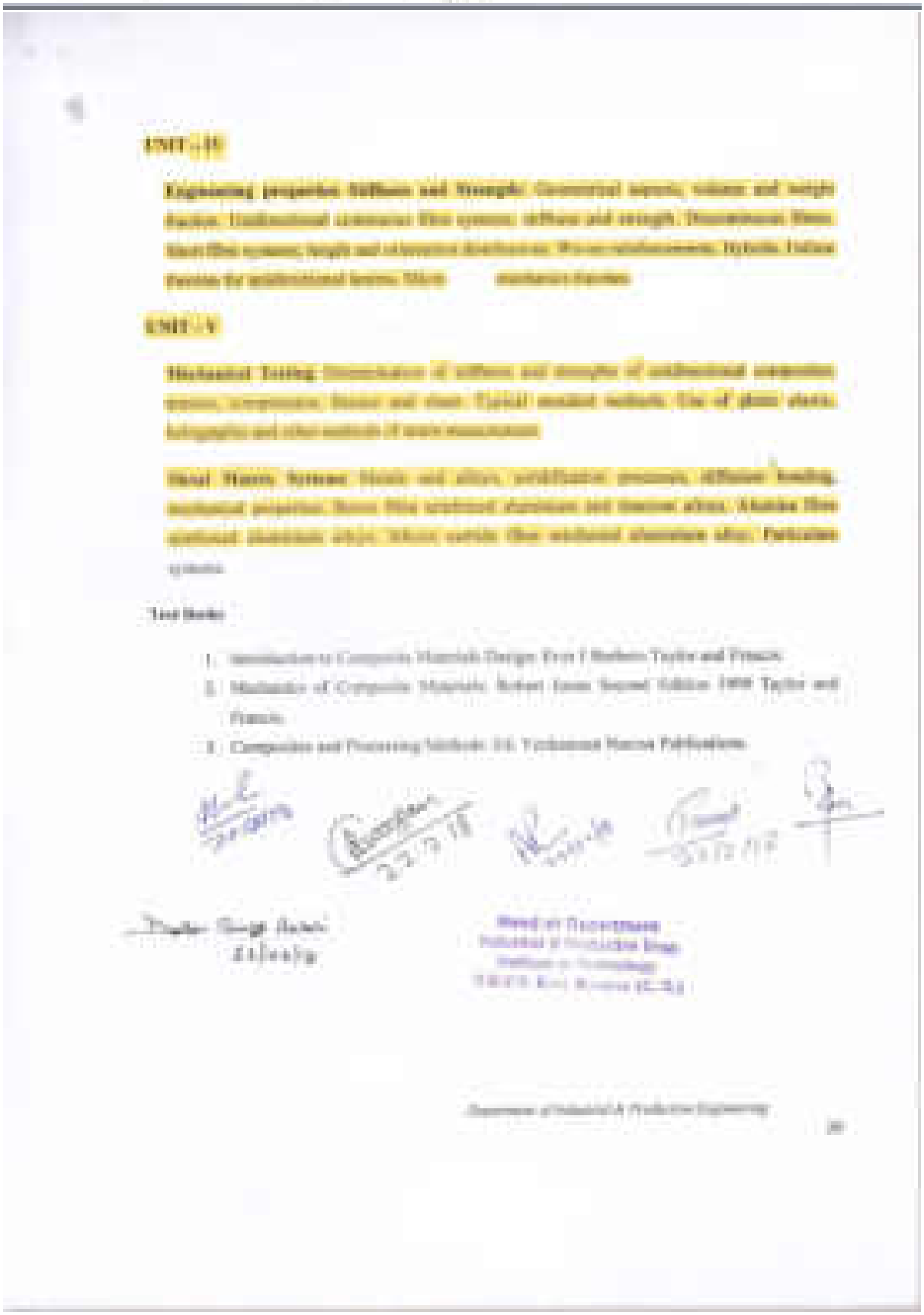
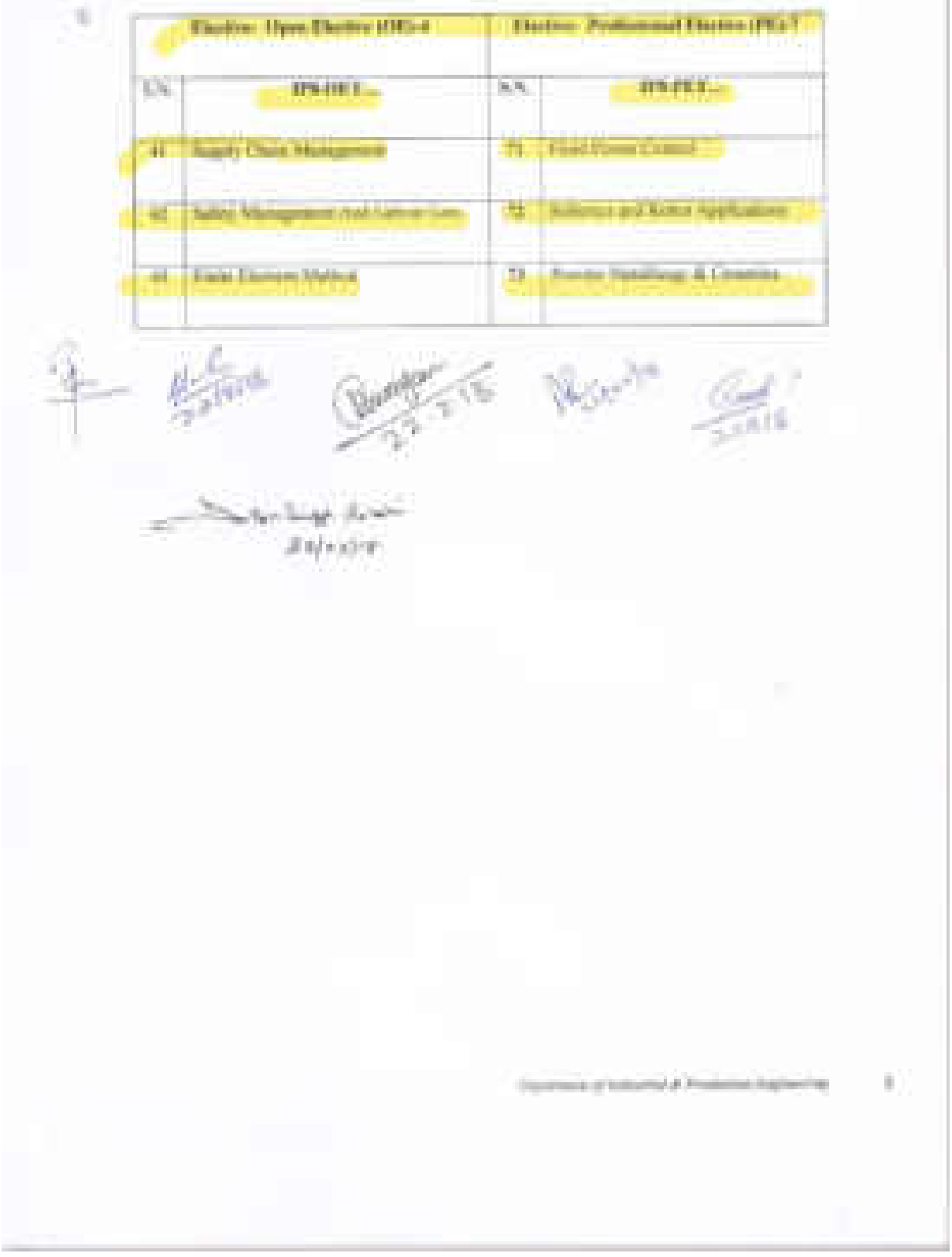


INSTITUTE OF TECHNOLOGY (SCHOOL OF ENGINEERING & TECHNOLOGY)
GURU GHASIDAS VISHWAVIDYALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO. 3 OF 2009)
DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING
STUDY & EVALUATION SCHEME
W.E.F. SESSION 2018-2019
Year/B.Tech./IV year

SEMESTER VIII

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1	IPEPE01	Operation Research	3	1	0	40	60	100	4
2	IPEPE02	Marketing Management	4	0	0	40	60	100	4
3	IPEPE[illegible]	Elective-PE7	4	0	0	40	60	100	4
4	IPEPE[illegible]	Elective-OE4	4	0	0	40	60	100	4
		Total	15	1	0	160	240	400	16
PRACTICALS									
5	IPELP05	Project	-	-	12	120	80	200	6
6	IPELP06	Comprehensive Viva	-	-	-	-	50	50	2
		Total	-	-	12	120	130	250	8
		Grand Total	15	1	12	280	370	650	24



Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. [illegible]	[illegible]	Operation Research	1	1	-	4	Max Marks-60 Min Marks-Duration-3Hrs

OPERATION RESEARCH

UNIT-I

Introduction to linear programming, graphically solution to linear programming problem, solving linear problem by simplex method, optimization problem, maximization & minimization function with or without constraints, task simplex & artificial variable method, degeneracy problem

UNIT-II

Mathematical statement of the transportation problem, the transportation model, method for basic feasible solution, Degeneracy & unbalance problem, Mathematical statement of the assignment problem, solution of assignment problem, pseudo-tabs-mart problem

UNIT-III

Game theory: rule of game, Method of solving game, graphically & Arithmetic, saddle point & without saddle point, dominance method, mixed strategies 2 X 2 game, 2 X N game, M X 2 game, 2 X 2 game (Method of saddle's, method of linear programming etc)

Inventory: Introduction, classification, function, kind, control techniques, models, various costs associated, DOQ, optimum lot-sizing

UNIT-IV

Introduction of queuing theory: elements of queuing system, operating characteristics of a queuing system, Poisson arrivals & exponential service time, waiting time & idle time cost, single channel queuing theory

Replacement problem, replacement policy, replacement of items, machinery various theories, group replacement policy, MAPI methods

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UNIT- V

Network analysis: Introduction of PERT & CPM, computation of PERT, Time estimation, measure of deviation & variation, probability of completing project, Arrow diagram & critical path method, Scheduling, cost analysis & crashing of network.

Text Books

1. Sharma & S.D Kushwaha - Operation Research, Pastrach & Co Mumbai
2. Operation Research, Sarani Vasant
3. Operation Research - N. D. Vohra - TMH Publication
4. Operation Research - Hira & Gupta - S. Chand & Co
5. Operation Research - H. Gilbert - TMH, New Delhi
6. Operation Research - M. Taha - TMH, New Delhi
7. Operation Research - Philip Ravindran- Wiley Publications

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
[illegible]	[illegible]	Marketing Management	4	-	-	4	Max Marks:40 Min Marks- Duration:3hr

MARKETING MANAGEMENT

UNIT-I

Introduction to marketing management : what is marketing? The core concept, need, wants, demands, product, value cost its functions

Marketing management: Production concept, product concept, and selling, marketing concept, role of marketing in modern organization, marketing philosophies

UNIT- II

The actors of high performance business: corporate and division strategic planning, business strategic planning, marketing process, Analyzing consumer markets & buying behavior

UNIT- III

The product life cycle: conditions and strategies in different phases. Marketing strategies through PLC

New Product Decision: Definitions and factors contributing to new production development, new product development process

UNIT IV

Dealing on the marketing Program: Product, promotion, pricing, place (Distribution Channel), Managing Advertising, Sales promotion & public relations, developing & managing development program, sales promotion, public relations

UNIT- V

Managing retailing, whole selling and logistic- types of retailers and levels of services, trends in retailing, types of whole selling, market logistics

The role of marketing communication, communication process model and developing effective c communication, characteristics of marketing communication mix, factors in setting the communication mix.

Text Books

1. Product Design and Manufacturing, Chitale & Gupta, PHI
2. Marketing Management, Philip Kotler PHI Publications

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B.Tech. VII Sem	PE-OE-[illegible]	Supply Chain Management	4	-	-	4	Max Marks-60 Min. Marks-Duration-3Hrs

SUPPLY CHAIN MANAGEMENT

UNIT-I

Building a Strategic Framework to Analyze Supply Chains: What is a Supply Chain? The Objective of a Supply Chain ,The Importance of Supply Chain Decisions, Decision Phases in a Supply Chain , Process View of a Supply Chain, Examples of Supply Chains, Supply Chain Performance: Achieving Strategic Fit and Scope, Competitive and Supply Chain Strategies ,Achieving Strategic Fit ,Expanding Strategic Scope, Supply Chain Drivers and Metrics, Drivers of Supply Chain Performance, Framework for Structuring Drivers,Facilities ,Inventory ,Transportation ,Information ,Sourcing ,Pricing

UNIT-II

Designing the Supply Chain Network: Designing Distribution Networks and Applications in e-Business the Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design, Design Options for a Distribution Network, e-Business and the Distribution Network, Distribution Networks in Practice.

Network Design in the Supply Chain: The Role of Network Design in the Supply Chain, Factors Influencing Network Design Decisions Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation, The role of IT in Network Design, Making Network Design Decisions in Practice.

Network Design in an Uncertain Environment: The Impact of Uncertainty on Network Design, Discounted Cash Flow Analysis ,Representations of Uncertainty ,Evaluating Network Design Decisions Using Decision Trees ,A/M Trees Evaluation of Supply, Chain Design Decisions Under Uncertainty ,Risk Management and Network Design (TL)Making Supply Chain Decisions Under Uncertainty in Practice.

UNIT-III

Planning Demand and Supply in a Supply Chain: Demand Forecasting in a Supply Chain, The Role of Forecasting in a Supply Chain, Characteristics of Forecasts, Components of a Forecast and Forecasting Methods, Basic Approach to Demand Forecasting, Time-Series Forecasting Methods, Measures of Forecast Error, Forecasting Demand at Future Sub ,The Role of IT in Forecasting, Risk Management in Forecasting, Forecasting in Practice.

Aggregate Planning in a Supply Chain: The Role of Aggregate Planning in a Supply Chain, the Aggregate Planning Problem, Aggregate Planning Strategies, Aggregate Planning Using Linear Programming, Aggregate Planning in Excel, The Role of IT in Aggregate Planning, Implementing Aggregate Planning in Practice.

Planning Supply and Demand in a Supply Chain: Managing Predictable Variability, Responding to Predictable Variability in a Supply Chain, Managing Supply, Managing Demand, Implementing Solutions to Predictable Variability in Practice.

UNIT-IV

Planning and Managing Inventories in a Supply Chain: Managing Economies of Scale in a Supply Chain, Cycle Inventory, The Role of Cycle Inventory in a Supply Chain ,Economies of Scale to Exploit Fixed Costs, Economies of Scale to Exploit Quantity Discounts ,Short-Term Discounting, Trade Promotions, Managing Multiechelon Cycle Inventory ,Estimating Cycle Inventory-Related Costs in Practice.

Managing Uncertainty in a Supply Chain: Safety Inventory,The Role of Safety Inventory in a Supply Chain, Determining Appropriate Level of Safety Inventory, Impact of Supply Uncertainty on Safety Inventory, Impact of Aggregation on Safety Inventory, Impact of Replenishment Policies on Safety Inventory ,Managing Safety Inventory in a Multiechelon Supply Chain ,The Role of IT in Inventory Management ,Estimating and Managing Safety Inventory in Practice.

Determining the Optimal Level of Product Availability: The Importance of the Level of Product Availability, Factors Affecting Optimal Level of Product Availability, Managerial Levers to Improve Supply Chain Profitability, Setting Product Availability for Multiple Products under Capacity Constraints, Setting Optimal Levels of Product Availability in Practice.

5. UNIT- V

Designing and Planning Transportation Networks: Transportation in a Supply Chain, The Role of Transportation in a Supply Chain, Modes of Transportation and Their Performance Characteristics, Transportation Infrastructure and Policies, Design Options for a Transportation Network Tradeoffs in Transportation Design, Tailored Transportation, The Role of IT in Transportation Risk Management in Transportation, Making Transportation Decisions in Practice.

Managing Cross-Functional Drivers in a Supply Chain: Sourcing Decisions in a Supply Chain, The Role of Sourcing in a Supply Chain, In-House or Outsource, Third- and Fourth-Party Logistics Providers, Supplier Scoring and Assessment, Supplier Selection Auctions and Negotiations Contracts and Supply Chain Performance, Design Collaboration, The Procurement Process, Sourcing Planning and Analysis, The Role of IT in Sourcing, Risk Management in Sourcing, Making Sourcing Decisions in Practice.

Text Book

1. Supply Chain Management: Jason Hall, Pearson Publications 2015.
2. Supply Chain Management: Sunil Chopra and Meta del, Fourth Edition, PHI 2016.
3. Supply Chain Management: A.S.Alaskar PHI Second Ed.2006.
4. Logistics Management: James Stock and Douglas Lambert, McGraw Hill International Ed.2008.
5. Supply Chain Management for Global Competitiveness: Ed.B.S.Sahay McMillan Publication 2003.
6. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay McMillan Publication 2003.
7. Logistics Management: Bowersox TMH 2004.

[illegible]

[illegible]

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IPE-OET – 42	Safety Management And Labour Law	4	-	-	4	Max Marks-60 Min. Marks- Duration-3Hrs

SAFETY MANAGEMENT AND LABOUR LAW

UNIT -I

Safety Management: Concepts Evolution of modern safety concept- Safety policy – Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety. Technique Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety – survey, – safety inspection, safety sampling, Safety Audit.

Safety in Material Handling: Ergonomic considerations in material handling, design, installation, operation and maintenance of Conveying equipment, hoisting, travelling and moving mechanisms

UNIT -II

Design of Air Pollution Control System: Industrial sources of Air Pollution, Emission factors, Regulations Control Strategies, Policies, Gaseous Pollutant control: Gas absorption in tray and packed towers, Absorption with / without chemical reaction – Removal of SO2 – Absorption in Fluid Matter- Breakthrough, Removal of HCs / VOCs – NOx removal – Wet scrubbers.

Integrated Air pollution control systems: Pollution Control in Process Industries, Pollution control in process industries like sources, paper, petroleum, petroleum products- stable-concentrated-thermal power plants dying and pigment industries – eco-friendly energy

UNIT -III

Safety in Metal Working Machinery and Wood Working Machines: General safety rules, principles, maintenance, Inspection of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes, laws, types, hazards.

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5. **UNIT -IV**

Fire Prevention and Protection: Sources of ignition, fire triangle, principles of fire extinguishing, active and passive fire protection systems – various classes of fires, A, B, C, D, E, types of fire extinguishers, fire stoppers, hydrant pipes, hoses, monitors, fire watchers layout of steel pipes – fire station-fire alarms and sirens, maintenance of fire trucks, foam generators, escape from fire rooms operations, fire drills, motion first aid for burns.

UNIT -V

Explosion Protecting System: Principles of explosion-detonation and blast wave-explosion, parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure-explosion venting-burst gases, plant for generation of inert gas capture also in process vessels and lines explosion, suppression system based on carbon dioxide (CO2) and halons-hazards in LPG, ammonia (NH3), Sulphur dioxide (SO2), chlorine (CL2) etc.

Text Book

1. Accident Prevention Manual for Industrial Operations", N.S.C. Chicago, 1982
2. Heinrich H.W. "Industrial Accident Prevention" McGraw-Hill Company, New York, 1980
3. Gupta, R.K., "Hand Book of Fire Technology" Orient Longman, Bombay, 1977
4. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982
5. Hinks Tobias, "Fire and explosion protection

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. R. TECH- VIII Sem	IPE-OET...03	Finite Element Method	1	1	-	4	Max Marks-60 Min. Marks- Duration-3Hrs

FINITE ELEMENT METHOD (FEM)

UNIT-I

Basic Concept of FEM: Historical background, Basic concept and steps in FEM, Mathematical modeling of field problems in engineering, Governing equations, Discrete and continuous models, Boundary and initial value problems, One dimensional second order equation, Accumulation, Linear and higher order elements, Introduction of FEM software and steps.

Matrix displacement formulation: Matrix displacement equations, solution of matrix displacement equations, techniques of saving computer memory requirements, Finite element formulation.

UNIT-II

Natural Coordinate systems and Shape function: Basic concept of natural coordinate, 1-D and 2-D natural coordinate, Concept of shape function, Convergence requirements, Pascal triangle, Shape function for linear and plain elements, Shape function using Lagrange polynomials, Shape function for secondary finite elements, Degrading technique for scales.

UNIT-III

Strain displacement matrix: Strain-displacement matrix for linear and plain elements, Strain-displacement matrix for beam, Linear and plain elements.

Stiffness Matrix: Concept of element stiffness matrix for linear and plain elements, Stiffness matrix for bar & beams, Stiffness matrix for linear and plain elements, Force vectors, Body forces and thermal loads, Plate and shell elements, Finite representation of infinite bodies, Element aspect ratio, Quadrilateral and higher order element in mesh refinement.

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UNIT-IV

Assembling of stiffness Matrix, Assembly of elemental matrices, boundary conditions and solution, Direct approach, Strain energy, Castigliano's first theorem, Minimum potential energy, Galerkin's method, Galerkin's method applied to elasticity problems, Weighted Residual Methods, Variational formulation of boundary value problems, Rite technique, Supersonic formulation.

UNIT-V

Finite element Solutions: Numerical integration and application to plane stress problems, Solid mechanics and heat transfer, Longitudinal vibration and mode shapes, Fourth order beam equation, Transverse deflections and natural frequencies, Bar, Trusses & Beams, Plane stress and plane strain problems, Use of higher order elements, Solution of dynamic problems application to thermal problems, solution of non-circular shafts.

Text Books:

1. K.H Huebner, and E.A., Thornton, "The Finite Element Methods for Engineers" John Wiley & Sons.
2. R.H. Cook, Malkus, D.S. and Plesha, M.E., "Concepts and Applications of Finite Element Analysis", 3rd Ed., John Wiley & Sons.
3. S.S. Rao, Finite Element Method in Engineering, Butterworth Heinemann.
4. Hahn, R.J., "Finite Element Procedures", Prentice Hall of India, New Delhi.
5. Zienkiewicz, O.C. and Taylor, R.L., "The Finite Element Methods", Vol.1 and Vol.2, McGraw Hill.
6. S.S.Bhavikatti, Finite element analysis, New Age Pub.
7. J.N., Reddy, An Introduction to Finite Element Method, Tata McGraw Hill.
8. P. Sadhu, Text Book of Finite Element Analysis, Prentice Hall, New Delhi.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH - VIII Sem	IPE/PEC – 71	Fluid Power Control	3	1	-	4	Max Marks-60 Min. Marks- Duration-3Hrs

FLUID POWER CONTROL

UNIT -I

Introduction - what is fluid power, application of fluid power, components of fluid power system, Force pressure and load. Specific weight, density specific gravity, bulk modulus, viscosity, viscosity index.

Energy and Power in Hydraulic System: Pascal's law, continuity equation, conservation of energy, hydraulic power, Bernoulli's equation, Torricelli's theorem, the siphon, Energy power and flow rate in the SI units.

UNIT -II

Hydraulic pumps: Introduction pumping theory, pumps classification, gear pump, vane pump, piston pump, pump Performance, pump Noise, pump selection , pump performance rating in SI unit.

Hydraulic Cylinders and cushioning: Introduction, Hydraulic Cylinders operating features, Cylinders mounting and mechanical linkage, Cylinder loads due to moving weights, special cylinder designs, cylinder loading through mechanical linkage, hydraulic cylinder controls, and hydraulic shock absorber.

UNIT -III

Hydraulic motors: Introduction, Inched motion, Hydraulic motors, gear motors, vane motors, Hydraulic motors theoretical torque, power and flow rate, Hydraulic motors performance, Hydraulic transmission, Hydraulic motors performance in metric unit.

Hydraulic valves: Hydraulic components pressure flow direction controls valves - proportional, servo, cartridge (logic) valves, Hydraulic flow

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UNIT - IV

Hydraulic Conductor and Fittings: Introduction, conductor sizing for flow-rate requirements, pressure rating of conductors, steel pipes, steel tubing, plastic tubing, flexible hoses, quick disconnect couplings, hoses and tubing.

Hydraulic Circuit Design and Analysis: Introduction, control of single and double acting hydraulic cylinder, pump hydraulic system, circuit, valve application, speed control of motor and cylinder, model braking system, analysis of hydraulic system.

UNIT - V

Pneumatics: Air preparation & components: Introduction, compressor, fluid conditioner, analysis of maximum removal from air, air control valves, Pneumatic actuators.

Pneumatic circuits and applications: design consideration, pressure losses in pipe lines, circuits, vacuum systems, analysis.

Text books

1. Fluid power with application by Anthony Esposito by FSE publication.
2. Oil hydraulic system by Majumdar by TMC publication.

[illegible]

[illegible]

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	[illegible]	Robotics and Robot Applications	3	1	-	4	Min Marks-40 Max Marks Duration-3Hrs

ROBOTICS AND ROBOT APPLICATIONS

UNIT – I

Introduction to Robotics: Evolution of robots and robotics, progressive advancement in robots, definitions and classifications, laws of robotics, robot anatomy and related attributes, operations, accuracy and precision, human arm characteristics, robot specifications and resolutions, concepts of robots programming, the future prospects.

UNIT – II

Coordinate Frames, Mapping and Transforms : Coordinate frames, Spatial descriptions and transformations, Fundamentals of translation, rotations and transformations, inverting a homogeneous transform, fundamental rotation matrices, yaw pitch and roll, yaw pitch and roll transformations, equivalent angle.

UNIT – III

Symbolic Modeling of Robots, Direct Kinematic Model: Mechanical structure and transmission, description of links and joints, kinematic modeling of the manipulators, Denavit- Hartenberg (D-H) representation, kinematic relationship between adjacent links, manipulator transformation matrix, link equations.

UNIT – IV

Robotic Sensors and Vision: The meaning of sensing, sensors in robotics, kinds of sensors used in robotics, robotic vision, industrial applications of vision-controlled robotic systems, process of imaging, architecture of robotic vision systems, image acquisition, description of other components of vision system, image representation, image processing, Artificial Intelligence (AI) in robotics.

UNIT - 5

Robot Controller & Applications: Linear control of robot manipulators, Feedback and close loop control, Second-order linear systems, Trajectory following control, Modelling and control of single joint, Architecture of industrial robotic controllers, Artificial intelligence, Industrial and non-industrial applications, robotic applications for sustainable development & social issues.

Text Books

1. Robotics & Control - R.K. Mittal & I.J. Nagrath - TMH Publications
2. Robotics for engineers - Yoram Koman, McGraw Hill Co.
3. Industrial Robotics Technology programming and Applications - M.P. Groover, M.Weiss,
4. Robotics Control Sensing, Vision and Intelligence - K.S.Fu, R.C Gonzalez, C.S.G.Lee- McGraw Hill Book co.
5. Kinematics and Synthesis of Linkages - Hartenberg and Denavit - McGraw Hill Book Co.
6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall
7. Kinematics and Dynamics of Machinery - J.Hirschhorn - McGraw Hill Book Company

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. & [illegible]	[illegible]	Powder Metallurgy and Ceramics	3	1	-	4	Max. Marks-[illegible] Min. Marks-[illegible] Duration-[illegible]

POWDER METALLURGY AND CERAMICS

UNIT – I

Introduction: Steps in powder metallurgy, advantage application limitation and recent scope.

Powder production methods and Properties: Metal production methods: Decolorization, Mechanical (Milling), Electro deposition, Spray drying, Powder Treatment: Screening, cleaning, annealing, and lubrication, Powder treatment and handling: , coating and pyrophoricity, toxicity

UNIT – II

Characterization of metal powder: Sampling of metal powder, particle size and size distribution, Particle shape analysis, surface area, density and porosity, apparent density, tap density

Compaction and shaping: powder pressing, compaction methods classification of parts, Cold Isostatic compaction, powder rolling, High temperature compaction – principle of pressure sintering

UNIT – III

Sintering and consolidation: Sintering types of Sintering, theory of Sintering, Sintering of multi components, effect of Sintering, porosity in Sintered part, Sintering atmosphere, Sintering furnaces, metallographic of Sintering parts

PM Products and their Applications: Electrical and magnetic applications (Resistance welding electrode, Metal graphite brushes, Tungsten etc),PM porous parts, PM Friction materials, Metal bearings, Dispersion strengthened materials, Cutting tool materials, Cemented carbides and tools, cermet.

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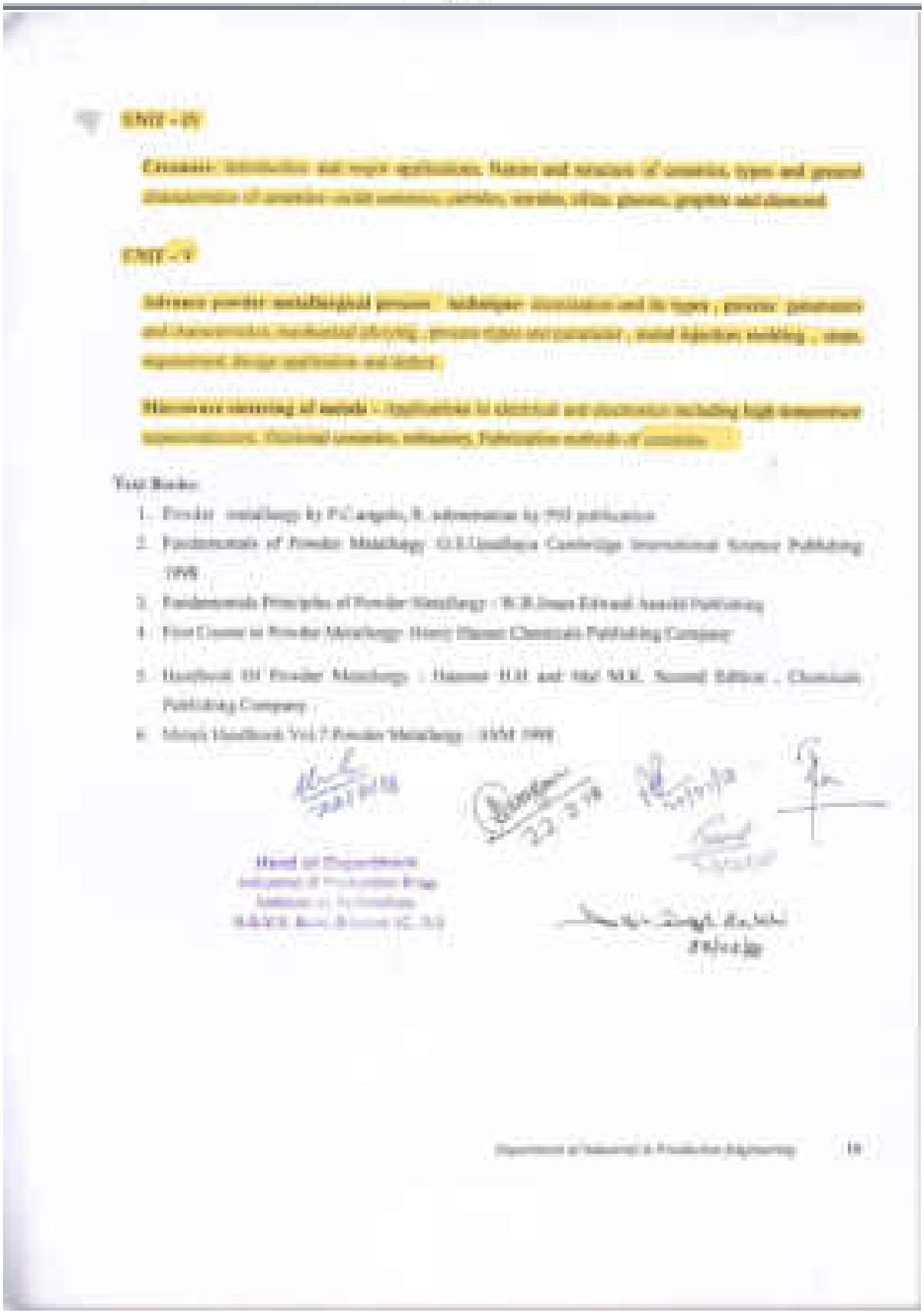

UNIT - IV

Ceramics: Introduction and major applications. Nature and structure of ceramics, types and general characteristics of ceramics: oxide ceramics, carbides, nitrides, silicas, glasses, graphite and diamond.

UNIT - V

Advance powder metallurgical process: Isostatique: Introduction and its types, process: parameters and characteristics, mechanical alloying, process types and parameter, metal injection molding, steps, equipment, design application and defect.

Microwave sintering of metals - Applications in electrical and electronics including high temperature superconductors, functional ceramics, refractory, Fabrication methods of ceramics.

Text Books:

1. Powder metallurgy by P.Cangelo, R. submersion by PSI publication
2. Fundamentals of Powder Metallurgy: G.S.Upadhaya Cambridge International Science Publishing 1998
3. Fundamentals Principles of Powder Metallurgy : R.R.Jman Edward Arnold Publishing
4. First Course in Powder Metallurgy: Henry Hansen Chemicals Publishing Company
5. Handbook Of Powder Metallurgy : Hansen H.H and Mal M.K. Second Edition , Chemicals Publishing Company
6. Metals Handbook Vol.7 Powder Metallurgy : ASM 1998

Head of Department
Industrial & Production Engg.
Institute of Technology
R.R.V.R. Koni, Bilaspur (C.G.)

SCHEME OF EXAMINATION

B.TECH (FOUR YEAR) DEGREE COURSE

FIRST YEAR , INDUSTRIAL PRODUCTION ENGINEERING

SEMESTER I (OCTOBER-M)

EFFECTIVE FROM SESSION 2018-19

SL. NO	SUBJECT CODE	SUBJECTS	PERIODS/WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	[illegible]	[illegible]	3	1	0	30	70	100	4
2	[illegible]	[illegible]	3	1	0	30	70	100	4
3	[illegible]	[illegible]	3	0	0	30	70	100	3
4	[illegible]	[illegible]	3	0	0	30	70	100	3
PRACTICAL									
1	[illegible]	[illegible]	0	0	3	60	40	100	1.5
2	[illegible]	[illegible]	0	0	3	60	40	100	1.5
3	[illegible]	[illegible]	1	0	3	60	40	100	2.5
4	[illegible]	[illegible]	0	0	2	60	40	100	1
5	[illegible]	[illegible]	-	-	2	-	-	-	-
							TOTAL		[illegible]

IA - INTERNAL ASSESSMENT ESE - END SEMESTER EXAM L- LECTURE
T-TUTORIAL P-PRACTICAL

SCHEME OF EXAMINATION

B.TECH (FOUR YEAR) DEGREE COURSE

FIRST YEAR, INDUSTRIAL PRODUCTION ENGINEERING

SEMESTER II (COURSE-A)

EFFECTIVE FROM SESSION 2018-19

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	TA	ESE	TOTAL	
THEORY									
1	[illegible]	PHYSICS	3	1	0	30	70	100	4
2	[illegible]	BASIC ELECTRICAL ENGINEERING	3	1	0	30	70	100	4
3	[illegible]	MATHEMATICS-II	3	1	0	30	70	100	4
4	[illegible]	ENGLISH	3	0	0	30	70	100	3
5	[illegible]	ENVIRONMENTAL SCIENCES	3	0	0	-	-	-	0
PRACTICAL									
1	[illegible]	PHYSICS LAB	0	0	3	30	20	50	1.5
2	[illegible]	BASIC ELECTRICAL ENGINEERING LAB	0	0	2	30	20	50	1
3	[illegible]	ENGINEERING GRAPHICS & DESIGN	1	0	3	30	20	50	2.5
								TOTAL	20

TA - INTERNAL ASSESSMENT ESE - END SEMESTER EXAM L-LECTURE
T-TUTORIAL P-PRACTICAL

Subject code/SUBJECT	L	T	P	Credit
[illegible]	3	1	0	4

Module 5a: First order ordinary differential equations(4 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 5b: Ordinary differential equations of higher orders (Prerequisite 5a, 4a) (8 hours)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation, Power series solutions, Legendre polynomials, Bessel functions of the first kind and their properties.

Module 5c: Partial Differential Equations- First order(Prerequisite 5a-b) (4 hours)

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Module 5d: Partial Differential Equations Higher order(Prerequisite 5c-c) (10 hours)

Solution to homogeneous and non-homogeneous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation, Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.
7. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
8. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
9. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
10. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.
11. Danian murty differential equations, oxford publications.

SUBJECT CODE NAME	L	T	P	Credit
PHYSICAL CHEMISTRY	3	1	0	4

Unit-I **Concept of Quantum Energy and Spectroscopy:** Quantization of Energy, Regions of spectrum, Electronic Spectroscopy: Electronic Transition, Woodward Fischer rules for calculating λ_{max} of conjugated dienes & α,β-unsaturated carbonyl compound, various shifts & λ_{max} and intensities. Infra Red Spectroscopy: Conditions for Infra Red Spectroscopy, Molecular vibrations & factors affecting Infra Red frequencies. [9 L]

Unit-II **Chemical Bonding in Molecules:** Introduction of chemical bonding, VSEPER Theory, V.B.Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions. [9 L]

Unit-III Concept of Chirality, Enantiomers, Diastereomers, Meso compounds and Racemic mixtures. Conformation of Acyclic hydrocarbon (Ethane, Propane & n-Butane) and Cyclic hydrocarbon (Cyclohexane). Plane of symmetry, Center of symmetry, Chirality and Relative Configuration (R & S, D & L and E & Z). [9 L]

Unit-IV Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules. Effects of thermodynamic control of reactions. [12 L]

Unit-V Strategy for Synthesis of Organic Compounds: Reactive Intermediates: Stability of Free Radicals, Carbocation and Carbanion. Introduction to reaction involving Addition, Elimination, Substitution and Ring opening and Cyclization. [6 L]

Subject code/NAME	L	T	P	Credit
[illegible]	3	0	0	3

Unit 1
Introduction to Programming (3 lectures)
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) -
Idea of Algorithm (3 lectures): steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples.
From algorithm to programs: source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit 2
Arithmetic expressions and precedence (12 lectures)
Conditional Branching and Loops
Writing and evaluation of conditionals and consequent branching
Iteration and loops
Arrays (6 lectures)(Arrays (1-D, 2-D), Character arrays and strings)

Unit 3
Basic Algorithms (6 lectures)
Searching concept of binary search etc., Basic Sorting Algorithms (bubble sort etc.)Finding roots of equations, Introduction of Algorithm complexity

Unit 4
Function (5 lectures)
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions, idea of call by reference binary search etc.
Recursion functions (5 lectures) Recursion, as a different way of solving problems. Example programs such as Finding Factorial, Fibonacci series, etc.

Unit 5
Structure (4 lectures)
Structures, Defining structures and Array of Structures
Pointers (3 lectures) Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Suggested Text Books
(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books
(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

SUBJECT CODE/SUBJECT	L	T	P	Credit
DSE TEXTILE ENGINEERING MECHANICS	2	0	0	2

ENGINEERING MECHANICS

UNIT-I

Introduction to Engineering Mechanics covering, Force Systems/Basic concepts,Particle equilibrium in 2-D & 3-D, Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space–Resultant- Moment of Forces and its Application,Couples and Residual of Force System, Equilibrium of System of Forces, Free Body Diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT-II

Friction covering, Types of friction, Limiting friction, Laws of Friction, Rotational Dynamic Friction, Motion of Bodies.
Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; Simple Trusses; Zero Force members.

UNIT-III

Centroid and Centre of Gravity covering, Centroid of simple Spaces from first principle, centroid of composite sections; Centre of Gravity and its implications; Accurate of inertia; Definition, Moment of inertia of plane sections from first principles,Theorems of moment of inertia, Moment of inertia of standard sections and composite sections.

UNIT-IV

Virtual Work and Energy Methods Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, diagram of freedom, Active force diagram, mechanical efficiency.
Review of particle dynamics- Rectilinear motion; Newton's 2nd law (rectangular and path). Work-kinetic energy,power, potential energy,impulse-momentum, Impact (Direct and oblique).

UNIT-V

Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principle in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies;Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

Text/Reference Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. E. P. Hear and E. R. Johnston (2017), Vector Mechanics for Engineers, Vol I – Statics, Vol II. -Dynamics, 9th Ed, Tata McGraw Hill
3. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
4. Shames and Rao (2006), Engineering Mechanics, Pearson Education
5. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
6. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
7. Tayal A.K. (2010), Engineering Mechanics, Umesh Publication

	L	T	P	Credit
[illegible]	4	0	2	5

List of Experiments

Group - A

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution
2. To determine the Normality and Strength (gm/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (FAS) solution 'B' taking KMnO4 solution as an intermediate.
3. To determine the concentration of Cu(II) solution (CuSO4.5H2O) iodometrically with given Iodine (N/50) solution.
4. Find out the Temporary hardness of given water sample using EBTM EDTA solution, buffer solution (pH-10) and EBT as an indicator.
5. To determine chloride ion in a given water sample by Argentometric method (Mohr's method)

Group - B

6. Preparation of Urea Formaldehyde resin
7. Acetylation of Primary Amine: Preparation of Acetanilide.
8. Base Catalyzed Aldol Condensation: Synthesis of Dibenzalacetone
9. [4+2] Cycloaddition Reaction: Diels-Alder reaction.
10. Preparation of Aspirin and salicylate ion (Acid

Group - C

11. To calculate the λ_{max} of a given compound using UV-visible spectrophotometer
12. To examine the racemic ions by paper chromatography.
13. To determine the surface tension of a liquid by stalagmometer
14. To determine the percentage composition of the given mixture consisting of two liquids A and B (non interacting system) by viscosity method.
15. To determine the relative viscosity of given liquids by Ostwald's viscometer

Note: At least two Experiments from each group must be performed.

SUBJECT CODE NAME	L	T	P	Credit
[illegible]	0	0	3	1.5

(The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.)

Tutorial 1: Problem solving using computers
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: (I) Arrays: searching, sorting
Lab 5: (1) Array manipulation

Tutorial 6: (II) Arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration)
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

SUBJECT CODE/NAME	L	T	P	Credit
WORKSHOP & MANUFACTURING PRACTICES	1	0	3	2.5

Lectures & videos (9 hours)

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal cutting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4Th edition, Pearson Education India Edition, 2002.
(iii) Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology- I",Pearson Education, 2008.
(iv) Roy A. Lindberg,"Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill Hours, 2017.

SUBJECT CODE	SUBJECT	L	T	P	Credit
[illegible]	[illegible]	0	0	2	1

Engineering Mechanics - Lab

List of Experiments

1. Verification of law of parallelogram of forces.
2. Verification of law of triangle of forces.
3. Verification of law of polygon of forces by universal force table.
4. Verification of law of moment for parallel forces apparatus.
5. Practical verification of forces in the member of jib crane.
6. Practical verification of forces in the member of the truss.
7. Determination of coefficient of friction between two given surfaces by inclined plane method.
8. Determination of efficiency of simple screw jack.
9. Determination of efficiency of single purchase winch crab.
10. Determination of efficiency of double purchase winch crab.
11. Determination of efficiency of simple wheel and axle.

Unit : I

Unit : II

Unit : III

Unit : IV

Text Books and References:

1) ...
2) ...
3) ...
4) ...
5) ...
6) ...
7) ...
8) ...
9) ...
10) ...
11) ...
12) ...
13) ...
14) ...
15) ...

SUBJECT CODE/NAME	L	T	P	Credit
[illegible]	3	1	0	4

Module-I : DC Circuits (8 hours)
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

Module-II : AC Circuits (8 hours)
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Module-III : Transformers (8 hours)
Magnetic materials, BH characteristics, Ideal and practical transformers, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module-IV : Electrical Machines (8 hours)
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of repulsion motor. Construction and working of synchronous generators.

Module-V : Power Converters (8 hours)
DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module-VI : Electrical Installations (8 hours)
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Important Characteristics for Batteries, Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

(1) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(2) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(3) L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(4) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(5) V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Subject code	L	T	P	Credit
[illegible]	3	1	0	4

Calculus (Single Variable)

Module I: Calculus (8 hours)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions; Asymptotes; Reflection; properties and problems.

Module II: Calculus (8 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module III: Sequences and series (Prerequisite: [illegible]) (8 hours)

Convergence of sequence and series, tests for convergence, power series, Taylor's series,Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Textbooks/References:

1.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Multivariable Calculus

Module: Ia: Multivariable Calculus (Differentiation) (Prerequisite: [illegible]) (10 hours) Limit, continuity and partial derivatives, direct total derivatives, total derivative rule, tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module: Ib: Multivariable Calculus (Integration) (Prerequisite: Ia) (10 hours)

Multiple integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by calculus integration; Center of mass and Gravity (constant and variable densities); Theorems of Pappus, Guass and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelopipeds.

Textbooks/References:

1.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3.Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 Reprint, 2010.
4.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition,2000.

Matrices and Linear Algebra

Module: IIa: Matrices (In case vector spaces is not to be taught) (14 hours)

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; Systems of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem; Orthogonal transformation and quadratic to canonical forms.

Module 4b: Matrices (in case vector spaces is to be taught) (8 hours)
Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear independence, rank of a matrix, determinants; Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Module 4c: Vector spaces (Prerequisite 4b) (10 hours)
Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem, composition of linear maps, Matrix associated with a linear map.

Module 4d: Vector spaces (Prerequisite 4b-c) (10 hours)

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases; Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

1.D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2.V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.
3.Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4.Veeraraju T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008
5.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

31/7/18

31/7/18

1. Vocabulary Building

2. Basic Writing Skills

3. Identifying Common Errors in Writing

4. Nature and Style of sensible Writing

5. Writing Practices

6. Oral Communication (This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Suggested Readings:

(1) Practical English Usage. Michael Swan. OUP. 1995.
(2) Remedial English Grammar. F.T. Wood. Macmillan.2007
(3) Effective Writing Skills. William Zinsser. Harper Resource Book. 2001
(4) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
(5) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
(6) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

	L	T	P	CREDIT
	3	0	0	3

ENVIRONMENTAL STUDIES

Introduction to environmental studies: Multidisciplinary nature of environmental studies, scope and importance. Concept of sustainability and sustainable development. Ecosystems: Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological pyramids. Types of ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Natural Resources: Renewable and Non-renewable Resources: Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, drought, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India. [illegible]

Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts; Biological invasions. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value. Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies. Environmental Policies & Practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act of (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Human rights: Human rights, relief populations and rights, human wildlife conflicts in Indian context. Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of [illegible] project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements: Chipko, silent valley, Bishnois of Rajasthan. Environmental ethics: role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness: case studies (e.g., CNG vehicles in Delhi). Field work: Visit to an area to observe environmental issues: river/ forest/ flora/fauna, etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystem-pond, river, etc.

Suggested Readings:

1. [illegible]. P. D. 1993. Ways to Clean Pacific Seafoam for Studies in Geo., Environment & Security. Doubleday Geo. Institute, Oxford Univ. Press.
2. Ghumbha,R. Sahoo[illegible] and Pandit, M.K.2011. Threats from India's Himalaya dams. Science, 335:28—37.
3. Sengupta, N. 2002. Ecology and economics: An approach to sustainable development, OUP.
4. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

List of Experiments:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.
2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.
3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colors of mercury (yellow) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of lines per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determining the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the Energy band gap (E_g) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by Thomson's method.
11. To study the P-N junction diode characteristics, in forward and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in CE mode and CC mode.
14. Demonstrate the Planck's constant.

SUBJECT CODE NAME	L	T	P	Credit
PROPOSED BASIC ELECTRICAL ENGINEERING LAB	0	0	2	1

List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multimeter, oscilloscope. Real life resistors, capacitors and inductors.
- Measuring the steady state and transient time responses of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
- Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers. Observation of the no-load current waveform on an oscilloscope (non-sinusoidal waveform shape due to the nonlinear hysteresis and the discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).
- Phase shifts between the primary and secondary side. Correlation three-phase power in balanced three-phase circuits.
- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging – slip ring arrangement) and single phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.
- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters (PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

SUBJECT CODE/SUBJECT	L	T	P	Credit
[illegible] GRAPHICS & DESIGN LAB	1	4	2	5.1

ENGINEERING GRAPHICS & DESIGN

UNIT-I

Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments,lettering, Conic sections including the Rectangular Hyperbola (General method only),Cycloid, Epicycloid, Hypocycloid and Involute, Scales - Plain, Diagonal and Vernier Scales.

UNIT-II

Orthographic Projections

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

Projections of Regular Solids

Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale.

UNIT-III

Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid, Cone- Auxiliary Views; Development of surfaces of RightAngular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic elevated geometrical solids, objects from industry and dwellings (Examination in club only)

UNIT-IV

Isometric Projections covering,

Principles of Isometric projection- Isometric Scale, Isometric Views, Conventions,Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice versa, Conventions.

UNIT-V

Overview of Computer Graphics

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard,Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs,Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects., Isometric Views of lines, Planes, Simple and compound Solids].

Suggested Text/Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
(v) (Corresponding set of) CAD Software Theory and User Manuals

Course Name & Semester	Course No.	SUBJECT	PERIODS L	T	P	EVALUATION SCHEME INTERNAL ASSESSMENT CIA	CCE	ESE	SUB TOTAL	CREDITS
B.Tech. VII Sem.	[illegible]	Fundamentals of Green Manufacturing	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

- To originate engineering skills to identify, formulate, and solve industrial process problems.
- To demonstrate the concept of organization, production systems and cost analysis.
- To understand the problems and opportunities faced by the operations managers in manufacturing and service organizations.
- To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, engineering, personnel management, logistics, etc.
- To integrate operations concepts with other functional areas of business and to consider several important contemporary topics relevant to business managers under functional disciplines, including quality management, production concepts, and sustainability issues.
- To evaluate the PPC function in both manufacturing and service organizations and to examine several dilemmas related to operations management, production planning and inventory control.

COURSE OUTCOMES:

After successful completion of the course, the students will be able to:

- Recognize the objectives, functions and applications of Production management and allied techniques.
- Categorize and solve different inventory control techniques, forecasting dilemmas, routing problems and scheduling models.
- Summarize various appropriate production planning techniques and integrating them to different departments to execute effective PPC functions.
- Inspect organizational performance, production systems, demand trends, location feasibility and cost analysis.
- Elaborate and evaluate methods of line balancing, process charts, production strategies, sales forecasting and assessments.

COURSE CONTENT:

MODULE-I

Introduction: Sustainable development, indicators of sustainability, sustainability strategies, sustainable manufacturing, evolution of sustainable manufacturing, elements of sustainable manufacturing, theory of green manufacturing and its principles, need for green manufacturing, drivers and barriers of green manufacturing.

MODULE – II

Green manufacturing strategy: Manufacturing strategy, elements of manufacturing strategy, manufacturing cost pers, competitive priorities, quality, delivery speed and reliability, cost efficiency, flexibility, order winners and order qualifier, tradeoff, production systems, manufacturing levers, competitive analysis, level of manufacturing capability, framework for formulating manufacturing strategy, implications of green manufacturing for manufacturing strategy.

MODULE – III

Life cycle approach of green manufacturing: Reliable and total life-cycle approach, six step methodologies for green manufacturing (6-R approach), life cycle assessment (LCA), elements of LCA, life cycle costing, eco labelling target setting, data collection and processing, final evaluation by virtue of criteria, environmental management systems.

MODULE – IV

Green manufacturing technology: Definition of green manufacturing technology and practices, classifications of green manufacturing technology, advantages and disadvantages of implementation of green technology.

MODULE – V

Lean and Green manufacturing: Introduction, lean evolution & steps, introduction to lean manufacturing, definition of lean manufacturing, lean vs. green manufacturing: similarities and differences.

TEXT & REFERENCE BOOKS:

1. Cleaner Production: Environmental and Economic Perspectives, Mont Kristian B., Springer, Berlin, Latest edition.
2. Environmental Management Systems and Cleaner Production, Dr. Rath Hillary, Wiley, New York, Latest edition.
3. Pollution Prevention: Fundamentals and Practice, Part I, Bishop, TMH.
4. Costing the earth, Economics and Ecosystem, Harvard Business School Press – 2009
5. The principle of sustainability, Simon Dresner, – Earth Scan publishers (2008).
6. Manufacturing strategy: How to formulate and implement a winning plan, Ross Hillsdwing, Productivity Press Portland, Oregon-2017.

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT CT-I	CT-II	ESE	ESE DURATION	
B.Tech. VII Sem	[illegible]	Advanced Manufacturing Processes	3	1	0	15	15	70	3 HR	4

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To understand the principle of various advanced machining processes, features of machine tool.
- To impart knowledge about cutting different material removal, joining processes.
- To understand about various advanced metal forming processes.
- Explain how to classify suitable hybrid welding processes for joining dissimilar materials.
- To understand about various advanced casting processes.

COURSE OUTCOMES:

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

- Analyze real life applications in various organizations.
- Categorize different material removal, joining processes as per the requirements of material being used to manufacture end product.
- Choose material processing technique with the aim of cost reduction, reducing material wastage & machining time.
- Evaluate process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.

COURSE COVERED:

MODULE –I

Advanced machining processes: Introduction, need, working process, principle, material removal mechanism, parameters, features and applications of processes such as ultrasonic machining (USM), abrasive jet machining (AJM), water jet machining (WJM), abrasive water jet machining (AWJM), electrochemical machining (ECM), electro discharge machining (EDM), electron beam machining (EBM), laser beam machining (LBM) processes, working principle of plasma arc machining.

MODULE –II

Advanced machining theory & practices: Mechanism of chip formation, shear angle relations, and theoretical determination of cutting forces in orthogonal cutting, analysis of turning, drilling and

milling operations, mechanics of grinding, dynamometry; thermal aspects of machining, tool wear, economics of machining, processing of polymers, ceramics and composites.

MODULE – III

Advanced metal forming processes: Details of high energy rate forming (HERF) process, electro-magnetic forming, explosive forming, electro-hydraulic forming, metals forming, rotating roll forming.

MODULE – IV

Advanced welding processes: Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW), solid welding, diffusion welding, forge welding, friction welding, explosive welding, hard vacuum welding, soft vacuum welding, underwater welding processes, concept of structural welding and welding automation.

MODULE – V

Advanced casting processes: Metal mould casting, continuous casting, squeeze casting, vacuum mould casting, evaporative pattern casting, ceramic shell casting.

TEXT & REFERENCE BOOKS:

1. Manufacturing processes for Engineering Materials, Serope Kalpakjian, Steven R. Schmid, Fourth edition, Pearson Education.
2. Manufacturing Engineering and Technology, Serope Kalpakjian, Third Edition, Addison-Wesley Publication Co.,
3. Materials and Processes in Manufacturing, E.P. DeGarmo, J. T. Black, R.A. Kohser, 9th Edition, Prentice Hall of India, New Delhi (ISBN 0-02-978709).
4. Manufacturing Science, A. Ghosh & A.K. Malik, East-West Press Pvt. Ltd. New Delhi.
5. Non-traditional Manufacturing Processes, G.F. Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7852-7).
6. Advanced Machining Processes, V.K. Jain, Allied Publishers Pvt. Ltd.
7. Modern Machining Processes, P.C. Pandey & H.S. Shan, McGraw Hill Education.
8. Manufacturing Technology, P. N Rao, Tata McGraw Hill Publishing Company.
9. Non-Conventional Machining, P. K Mishra, Narosa Publishers.
10. Unconventional Manufacturing Processes, H. K. Singh, Dhanpat Rai & Company, New Delhi.

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
II/ Tech VII Sem	[illegible]	Maintenance Management	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To develop the skill of maintenance functions in industry.
- To provide the concept of various types of maintenance system used in industries.
- To impart knowledge on reasons for failure and the corrective and preventive measures adopted to reduce them.
- To create the ability of data, analyze failure cause and reliability engineering.
- To develop the new techniques of maintenance for minimizing the cost of maintenance and improving of life of equipment's.

COURSE OUTCOMES:

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

- Understand and be able to explain the aim and bases of maintenance activity.
- Use various methods of maintenance and procedures applied to equipment's.
- Be aware of methods of detection for faults and errors in operations.
- Apply the tools and techniques of reporting, faults analysis.

COURSE CONTENT:

MODULE - I

Introduction: Fundamentals of maintenance engineering, maintenance engineering its importance in material & energy conservation, inventory control, productivity, safety, pollution control etc. safety regulations, pollution problems, human reliability, total quality management (TQM), total productivity maintenance (TPM), environmental issues in maintenance, ISO 9000.

MODULE - II

Maintenance management: Types of maintenance strategies, Planned and unplanned maintenance, breakdown, preventive & predictive maintenance and their comparison, advantages & disadvantages, Statistics of component aided maintenance, maintenance scheduling, spare part management, inventory control, organization of maintenance department.

MODULE - III

Tribology in maintenance: Friction, wear and lubrication, Friction & wear mechanisms, prevention of wear, types of lubrication mechanisms, lubrication processes

Lubricants: Types, general and special purpose, additives, testing of lubricants, degradation of lubricants, seal & packing

MODULE : IV

Machine health monitoring: Condition based maintenance, signature analysis, oil analysis, vibration, noise and thermal signatures, on line & off line techniques, instrumentation & equipment used in machine health monitoring, characteristics to measurement, signal processing, data acquisition and analysis, application of intelligent systems, data base design.

TPM: Introduction, history, components, pillars of TPM, calculation of OEE, Easy techniques

MODULE : V

Reliability, availability & maintainability (RAM) analysis: Introduction to RAM, failure mechanisms, failure data analysis, failure distributions, reliability of repairable and non-repairable systems, improvement in reliability, reliability testing, reliability prediction, utilization factor, system reliability by Monte Carlo simulation technique, FMECA.

TEXT & REFERENCE BOOKS:

1. Maintenance Engineering Hand Book, Higgins.
2. Maintenance & Spare parts Management, Gopal, Krishnan.
3. Industrial Maintenance Management, S.K. Shrivastava
4. Industrial Engineering, Hand book of Condition Monitoring, C.N.R. Rao

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR (C.G.)

GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY
Department of Industrial & Production Engineering
CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2021-22
B. TECH FOURTH YEAR, VIII SEMESTER

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	BMETEC16	Robotics and Robot Applications	3	1	–	30	70	100	4
2.	BMETHS01	Electives from Humanity Science-01	3	–	–	30	70	100	3
3.	BMETOE03	Open Elective-03	3	–	–	30	70	100	3
4.	BMETOE04	Open Elective-04	3	–	–	30	70	100	3
5.	BMETMC01	Courses of Indian Traditional Knowledge	3	–	–	–	–	–	–
		Total	15	1	–	120	280	400	13
PRACTICALS									
1.	BMEPROJ	Major Project	–	–	12	120	80	200	6
2.	BMEVIV01	Comprehensive Viva	–	–	–	–	50	50	2
		Total	–	–	12	120	130	250	8

Total Credits: 21
Total Contact Hour: 28
Total Marks: 650
INTERNAL ASSESSMENT: Two class tests of 15 marks each will be conducted
L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION

BMETOE03 Electives from Humanity Science-01
BMETHS01 Intellectual Property Rights
BMETOE02 Safety Management and Labour Law
BMETOE03 Open Elective-03
BMETOE11 Computer Aided Process Planning
BMETOE12 Microprocessor in Automation
BMETOE04 Open Elective-04
BMETOE41 Supply Chain Management
BMETOE42 Composite Materials Technology

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT CT-I	CT-II	ESE	SUB. TOTAL	
B.Tech VII Sem.	[illegible]	Intellectual Property Rights	3	1	0	15	15	70	100	4

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Understand, define and differentiate various types of intellectual properties (IPs) and their roles in maintaining in organizational competitiveness.
- Understand the framework of strategic management of Intellectual Property (IP).
- Appreciate and appraise different IP management (IPM) approaches and describing how practicing firms operate, implement and manage IPM programs.
- Explain how to derive value from IP and leverage its value in new product and service development.

COURSE OUTCOMES:

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

- Identify the different types of intellectual properties (IPs), the right of ownership and scope of protection.
- Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
- Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautionary steps to be taken to prevent infringement of proprietary rights in products and technology development.
- Analyze ethical and professional issues which arise in the intellectual property right context.
- Apply intellectual property right principles (including copyright, patents, designs and trademarks) to real problems and analyze the social impact of intellectual property rights.
- Demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under

intellectual property law as applicable to information, ideas, new products and product marketing.

COURSE CONTENT:

MODULE - I

Introduction to intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

MODULE - II

Trademarks: Purpose and functions of trademarks, acquisition of trademarks rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

MODULE - III

Law of copyrights and law of patents: Fundamentals of copyright law, originality of material, rights in reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, international copyright law, foundations of patent law, patent searching process, ownership rights and transfer.

MODULE - IV

Trade secrets and unfair competition: Trade secrets law, determination of trade secrets status, liability for misappropriations of trade secrets, protection for submissions, trade secrets litigation, misappropriation of right of publicity and false advertising.

MODULE - V

New developments of intellectual property: New developments in trade law, copyright law, patent law, intellectual property audits, international overview of intellectual property, international trademark law, copyright law, international patent law, international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual Property Right, Deborah. E. Bouchoux, 4th Edition, 2013, Cengage Learning.
2. Intellectual Property Right: Unleashing the Knowledge Economy, Prabuddha Ganguli, 1st Edition, 2001, Tata McGraw Hill Publishing Company Ltd.

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT CT-I	CT-II	ESE	SUB. TOTAL	
B.Tech VIII Sem.	[illegible]	Computer Aided Process Planning (CAPP)	3	0	0	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this Course is to:

- [illegible]
- [illegible]
- [illegible]

COURSE OUTCOMES:

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

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

COURSE CONTENT:

MODULE-I

Introduction to CAPP: [illegible]

MODULE – II

Generative CAPP system: [illegible]

Retrieval CAPP system: [illegible]

MODULE – III

Selection of manufacturing sequence: Significance, characteristics of manufacturing processes, selection of most advantageous part for a particular sequence, quantitative methods for optimal selection, examples.

MODULE – IV

Determination of machining parameters: Reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, strategy, constraints, models of machining processes.

MODULE – V

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal tool/s positions for executing fixed sequence, quantitative methods.

TEXT & REFERENCE BOOKS:

1. Automation, Production systems & Computer Integrated Manufacturing Systems, Mikell P. Groover, PHI Publication.
2. Computer Aided Engineering, David Bedworth, TMH Publishers.
3. Computer Aided Design and Manufacturing, Sadhu Singh, Khanna Publisher.
4. Computer Aided Process Planning, R.P. Wang and I.K. Li, Elsevier Science and Technology Publishers, 1st edition, 1991.
5. Computer Aided Process Planning, Joseph Talkof, SME Publications.

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT CT-I	CT-II	ESE	SUB. TOTAL	
B.Tech VIII Sem	[illegible]	Microprocessors & Automation	3	1	0	15	15	70	100	4

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To understand the fundamentals of PIC microcontroller.
- Understand the working of microcontroller systems and able to determine its hardware and software.
- Interface with real time systems.
- Understand the design applications based on microprocessor systems.

COURSE OUTCOMES:

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

- Learn embedded systems and its applications in industry.
- Recognize working of microcontroller architecture and programming model.
- Identify the concept of timers, interrupts, I/O port interfacing with microcontroller.
- Study the concept of interfacing with real time systems.

COURSE CONTENT:

MODULE - I

Number Systems: Codes, digital electronics, logic gates, combinational circuits design, flip-flops, sequential logic circuits design, counters, shift registers.

Introduction to 8085 functional block diagram, registers, ALU, bus systems, timing and control signals.

MODULE - II

Machine cycles: Instruction cycle and timing states, instruction timing diagrams, memory interfacing.

MODULE - III

Assembly language programming: Addressing modes, instruction set, simple programs in 8085, concept of interrupt, need for interrupts, interrupt structure, multiple interrupt requests and their handling, programmable interrupt controller, interfacing peripherals, programmable peripheral interface (8255).

MODULE - IV

Interfacing analog to digital converter & digital to analog converter, multiplexed seven segments LED display systems, stepper motor control, data communication, serial data communication (8251).

programmable timer (PIT), 8086/8088 microprocessor and its advanced features.

MODULE - V

Introduction to digital control: Sampling theorem, signal conversion and processing, Z-transform, digital filters, implementation of digital algorithm

TEXT & REFERENCE BOOKS:

1. Digital Electronics: An Introduction to Theory and Practice, William H. Gothmann, PHI Learning Private Limited.
2. Digital Computer Electronics: An Introduction to Microcomputers, Albert Paul Malvino, Tata McGraw-Hill Publishing Company Ltd.
3. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh Gaonkar, PENRAM International Publishers.
4. Digital Control Systems, Benjamin C. Kuo, Oxford University Press (2/e, Indian Edition).
5. Microcomputer Interfacing with the Intel 80X-85, Lance A. Leventhal, Prentice Hall.

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT CT-I	INTERNAL ASSESSMENT CT-II	ESE	SUB TOTAL	
B.Tech VIII Sem	[illegible]	Sources of Traditional Knowledge	0	-	-	-	-	-	-	-

COURSE LEARNING OBJECTIVES:

- The course aims at imparting basic principles of thought process, reasoning and inferencing sustainability in the view of Indian traditional knowledge systems connecting society and nature.
- Holistic life style of yogic science and wisdom captured in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian knowledge system, Indian perspective of modern scientific world-view and basic principles of yoga and holistic health care system.

COURSE OUTCOMES:

- Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

COURSE CONTENT:

- Basic structure of Indian knowledge system: अष्टाध्यायीप्रवेश, आर्ष, दर्शनानि (वैशेषिक, सांख्य, योग, न्याय, मीमांसा, वेदान्त), तर्कसंग्रह, तर्कभाषा, ज्ञानेश्वरी, गीता, ज्ञानेश्वरी, तिरुक्कुरल, आत्मानुभव, शिवतत्त्वरत्नाकर, महाभारत, महाभारत, शुक्रनीति, नीतिसार;
- Modern science and Indian knowledge system
- Yoga and holistic health care
- Case studies

TEXT & REFERENCE BOOKS:

1. Cultural Heritage of India-course material, V. Sivaramakrishnan (Ed.), Bharatiya Vidya Bhavan, Mumbai 5th Edition, 2014
2. Modern Physics and Vedant, Swami Satyamurti, Bharatiya Vidya Bhavan
3. Tao of Physics, Fritjof Capra
4. Tarkasangraha of Annam Bhatta, V.N. Jha (Eng. Trans.), International Chinmay Foundation, Veliyanad, Ernakulam
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
6. Yoga-darshanam with Vyasa Bhashya, G.N. Jha (Eng. Trans.), Ed. R.N. Jha, Vidyanidhi Prakashan, Delhi 2016

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR (C.G.)

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B. Tech. VII Sem.	[illegible]	Indian Constitution	3	0	0	0	0	0	0

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To help the students to understand and explain the fundamental rights.
- To describe the uses of directive principle.
- Importance of union executives.
- Describe the composition of legislative assembly, its powers and functions.

COURSE OUTCOMES:

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

- Understand the meaning and importance of constitution.
- Identify and explore the basic features and modalities about Indian constitution.
- Realize the state and central policies (union and state executive), fundamental rights & their duties.
- Analyze the salient (outstanding) features of Indian constitution.
- Recognize the importance and significance of preamble with respect to Indian constitution.

MODULE – I

Introduction: Constitution-meaning of the term, sources and constitutional theory, features, citizenship preamble.

MODULE – II

Fundamental rights and duties: Fundamental rights, fundamental duties, directive principles of state policy.

MODULE – III

Union government: Structure of Indian union, federalism, Centre state relationship President: role, power and position, Prime minister and council of ministers, cabinet and central secretariat, Lok Sabha, Rajya Sabha.

MODULE – IV

State Government: Governor: role and position, chief minister and council of ministers, state secretariat.

MODULE – V

List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Industrial and Production Engineering*

Programme Name : *M.Tech.*

Academic Year : 2021-22

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	IPPATT1	COMPUTER AIDED DESIGN
02.	IPPATT2	FUNDAMENTALS OF ROBOTICS
03.	IPPATP1	COMPUTER INTEGRATED MANUFACTURING
04.	IPPATP2	RAPID PROTOTYPING AND TOOLING
05.	IPPATP3	SUPPLY CHAIN MANAGEMENT
06.	IPPATP4	ADVANCED MANUFACTURING PROCESSES
07.	IPPATP5	MECHANICS OF SHEET METAL FORMING
08.	IPPATP6	MICRO-MANUFACTURING
09.	IPPATP7	MODELING & SIMULATION
10.	IPPATP8	THEORY OF VIBRATION
11.	IPPATP9	ARTIFICIAL INTELLIGENCE
12.	IPPATC1	RESEARCH METHODOLOGY& IPR
13.	IPPALT1	CAD-CAM LAB
14.	IPPBTT1	FINITE ELEMENT ANALYSIS
15.	IPPBTT2	ROBOTICS AND CONTROL
16.	IPPBTP1	GREEN MANUFACTURING
17.	IPPBTP2	ADVANCE OPERATION RESEARCH
18.	IPPBTP3	TOTAL QUALITY MANAGEMENT

19	IPPBTP4	MECHANICS OF COMPOSITE MATERIAL
20	IPPBTP5	SMART MATERIALS AND APPLICATIONS
21	IPPBTP6	MECHATRONICS IN MANUFACTURING SYSTEMS
22	MSPBTO1	BUSINESS ANALYTICS
23	IPPBTO2	INDUSTRIAL SAFETY
24	IPPBTO3	OPERATIONS RESEARCH
25	CEPBTO4	COST MANAGEMENT OF ENGINEERING PROJECTS
26	MEPBTO5	COMPOSITE MATERIALS
27	CHPBTO6	WASTE TO ENERGY
28	ECPBTO7	IOT
29	MCPBTO8	MOOCS
30	ELPBTX1	ENGLISH FOR RESEARCH PAPER WRITING
31	PEPBTX2	STRESS MANAGEMENT BY YOGA
32	CEPBTX3	DISASTER MANAGEMENT
33	LAPBTX4	CONSTITUTION OF INDIA
34	IPPBPT1	MINI PROJECT/SEMINAR
35	IPPBLT1	ROBOTICS LAB
36	IPPCPT1	DISSERTATION STAGE–I
37	IPPDPT1	DISSERTATION STAGE–II

Scheme and Syllabus

GURU GHASIDAS VISHWAVIDYALAYA
BILASPUR (C.G.)

(A Central University)
Koni, Bilaspur-495009, C.G (India)

OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM (CBCS)

MASTER OF TECHNOLOGY
IN
CAD-CAM AND ROBOTICS

COURSE STRUCTURE AND SYLLABI

M.Tech. Regular Two Year Degree Program
(Effective from the academic year 2021-22)

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
SCHOOL OF ENGINEERING &TECHNOLOGY, GGV,
BILASPUR, C.G. (INDIA)

With effect from Academic Year 2021-22

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
SCHOOL OF ENGINEERING & TECHNOLOGY, GGV, BILASPUR, C.G. (INDIA)

SCHEME OF EXAMINATION

M.TECH. CAD-CAM and ROBOTICS

M.Tech. I Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	IPPAETI	Computer Aided Design	3	0	0	40	60	100	3
2.	IPPAETI	Fundamentals of Robotics	3	0	0	40	60	100	3
3.		Elective – I	3	0	0	40	60	100	3
	IPPAEPI	1. Computer Integrated Manufacturing							
	IPPAEP2	2. Rapid Prototyping and Tooling							
	IPPAEP3	3. Supply chain management							
4.		Elective – II	3	0	0	40	60	100	3
	IPPAEP4	1. Advanced Manufacturing Processes							
	IPPAEP5	2. Mechanics of Sheet Metal Forming							
	IPPAEP6	3. Micro-manufacturing							
5.		Elective – III	3	0	0	40	60	100	3
	IPPAEP7	1. Modeling & Simulation							
	IPPAEP8	2. Theory of Vibration							
	IPPAEP9	3. Artificial Intelligence							
6.	IPPAEC1	Research Methodology & IPR	2	0	0	-	50	50	2
7.	IPPAEL01	CAD-CAM lab	0	0	4	50	50	100	2
		Total	17	0	4	330	370	600	19

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M.TECH. CAD-CAM and ROBOTICS

M.Tech. II Semester

Sl.	Course Type/ Code	Subjects	Periods/Week L	T	P	Evaluation IA	ESE	Total	Credits
1.	[illegible]	[illegible]	3	0	0	40	60	100	3
2.	[illegible]	[illegible]	3	0	0	40	60	100	3
3.		Elective – IV	3	0	0	40	60	100	3
	[illegible]	1. [illegible]							
	[illegible]	2. [illegible]							
	[illegible]	3. [illegible]							
4.		Elective – V	3	0	0	40	60	100	3
	[illegible]	1. [illegible]							
	[illegible]	2. [illegible]							
	[illegible]	3. [illegible]							
5.		Open Elective	3	0	0	40	60	100	3
	[illegible]	1. [illegible]							
	[illegible]	2. [illegible]							
	[illegible]	3. [illegible]							
	[illegible]	4. [illegible]							
	[illegible]	5. [illegible]							
	[illegible]	6. [illegible]							
	[illegible]	7. [illegible]							
	[illegible]	8. [illegible]							
6.		Audit Course/Value Added Course	2	0	0	0	0	0	0
	[illegible]	English for Research Paper Writing							
	[illegible]	Stress Management by Yoga							
	[illegible]	Disaster Management							
	[illegible]	Constitution of India							
7.	[illegible]	Mini Project Seminar	0	0	4	50	50	100	2
8.	[illegible]	Robotics lab	0	0	4	50	50	100	2
		Total	17	0	08	360	440	800	19

Note: Under MOOC's the students have to opt any subject other than Industrial & Production Engineering from NPTEL/UGC SWAYAM

With effect from Academic Year 2021-22

M.TECH. CAD-CAM and ROBOTICS

M.Tech. III-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	IPPOP11	Dissertation Stage-I	0	0	28	100	100	200	14
		Total	0	0	28	100	100	200	14

M.TECH. CAD-CAM and ROBOTICS

M.Tech. IV-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	IPPHP11	Dissertation Stage- II	0	0	32	200	200	400	16
		Total	0	0	32	200	200	400	16

Total Credits for the Program = 19 + 19 +14 +16 = 70

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
IPPATE1	Computer Aided Design	3	0	0	40	60	100	3

IPPATE1- COMPUTER AIDED DESIGN

Course Objectives

The objectives of this course is to:

1. Get idea of basic fundamentals of computer graphics used in CAD hardware and software and its communications.
2. Introduce various algorithms and mathematical expressions of curves, surfaces and solid CAD models.
3. Impart knowledge of new design concepts and optimization techniques to generate surface and solid in CAD.
4. Introduce basic fundamental of finite element method (FEM) for design optimization of mechanical elements.

Course Outcomes

After successful completion of this course students able to:

1. Generate and interpret engineering design of mechanical parts according to engineering design standards and its role in graphic communication process.
2. Impart knowledge about conceptual understanding of the principles of CAD systems, the

With effect from Academic Year 2021-22

implementation of Bezier principles, and its connections to CAD systems.

5. Comprehend the coordinate representations of 2-D and 3-D entity and formulate the geometric transformations and its properties.
6. Get knowledge of mathematical representations of curves, surface and solid model and analysis of designed object.
7. Analyze the solid model and able to calculate its property through basic fundamental of FEM.

COURSE CONTENTS

Module 1

Introduction and progressive development of CAD, CAD system evaluation criteria, hardware and software, hardware integration and networking, computer communication, color management and raster graphics, aliasing and anti-aliasing, lines, circle and ellipse algorithms, windowing, clipping and view port.

Module 2

Coordinate systems, fundamental of geometric transformations, homogeneous representations, concatenation and composite transformations, 2-D and 3-D geometric transformations, orthographic and oblique projections.

Module 3

Basics of curves, parametric and non-parametric curves, analytical and synthetic curves, parametric representations of analytical and synthetic curves, Hermite curves, curve manipulations, Bezier curves, B-splines, rational curves, wire frame models.

Module 4

Mathematical representations of surfaces, analytical and synthetic surfaces, parametric representations of surfaces such as, plane surface, ruled/lofted surface, revolve surface, tabul surface, coon's patch, bi-linear surface, Hermite bi-cubic surface, Ferguson surface, Bezier surface patch, B-Spline surface patch, NURBS surface patch.

Module 5

Progressive development and fundamental of solid modeling, solid primitives, primitive instancing (PI), set theories, regularized Boolean set operations (RBOS), constructive solid geometry (CSG), boundary representation (B-rep), sweep representations (SR), spatial occupancy enumerations, cellular and octree decomposition (CD), analytic solid modeling (ASM), introduction to finite element method (FEM), 1-D FEM analysis.

Text Books & References

1. Zeid I. & Subramanian R. S., CAD/CAM Theory and practice, Tata McGraw Hill.

2. Zeid I., Mastering CAD/CAM, McGraw Hill International.
3. Groover M.P. &Zimmers E., CAD/CAM: Computer-Aided Design and Manufacturing.
4. Pearson Education.
5. Rao P. N., CAD/CAM Principles and Applications, Tata McGraw Hill.
6. Alavala, CAD/CAM Concepts and Applications, Prentice Hall of India.
7. Krishnamurthy N., Introduction to Computer Graphics, Tata McGraw Hill.
8. Newman/W.M.&Sproull R.F., Principles of Interactive Computer Graphics, Tata McGraw Hill.

Course Code	Subjects	Periods/Week L	T	P	Evaluation CA	ES E	Total	Credits
IPFAT22	Fundamentals of Robotics	3	0	0	40	60	100	3

IPFAT22-FUNDAMENTALS OF ROBOTICS

Course Objective

The objectives of this course is to:

1. Provide the concept of automation and robots and its challenges in real world environment.
2. Introduce the concept of drives, actuators, sensors and machine vision used in robotics.
3. Impart knowledge of the gripper and control aspects of the robotic systems.
4. Introduce the working principles of intelligent autonomous vehicle (IAV) and quadrotors unmanned aerial vehicle (QUAV).

Course Outcome

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

1. Learn basic concepts associated with automation and robotics and areas of recent updates in robotics.
2. Recognize the application of various drives and actuators used in robotic systems.
3. Understand the basic concept of sensors and machine vision system used in robotic systems.
4. Acquire knowledge of working principles of gripper and control system used in robotics.
5. Learn concept of intelligent autonomous vehicle (IAV) and quadrotors unmanned aerial vehicle (QUAV) used in industries and new industries.

COURSE CONTENTS

Module-I

Automation: concept and need, principles and strategies of automation, basic elements of an automated system, levels of automations, advanced automation functions, automatic control machines and robots, robot anatomy and classifications, laws of robotics, accuracy and repeatability, challenges of various robots, typical industrial and non-industrial applications of

robots.

Module -2

Introduction of robot drives and actuators, functions and classification of drive and actuator systems, selection of drives and actuators, pneumatic and hydraulic drives, motors used in robotics, arrangement of actuators in robots, servo response, feedback and feed forward compensations, modeling of robot servos, computer controlled servo systems, selection of robot drives and actuators.

Module -3

Introduction to sensors and transducers, characteristicsand requirements of sensing devices, classifications and functions of sensors and transducers, various types of sensors, robot guidance with vision system, vision system devices, image acquisition, masking, sampling and quantization, image processing techniques, edge detection, segmentation, calibration of sensors and multisensory controlled robot.

Module -4

Design aspect of gripper, functions and types of grippers, force analysis for various basic gripper systems, characteristics of control systems, types of controllers, open and closed loop control, robot and industrial control systems, continuous versus discrete control, control system components, motion interpolation, WAIT, SIGNAL and DELAY commands, subroutines, introduction to various types such as RAIL and VAL II etc, features of type and development of languages for recent robot systems.

Module -5

Introduction of autonomous mobile robots (AMR) and quad-rotors unmanned aerial vehicles (QUAV), holonomic and non-holonomic, sensing and control, navigation algorithms, stability and controllability of intelligent automated vehicles (IAV) and QUAV, driver assistance and monitoring systems, road scene interpretation, need and necessity of IAV and QUAV, industrial and non-industrial applications of IAV and QUAV.

Text Books & References

1. John J. Craig, "Introduction to robotics", Addison Wesley Longman.
2. Nagesh I.J. & Mittal R.K., "Robotics &Control" Tata McGraw Hill.
3. Murphy, "Introduction of AI robotics", MIT press.
4. Sagwari R., Neubaklick I.R. & Sesamanta D., "Introduction to Autonomous Mobile Robots", MIT press.
5. Rogelio Lozano, "Unmanned Aerial Vehicles: Embedded Control", Wiley Publisher.
6. Gourth J., Monkman, Stefan H., Ralf S. & Henrik S., "Robot Grippers", Wiley Publisher.

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Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Elective - I	3	0	0	40	60	100	3
IPPATP1	1. Computer Integrated Manufacturing							
IPPATP2	2. Rapid Prototyping and Tooling							
IPPATP3	3. Additive Manufacturing Technologies							

IPPATP1 COMPUTER INTEGRATED MANUFACTURING

Course Objectives:

The objective of this course is to

1. Emphasize the importance of manufacturing enterprise using computer integrated manufacturing (CIM) technologies
2. Employ CAD/CAM interface and other CIM subsystems
3. Develop database management, facility layout, Group technology, teamwork, and manufacturing operations

Course Outcomes:

At the end of the course students will be able to

1. Develop an understanding of computer integrated manufacturing (CIM) and its impact on productivity, product cost, and quality
2. Obtain an overview of computer technologies including computers, database and databases, networks, machine control, etc. as they apply to factory management and factory floor operations
3. Describe the integration of manufacturing activities into a complete system

COURSE CONTENTS

Module-1

Introduction: Evolution of CIM, scope of CIM, segments of generic CIM,Automated Process Planning: Process planning, group technology, variant and generative process planning methods, AI in process planning,process planning software, CNC technology - Principles of numerical control, features of CNC systems, programming techniques, capabilities of a typical NC CAM software, integration of CNC machines in CIM environment, DNC -- Flexible manufacturing systems: Architecture, work stations

Module-2

Manufacturing Systems: MRP II software, production control software, forecasting, master production schedule, materials requirements planning, capacity requirements planning, shop floor control, shop floor data collection techniques, inventory management, purchase orders, bill of materials, standard product routing, job costing, marketing applications

Module-3

Robotics, Automated Assembly and Inspection: Types of robots and their performance capabilities,programming of robots, hardware of robots, kinematics of robots, product design for robotized manufacturing, selecting assembly machines, feeding and transfer others, applications of robots in manufacture and assembly, sensors. Automated quality control types of CMM, non-contact inspection methods, in process and post process metrology, flexible inspection systems. Computer Aided Inspection and on-line quality monitoring.

Module-4

Data Communications and Technology Management: Technology issues, configuration management, database systems, management of technology, networking concepts, Local area Network (LAN), NQL fundamentals, Manufacturing Automation protocols (MAP) and Technical and office protocols (TOP) fundamentals- CIM models, economics of CIM, implementation of CIM.

Module-5

Collaborative Engineering: Introduction, Factor Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering, supply chain management (SCM), Customer relations management(CRM), Virtual Reality and Factory simulation, Agile and lean manufacturing, reverse engineering, Rapid prototyping.

Text Books & References

1. Manufacturing Engineering and Technology – SerupeKalpak Jain, and Steven R. Smith, Pearsonedication.
2. Automation, Production systems and Computer Integrated Manufacturing System-Mikell P Groover, PHI Publication.
3. Computer Integrated Manufacturing Head Book – EricTeichole and Ind Ort, McGraw Hill Publication.
4. Computer Integrated Manufacturing – Pusti G. Ranky, CIMware Publishers.
5. CAD / CAM / CIM – Radhakrishnan, New Age International Publication.

IPPATP2 RAPID PROTOTYPING AND TOOLING

Course Objectives

The objectives of this course is to

1. Familiarize the basic concepts of RPT
2. Recognize various process in RP
3. Analyze the principles of Rapid tooling and reverse Engineering

Course outcome

With effect from Academic Year 2021-22

After completion of the course, the students will be able to:

1) Use different techniques for processing of CAD models for rapid prototyping
2) Apply fundamentals of rapid prototyping techniques
3) Use appropriate tooling for rapid prototyping process
4) Develop different rapid prototyping techniques for reverse engineering

COURSE CONTENTS

Module 1

Introduction to Prototyping: Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

Module 2

Liquid based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Module 3

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs. RT, Need for RT, Rapid Tooling Classification, Indirect Rapid Tooling Methods: Epoxy Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Kelted process, Direct Rapid Tooling: Direct ABS, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

Module 4

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solutions, Other Translators, Newly Proposed Formats, Rapid Prototyping Software's: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3-D View, Velocity 2, Rhino, STL View, I-Data Expert and 3-D doctor.

Module 5

RP Applications: Application: Material Relationship, Application in Design , Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewellery Industry, Coin Industry, GIS application, Arts and Architecture, RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Bio-molecules.

Text Books & References

1. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific
2. Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer
3. Neeman R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons
4. Hilton P, Jacobs P F, Rapid Tooling: Technologies and Industrial Applications, CRC press
5. Liou W L, Liou F W, Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press
6. Kamrani A K, Nee E A, Rapid Prototyping: Theory and practice, Springer.

IPPATP3 SUPPLY CHAIN MANAGEMENT

Course Objectives

The objective of this course is to

1. To define supply chain, its importance and management.
2. To integrate various drivers of Supply Chain for grouping effectual performance.
3. To understand about uncertainty, risk management and forecasting.
4. To outline Competitive advantages, Distribution Networks and Supply Chain Strategies.
5. To elaborate drivers and barriers of Distribution Networks in Practice.

Course Outcomes

After the completion of this course, students will be:

1. Demonstrate a basic understanding about Competition and Supply Chain Strategies.
2. Acquire knowledge about distribution network, E-Business and Time-Series.
3. Demonstrate technical understanding about demand, inventory, safety, pricing.
4. Implement decision making policies, infrastructure and optimum Design for handling Transportation Network.
5. Resolve uncertain and risk decisions in decision making and can capably tailored

With effect from Academic Year 2021-22

transportation and supply chain costs.

COURSE CONTENTS

Module 1

Building a Strategic Framework to Analyze Supply Chains: What is a Supply Chain? The Objective of a Supply Chain ,The Importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process View of a Supply Chain, Examples of Supply Chains, Supply Chain Performance: Achieving Strategic Fit and Scope, Competitive and Supply Chain Strategies,Achieving Strategic Fit, Expanding Strategic Scope, Supply Chain Drivers and Metrics, Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing.

Module 2

Designing the Supply Chain Network: Designing Distribution Networks and Applications to an Internet, the Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design, Design Options for a Distribution Network, e-Business and the Distribution Network, Distribution Networks in Practice.

Network Design in the Supply Chain: The Role of Network Design in the Supply Chain, Factors Influencing Network Design Decisions, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation, The role of IT in Network Design, Making Network Design Decisions in Practice.

Network Design in an Uncertain Environment: The Impact of Uncertainty on Network Design, Discounted Cash Flow Analysis, Representation of Uncertainty, Evaluating Network Design Decisions Using Decision Trees ,Add Time: Evolution of Supply Chain Design Decisions Under Uncertainty, Risk Management and Network Design, Making Supply Chain Decisions Under Uncertainty in Practice

Module 3

Planning Demand and Supply in a Supply Chain: Demand Forecasting in a Supply Chain, The Role of Forecasting in a Supply Chain, Characteristics of Forecasts, Components of Forecast and Forecasting Methods, Basic Approach to Demand Forecasting, Time Series Forecasting Methods, Measures of Forecast Error, Forecasting Demand at Talon Sell, The Role of IT in Forecasting, Risk Management in Forecasting, and Forecasting in Practice.

Aggregate Planning in a Supply Chain: The Role of Aggregate Planning in a Supply Chain, the Aggregate Planning Problem, Aggregate Planning Strategies, Aggregate Planning Using Linear Programming, Aggregate Planning in Excel, The Role of IT in Aggregate Planning, Implementing Aggregate Planning in Practice.

Planning Supply and Demand in a Supply Chain: Managing Predictable Variability, Responding to Predictable Variability in a Supply Chain, Managing Supply, Managing Demand, Implementing Solutions to Predictable Variability in Practice.

Module 4

Planning and Managing Inventories in a Supply Chain: Managing Economies of Scale in a Supply Chain, Cycle Inventory, The Role of Cycle Inventory in a Supply Chain, Economies of Scale to Exploit Fixed Costs, Economies of Scale to Exploit Quantity Discounts, Short Term Discounting

With effect from Academic Year 2021-22

Trade Promotions; Managing Multinational Cycle Inventory; Estimating Cycle Inventory-Related Costs in Practice.

Managing Uncertainty in a Supply Chain: Safety Inventory, The Role of Safety Inventory in a Supply Chain; Determining Appropriate Level of Safety Inventory, Impact of Supply Uncertainty on Safety Inventory, Impact of Aggregation on Safety Inventory, Impact of Replenishment Policies on Safety Inventory; Managing Safety Inventory in a Multiechelon Supply Chain; The Role of IT in Inventory Management; Estimating and Managing Safety Inventory in Practice.

Determining the Optimal Level of Product Availability: The Importance of the Level of Product Availability; Factors Affecting Optimal Level of Product Availability; Managerial Levers to Improve Supply Chain Profitability; Setting Product Availability for Multiple Products under Capacity Constraints; Setting Optimal Levels of Product Availability in Practice

Module 5

Designing and Planning Transportation Networks: Transportation in a Supply Chain; The Role of Transportation in a Supply Chain; Modes of Transportation and Their Performance Characteristics; Transportation Infrastructure and Policies; Design Options for a Transportation Network; Trade-Offs in Transportation Design; Tailored Transportation; The Role of IT in Transportation; Risk Management in Transportation; Making Transportation Decisions in Practice.

Managing Cross-Functional Drivers in a Supply Chain: Sourcing Decisions in a Supply Chain; the Role of Sourcing in a Supply Chain; In-House or Outsource; Third- and Fourth-Party Logistics Providers; Supplier Scoring and Assessment; Supplier Selection-Auctions and Negotiations; Contracts and Supply Chain Performance; Design Collaboration; The Procurement Process; Sourcing Planning and Analysis; The Role of IT in Sourcing; Risk Management in Sourcing; Making Sourcing Decisions in Practice.

Text Books:

1. Supply Chain Management: Jamal Shah, Pearson Publications 2010.
2. Supply Chain Management: Sunil Chopra and Meta dal, Fourth Edition, PHI 2010
3. Supply Chain Management: A.S.Altekar PHI Second Ed.2006
4. Logistics Management: James Stock and Douglas Lambert, McGraw Hill International Ed.2006
5. Supply Chain Management for Global Competitiveness: B.E.B.Sahay MASMillanPublications 2000
6. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay MASMillan Publications2000
7. Logistics Management: Bowersox DHH 2004

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Elective – II	3	0	0	40	60	100	3
IPDA159	a. Advanced Manufacturing Processes							
IPDA159	b. Mechanics of Sheet Metal Forming							
IPDA159	c. Micro-manufacturing							

With effect from Academic Year 2021-22

IPPATP4 Advanced Manufacturing Processes

Course Objectives:

The objective of this course is to

1. Provide the in depth knowledge of the types of advanced manufacturing and machining processes (AMPs), evolution, and need.
2. Acquire fundamental knowledge and understanding of Production and Industrial Engineering and to know about the applications of advanced manufacturing processes
3. Make acquainted the various unconventional manufacturing processes
4. Create a congenial environment that promotes learning, growth and equips ability to work with multi-disciplinary groups in professional, industry and research organizations
5. Encourage the students for developing the models of Advanced Manufacturing Processes

Course Outcomes:

On completion of this course, the students will be able to

1. Categorize different material removal, joining processes as per the requirements of material being used to manufacture end product.
2. Select material processing technique with the aim of cost reduction, reducing material wastage & machining time.
3. Identify the correct advanced manufacturing processes by researching and determining the correct AMP's for development of various complex shaped geometries
4. Interpret foundry processes like pattern making, mould making, Core making and Inspection of defects.
5. Classify different plastic molding processes, Extrusion of Plastic and Thermoforming.
6. Select appropriate Joining Processes to manufacture any component.

COURSE CONTENTS

Module 1

Advanced foundry processes : metal moulds, centrifugal, squeeze, vacuum moulds, evaporative pattern, and ceramic shell casting.

Module 2

Non-Traditional Machining: Introduction, need, AJM, Parametric Analysis, Process capabilities, USM: Mechanics of cutting, models, Parametric Analysis, WJM : principle, equipment, process characteristics, performance, EDM : principles, equipment, generators, analysis of R-C circuits, MRR, Surface finish, WEDM.

Module 3

Laser Beam Machining : Principle of working, equipment, Material removal rate, Process parameters, performance characteristics, Applications. Electron Beam Machining : Principle of working, equipment, Material removal rate, Process parameters, performance characteristics, Applications. Electro Chemical Machining : Principle of working, equipment, Material removal rate, Process

With effect from Academic Year 2021-22

parameter performance characteristics, Applications

Module 4

Advanced forming processes – electro-magnetic forming, explosive forming, electro-hydraulic forming, stretch forming, contour roll forming

Module 5

Advanced welding processes : EBW, LBW, USW

Text Books and References:

1. Manufacturing Engineering and Technology by Kalpak Jain, Addison Wesley, 1995.
2. Materials and Processes in Manufacturing (8th Edition), E.P. DeGarmo, J. T. Black, R.A.Kohser, Prentice Hall of India, New Delhi (ISBN 0-02-978700)
3. Advanced Machining Processes by V. K. Jain, Allied Publications
4. Manufacturing Science, A. Ghosh, and A.K. Mallik, Affiliated East West Press Pvt. Ltd. New Delhi
5. Nontraditional Manufacturing Processes, G.F Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7352-7)
6. Introduction to Manufacturing Processes by John A Schey, Mc Graw Hill
7. Non Traditional Manufacturing Processes by Gary F Benedict, CRC Press
8. Advanced Methods of Machining by J. A Mc Geough, Springer

IPPATPS MECHANICS OF SHEET METAL FORMING

Course Objectives:

The objective of this course is to

1. Develop various metal forming processes
2. Generate the concept of plastic deformation during forming processes
3. Different laws and equations developed for solving metal forming problems

Course outcomes:

After completion of the course, the student should be able to:

1. Generate the concept of different metal forming process
2. Approach metal forming processes both analytically and numerically
3. Design metal forming processes
4. Develop approaches and solutions to analyze metal forming processes and the associated problems and flaws.

COURSE CONTENTS

Module 1

Classification of forming processes mechanics of metal forming, importance of metal working, hot working, cold working, friction and lubricants, Rolling of metals: Rolling processes, forces and

geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations.

Module 2

Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging. Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes, and production of seamless pipes.

Module 3

Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing. Sheet Metal forming: Forming methods, bending, stretch forming, spinning and Advanced techniques of Sheet Metal Forming, Forming limit criteria, and defect in formed parts.

Module 4

HERF, Electromagnetic forming, residual stresses, in-process heat treatment, computer applications in metal forming. Press tool design: Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive blanking dies, design of bending, forming and drawing dies.

Module 5

Forming methods dies & punches, progressive die, compound die, combination die, Rubber forming, Open back inclinable press (OBI press), piercing, blanking, bending, deep drawing, LDR in drawing, forming limit criteria, defects of drawn products, stretch forming, Roll bending & contouring, triangle problems.

Text Books and References:

1. Mechanical Metallurgy / G.E. Dieter / Tata McGraw Hill, 1998, III Edition
2. Principles of Metal Working / Sinder Kumar
3. Principles of Metal Working processes / G.W. Rowe
4. ASM Metal Forming Hand book
5. Mechanical metallurgy (SI Units), G.E.Dieter, McGraw hill Pub-2001
6. Manufacturing Science, Amitabh Ghosh & A.K.Malik, East-West press 2001

IPPATPS MICRO-MANUFACTURING

Course Objectives:

The objective of this course is to

1. To introduce the principles fundamental and process mechanics of micromachining
2. To understand of mechanics at micro level machining
3. To analyze on the mechanical/chemical behavior changes during micromachining/manufacturing
4. To evaluate micro and nano machining, visualize micro machining process

With effect from Academic Year 2021-22

1. To understand applications and advancements in the micro machining process.

Course Outcomes:

On completion of this course, the students will be able to:

1. Acquire knowledge about different micro-machining processes.
2. Acquire knowledge about repair finishing processes.
3. Understand about the capabilities of different micro-manufacturing processes.
4. Understand about the capabilities of different advanced micro manufacturing processes.
5. Understand about the capabilities of traditional micro-manufacturing processes.

COURSE CONTENTS

Module 1

Introduction and classification of micromachining. Mechanical type micro machining processes. Abrasive jet micromachining (AJMM). Ultrasonic micromachining, abrasive water jet micro machining (AWJMM)

Module 2

Magneto-rheological finishing (MRF). Magneto-rheological abrasive flow finishing (MRAFF). Magnetic float polishing (MFP)

Module 3

Chemical and electrochemical type advanced machining processes. Electrochemical micromachining (ECMM), electrochemical micro deburring. Chemical and photochemical micromachining. Abrasive based micro finishing processes, Abrasive flow finishing (AFF), Chemo-mechanical polishing (CMP), Magnetic abrasive finishing (MAF)

Module 4

Thermal electric type micro machining process. Electric discharge micromachining (EDMM), wire EDM, EDDG, ELID. Laser beam micro machining (LBMM), Electron beam micromachining (EBMM)

Module 5

Traditional mechanical micro machining processes, Micro turning, micro milling, micro drilling.

Text Books & References

1. Introduction to micromachining, VK Jain, Narosa Publisher, New Delhi 2nd edition
2. Micromachining methods, JA Mc Geough, Chapman and Hall, London.
3. Micro manufacturing processes, VK Jain, CRC Press
4. Advanced machining processes, VK Jain, Allied Publisher New Delhi

Scheme of Short Term Academic Year 2021-22

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Elective – III	2	0	0	40	60	100	2
IPPATP7 IPPATP8 IPPATP9	6. Modeling & Simulation 7. Theory of Vibration 8. Artificial Intelligence							

IPPATP7 MODELING & SIMULATION

Course Objectives:

The objective of this course is to

1. Design the importance of modeling to science and engineering.
2. Describe future trends and issues in science and engineering, and identify specific industry related examples of modeling in science and engineering.
3. Utilize the modeling Process to identify the key parameters of a model, estimate model structures, utilize a computational tool, e.g. MATLAB to implement the mathematical representation of the model, convey the results of the simulation accurately, validate the model with data, and discuss the quality and sources of errors in the model.
4. Conduct the transformation of continuous functions and dynamics equations into discrete computer representations.
5. Examine mathematical representations of functions - Describe and utilize linear and nonlinear functions to model empirical data. Visualize empirical data and the fitting function using a computational tool.

Course Outcomes:

On completion of this course, the students will be able to

1. Develop the techniques of modeling in the context of knowledge of knowledge about a system and develop the capability to apply the same to study systems through available software.
2. Analyze different types of simulation techniques.
3. Simulate the models for the purpose of optimum control by using software.
4. Identify different types of models and simulations, describe the iterative development process of a model, and
5. Explain the use of models and simulations for hypothesis testing and explain how models link the physical world, the virtual world and the science of prediction.

COURSE CONTENTS

Module 1

Introduction: Definition and components of a system, continuous and discrete systems. Modeling: Concepts of system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models. Simulation: Basics of simulation, Steps in simulation, Discrete event

With effect from Academic Year 2021-22

system simulation, Advantages and disadvantages of simulation, Decision making with simulation.

Module 2

Statistical Models: Review of terminology and concepts, Useful stochastic models, Discrete distributions, Continuous distributions, Poisson process, Empirical distributions, Random numbers, Techniques for random generation, Queuing Models: Characteristics of queuing systems; Queuing notation; Long run measures of performance of queuing systems, Application of models.

Module 3

System Simulation: Techniques of simulation, Monte Carlo method, Experimental nature of simulation, Discrete event models, Continuous system models, Analog and Hybrid simulation, Feedback systems, Computers in simulation studies.

Module 4:

Simulation software: Comparison of simulation packages with programming languages, classification of simulation software, Description of a general purpose simulation package, Design of scenario and modules, dialog box, database, animation, plots and output, interfacing with other software, summary of results. Examples with MATLAB/ AWESIM / ARENA.

Module 5

Analysis after simulation, Importance of the variance of the sample mean, Procedure for estimating mean and variance, Antithetical method, Replication Method, Regression method, Variance reduction techniques, Start up policies, Stopping rules, Statistical inferences, Design of experiments, Verification and validation of simulation models, optimization via simulation, Case studies on application of modeling and simulation in manufacturing systems.

Text books & References:

1. Averill M. Law: "Simulation Modeling and Analysis", Tata McGraw-Hill, 2007.
2. Frank L. Severance: "System Modeling& Simulation-an Introduction", John Wiley& Sons, 2001.
3. Geoffrey Gordon, "System Simulation", Prentice Hall India, 1969.
4. Robert E. Shannon, "System Simulation: The Art and Science", Prentice Hall India, 1975.
5. Charles M Close and Dean K. Frederick Houghton Mifflin, "Modeling and Analysis of Dynamic Systems" TMH, 1993.
6. Allan Carrie, "Simulation of manufacturing", John Wiley & Sons, 1988.

IPPATPB THEORY OF VIBRATION

Course Objectives:

The objective of this course is to

1. Formulate mathematical models of problems in vibrations using Newton's second law or energy principles.
2. Determine a complete solution to the modelled mechanical vibration problems.

3. Correlate results from the mathematical model to physical characteristics of the actual system.
4. To be able to mathematically model real-world mechanical vibration problems.

Course Outcomes:

On completion of this course, the students will be able to

1. Determine the natural frequency of transverse vibrations of the shaft and torsional vibrations of rotor systems.
2. Analyze the mathematical modelling of the two degrees of freedom systems and explain about the working principle of vibration absorber.
3. Compare the natural frequencies and mode shapes of a multi degree of freedom system and explain the modal analysis of a vibrating system.
4. Select the numerical methods to determine natural frequencies of the beam and rotor systems.
5. Describe the vibration measurement by using transducers and vibration exciters.

COURSE CONTENTS

Module 1

Elements of vibration system: - lumped mass, stiffness and damping, simple harmonic motion, vector representation, Singledegreeoffreedomsystem, equationsofmotion-energymethod, Newtonlawbased, general solution, free and forced vibration, damped and undamped motion.

Module 2

Damped Vibration, equivalent damping, logarithmic decrement, damping measurement, forced vibration, coating and reciprocating unbalance, vibration, absorber, Sensorsmotionmeter.

Module 3

Transient vibration: – impulse response, Convolution integral, Fourier analysis.

Module 4

Multi degree freedom system, equation of motion, co-ordinate coupling, undamped forced vibration, principalmodes, generalized co-ordinates, semi-definite system, orthogonality of modes, modal analysis, Lagrange's equation.

Natural frequency numerical solution: - Rayleigh's method, Dunkerley's method, Holzer method, Transfer matrix, Iteration method.

Module 5

Continuous system: Vibrationofsheetlikebeam,torsionalvibration,longitudinal vibration of slender rod, lateral vibration of beams, Shear deformation and rotary inertia effect, Rayleigh's quotient, Rayleigh's Ritzmethod.

Text Books &References

1. Tse S,MorseRRollandT Hinkle Svedf. "Mechanicalvibrationsfoundtypes,Application" Published by Allyn and Bacon.
2. Thomson T. Millions "Theory of vibrations with applications" Prentice Hall of India.

With effect from Academic Year 2021-22

1. Hartley, Jim, J. P. "Mechanical Systems" Tata McGraw Hill, (Publication 1976)
2. McGrawHill, "Shaum's Outline Series Mechanical Engineering" McGraw Hills, 1958
3. Anderson, R. A. "Fundamentals of Aviation" Mercer Engineering 1967
4. Elvin, N. G. "Fundamentals of Structural Analysis" McGraw Hills, 1958
5. Robert K. Vierck "Vibration Analysis" Publisher Harper & Row
6. Timoshenko S., Young D. H. Jeffrey W. Jr. "Vibration problems in engineering 4th ed. New York Wiley 1974
7. Meirovitch, L., "Analytical methods in vibrations" publication Macmillan (1967)

IPEATP9 ARTIFICIAL INTELLIGENCE

Course Objectives:

The objectives of this course is to

1) To impart knowledge about Artificial Intelligence
2) To give understanding of the state of the art and reasoning for intelligent systems.
3) To enable the students to understand the basic principles of Artificial intelligence in various applications.

Course Outcomes:

On successful completion of this course, students will be able to:

1. Solve basic AI based problems.
2. Define the concept of Artificial Intelligence.
3. Apply AI techniques to real world problems to develop intelligent systems.
4. Select appropriately from a range of techniques when implementing intelligent systems.

CBCBS: CONTENTS

Module-1

Introduction to artificial intelligence and intelligent agents, categorization of AI, Production systems and rules for some AI problems: water jug problem, missionaries-cannibals problem etc. Solving problems by searching: state space formulation, depth first and breadth first search, iterative deepening.

Module-2

Intelligent search methods, memory restricted versions: Iterative search, Hill climbing, best-first search, problem reduction, constraint satisfaction, Game Playing: Minimax, alpha-beta pruning.

Module-3

Knowledge and reasoning: Propositional and first order logic, semantic networks, building a knowledge base, inference in first order logic, logical reasoning systems Planning: Components of a planning system, goal stack planning, non-linear planning strategies, probabilistic reasoning systems, Bayesian networks.

With effect from Academic Year 2021-22

Module-4

Learning-Overview of different forms of learning, Inductive learning, learning decision trees, computational learning theory, Artificial neural networks, Evolutionary computation, Genetic algorithms, swarm intelligence, particle swarm optimization.

Module-5

Applications: Robotics, Natural language processing etc.

Text & Reference Books

1. Rich and Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2011
2. Stuart Russell, "Artificial Intelligence", Cengage Learning, 2011
3. Deepak Khemani, "A First Course in Artificial Intelligence", Tata McGraw Hill, 2013
4. S. Russel and P.Norvig,"AI: A modern approach", 3rd Edition, Pearson Education, 2009

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
IPPA3EC3	Research Methodology & IPR	2	0	0		50	50	2

IPPA3EC3 RESEARCH METHODOLOGY & IPR

Course Objectives

The objective of this course is to:

1. To familiarize participants with basics of research and the research process.
2. To enable the participants with basic understanding of types of data and data collection methods.
3. To enable the participants in conducting research work and formulating research synopsis and report.
4. To familiarize participants with IPR.
5. To impart knowledge for enabling students to develop data analysis skills and meaningful interpretations to the data sets so as to solve the research problems.

Course Outcomes:

On successful completion of this course, students will be able:

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property
5. Right to be protected among students in general & engineering in particular

COURSE CONTENTS

Module-1

Introduction and Design of research: Meaning, objectives and significance of research, types and parameters of research, research process, identification and definition of the research problem.

With effect from Academic Year 2021-22

definition of construct and variables; pure and applied research design; exploratory and descriptive design methodology; qualitative vs. quantitative research methodology; field studies; field experiments vs. laboratory experiments; research design in social and physical sciences

Module 3

Data and Methods of Data Collection: Survey, assessment and analysis; data collection, primary and secondary sources of data; Collection of primary data through questionnaires and schedules; Collection of secondary data; processing and analysis of data; Sample survey, simple random sampling, stratified random sampling, systematic sampling, cluster sampling, area sampling and multistage sampling; Pilot survey; scaling techniques; validity & reliability;

Module 4

Data Analysis: Procedure for testing of hypothesis; the null hypothesis, determining levels of significance, type I and II errors, grouped data distribution; measures of central tendency, measures of spread/dispersion, normal distribution; analysis of variance: one way, two way, chi square test and its applications; students 'T' distribution; non-parametric statistical techniques; Statistical test; Correlation and regression analysis – discriminate analysis – factor analysis — cluster analysis, measures of relationship

Module 4

Research report preparation and presentation; Review of literature; historical survey and its necessity; layout of research plan, meaning, techniques and precautions of interpretation; types of report: technical report, popular report, report writing – layout of research report; mechanics of writing a research report; Writing bibliography and references

Module 5

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.International licensing. International cooperation on Intellectual Property. Procedure for grant of patents, Patenting under PCT

Reference Books:

1. Research in education, By J W Best and J V Kahn, Pearson/ Allyn and Bacon
2. Research Methodology – Methods and Techniques, C K Kothari, New Age International
3. Design and Analysis of Experiments, D C Montgomery, Wiley
4. Applied Statistics & Probability for Engineers, D C Montgomery & G C Runger, Wiley
5. Management Research Methodology: Integration of Principles, Methods and Techniques, K. N Krishnaswamy, A I Sivakumar and M Mathirajan, Pearson Education

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
IPPALT3	CAD/CAM lab	0	0	4	00	00	00	2

IPPALT3 CAD/CAM LAB

Course Objectives:

The objective of this course is to

1. Integral drawings of machine components

2. Prepare assembly drawings both manually and using standard CAD package

With effect from Academic Year 2021-22

1. Familiarize the students with Indian Standards on drawing practices and standard components
2. Gain practical experience in handling 2D drafting and 3D modelling software systems
3. Analyze the features of CNC Machine Tools
4. Expose students to modern control systems (Fanuc, Siemens etc.)
5. Give exposure to software tools needed to analyze engineering problems
6. Give exposure of different application areas of manufacture and analysis tools

Course Outcomes

On successful completion of this course, students will be able:

1. Describe steps required for modelling 3D objects by using protrusion, cut, revolve, extrude commands
2. Convert 3D solid models into 2D drawings different views, sections
3. Use isometric views and dimensioning of part models
4. Machine simple components on CNC machines
5. Use CAM software to generate NC code

List of Experiments

1. Use of commands of any computer aided drafting software package such as AutoCAD, Pro-engineer, CATIA etc.
2. Development of menu driven software for graphics using output primitives and for clipping of graphical entities
3. Design of mechanical parts using geometric transformations such as translation, scaling, rotation, reflection etc.
4. Development of software for design of any mechanical element and system
5. Development of software for analysis of one dimensional element using FEM technique
6. Development of computer programs for analysis of mechanical element using FEM for user input values

With effect from Academic Year 2021-22

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
IPPHET3	Finite Element Analysis	3	0	0	40	60	100	3

IPPHET3 FINITE ELEMENT ANALYSIS

Course Objectives

The objectives of this course is to:

1. Implement the basic concepts of Finite Element Analysis (FEA) in structural mechanics
2. Solve 1D, 2D and dynamic problems using Finite Element Analysis approach
3. Formulate the design and heat transfer problems with application of FEM

Course Outcomes

On successful completion of this course, students will be able:

1. Implement numerical methods to solve mechanics of solids problems
2. Formulate and Solve axially loaded bar Problems
3. Formulate and analyze truss and beam problems
4. Implement the formulation techniques to solve two dimensional problems using triangle and quadrilateral elements
5. Formulate and solve Axi-symmetric and heat transfer problems

COURSE CONTENTS

Module 1

Progressive development of FEA, nodes and elements, coordinate systems, application to the continuum, discretization of the domain, element shape, node, nodal element and coordinate system, shape functions, lagrangian technique, governing equations for continuum, pre-processor, processor and post processor.

Module 2

Strain displacement and elemental stiffness matrix, assembling of stiffness equation, boundary conditions and solutions, direct approach, Galerkin's and virtual work method, discretization of structure, analysis of spring, bar and truss elements.

Module 3

Solution of plane stress and plane strain problems, iso-parametric formulations, analysis of beams and rigid frames, bending of thin plates, analysis of shells.

Module 4

With effect from Academic Year 2021-22

Navier Solutions of Cross-Ply and angle-ply laminated simply-supported plates, Introduction of various finite element solutions for bending of rectangular laminated plates using CLPT and FSDT, formation of stiffness matrix, formation of load vector, numerical integration, post computation of stresses.

Module 5

Nonlinear Analysis: analysis of material and geometric nonlinear problems, adaptive finite analysis, automatic mesh generation, classes of new mesh, transfers variables.

Text & Reference Books

1. Rao S.S., "The Finite Element Method in Engineering", Elsevier Science & Technology
2. Bhatia D.V., "Fundamental of Finite Element Analysis", Mc Graw Hills.
3. Cook R.D., Malkus, D.S. and Plesha, M.E., "Concepts and Applications of Finite Element Analysis", 3rd Ed. John Wiley & Sons.
4. Barlat K.J. "Finite Element Procedures" Prentice Hall of India, New Delhi.
5. Huebner K.H. and Thorton, E.A., "The Finite Element Methods for Engineers" John Wiley &Sons.
6. Zienkiewicz O.C. and Taylor, R.L., "The Finite Element Methods", Vol.1,Vol.2 and Vol.3, Mc Graw Hill.
7. Belytschko,T., Liu, W.K. and Moran, B., Non-linear Finite Elements for Continua and Structures", Mc Graw Hills.

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
IPPBTT2	Robotics and Control	3	0	0	40	60	100	3

IPPBTT2 ROBOTICS AND CONTROL

Course Objective

The objective of this course is to:

1. Study about mechanics, mechanics and mechanical behavior of the industrial robot.
2. Introduce the basic concept of arithmetic foundations and its analysis of the industrial robot.
3. Impart knowledge of kinematic, dynamic and trajectory behavior of the industrial robot.
4. Introduce the concept of controller design and the artificial intelligence used in the robotics.

Course Outcomes

On successful completion of this course, students will be able to:

1. Learn the basic concept of arithmetic modeling of industrial robots.
2. Analysis the forward and inverse kinematic behavior of industrial robots.

3. Understand the dynamic behaviour and trajectory generations of industrial robots.
4. Apply the concept of robot control theory and its application in robot controller.
5. Explore the concept of artificial intelligence and machine learning algorithms used in robotics.

COURSE CONTENTS

Module 1

Progressive development of robotics, man vs machine, specifications and classifications of industrial robot, robot specifications, links joints and terminology, mobility and degree of freedom, yaw, pitch and roll motion, equivalent angle, work envelop parameters, reach and stroke, repeatability, accuracy and precision, the mechanics and control of mechanical manipulator, operating environment, industrial applications.

Module 2

Spatial descriptions and transformations, coordinates frames matrices and their orthonormal, frame assignment to links, fundamental of rotation and translation, homogeneous coordinate frame, composite, inverse and skew homogeneous transformation, description of position and orientation, Denavit-Hartenberg (D-H) parameters, arm equations, direct kinematic problems of industrial robots, inverse kinematics, algebraic and geometrical methods, inverse kinematic of roll pitch yaw joints, inverse kinematic problems of industrial robots, multiple solutions.

Module 3

Introduction to dynamics force, inertia and energy, principle of inertia tensor, joint velocity of manipulator, kinetic and potential energy of manipulator, Langrange-Euler formulation, equation of motion, dynamics problems of industrial robots, general description of path planning and trajectory generation, description of cartesian and joint space, manipulator locations and velocity of manipulator, trajectory generation and obstacles avoidance of industrial robot.

Module 4

Introduction and system modeling of manipulator control theory, open loop and close loop control, first order and second order linear system, properties of the dynamic model, linear and nonlinear control techniques, performance and stability of feedback control, Proportional-Derivative (PD)control, Proportional-Derivative-Integral (PID) control, introduction of nonlinear control, multivariable robot control, computed torque control, adaptive control, hybrid control, manipulator interaction with environment, system stability and optimal control, applications and examples.

Module 5

Generation of robot programming languages and software packages, introduction to artificial intelligence, knowledge and reasoning, artificial neural network (ANN) and its applications in robotics, fuzzy logic theories and its applications in robotics. AI based techniques for navigation,

With effect from Academic Year 2021-22

the control algorithms, multiple robot coordination, design and application of intelligent controller

Text Books & References

1. Fu K.S, Gonzalez R.C. and Lee C.S.G. "Robotics", McGraw Hill Education India
2. John J. Craig, "Introduction to robotics", Addison Wesley Longman
3. Schilling Robert J., "Fundamentals of Robotics", Prentice Hall of India
4. Nagrath I.J. & Mittal R.K., "Robotics &Control" Tata McGraw Hill.
5. Murphy, "Introduction of AI robotics", MIT press
6. Haykin S., "Neural Networks and Learning Machines", Pearson Publisher
7. Yen J. & Langari R., "Fuzzy Logic: Intelligence, Control, and Information", Pearson Publisher.

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Elective - IV	3	0	0	40	60	100	3
IPPRTP1 IPPRTP2 IPPRTP3	1. Green Manufacturing 2. Advance Operation Research 3. Total Quality Management							

IPPRTP1 GREEN MANUFACTURING

Course Objectives:

The objectives of this course is

1. The graduate use their talent, self-confidence, knowledge and manufacturing practice which facilitate them to pursue position of scientific and/or managerial leadership in their career paths towards green manufacturing.
2. Understand the three pillars of sustainability and how they are manifested in sustainable and green manufacturing.
3. Understand the basics of the green manufacturing concepts, strategy, different technologies used to implement green manufacturing.
4. To create congenial environment that promotes learning, growth and inquiry ability to work with inter disciplinary groups in professional, industry and research organizations.
5. Understand Life Cycle Assessment approach to evaluate environmental impacts of product design, manufacturing processes, product use phase, and product end of life.
6. To broaden and deepen their capabilities in analytical and experimental research methods, analysis of data, and drawing relevant conclusions for scholarly writing and presentations.
7. To provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research.

Course Outcomes:

On successful completion of this course, students will be able:

Wrist effect from Academic Year 2021-22

1. Graduate will demonstrate the ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
2. Graduate will become familiar with green manufacturing concepts and practices and analyze the problems within the domains of Green Manufacturing as the members of multidisciplinary teams.
3. Graduate will be trained towards developing and understanding the impact of environmental oriented components on global, economic, and societal context.
4. Explain the concept and principles of green manufacturing.
5. Plan good housekeeping practices for industry/other places with concern of safety, hygiene and waste reduction.

COURSE CONTENTS

Module 1

Introduction: Sustainable development, indicators of sustainability, sustainability strategies, sustainable manufacturing,evolution of sustainable manufacturing, elements of sustainable manufacturing, theory of green manufacturing and its principles, need for green manufacturing, drivers and barriers of green manufacturing.

Module 2

Green manufacturing strategy: Manufacturing strategy, elements of manufacturing strategy, manufacturing cost pots, competitive priorities, quality, delivery speed and reliability, cost efficiency,flexibility, order winners and order qualifiers, toolwell production systems, manufacturing levers, competitive analysis, level of manufacturing capability, framework for formulating manufacturing strategy, implications of green manufacturing for manufacturing strategy.

Module 3

Life cycle approach of green manufacturing: Holistic and total Life-cycle approach, six step methodologies for green manufacturing (6-R approach), life cycle assessment (LCA), elements of LCA – Life Cycle Costing,Eco Labelingtarget setting, data collectionand processing, flaskvaluation by virtue of criteria, environmental management systems.

Module 4

Green manufacturing technology: Definition of green manufacturing technology and practices, classifications of green manufacturing technology, advantages and disadvantages of implementation of green technology.

Module 5

Lean and Green manufacturing: Introduction, lean evolution drivers, introduction to lean manufacturing, definition of lean manufacturing, lean vs. green manufacturing: similarities and differences.

Text Books & References

1. Cleaner Production: Environmental and Economic Perspectives, Mirza Krishan B., Springer, Berlin, Latest edition.
2. Environmental Management Systems and Cleaner Production, Dr. Roth Hillary, Wiley, New York, Latest edition.
3. Pollution Prevention: Fundamentals and Practice, Paul L Bishop, TMH.
4. Costing the earth, Cairncrss and Francis, Harvard Business School Press - 2009.
5. The principle of sustainability, Simon Dresner, -Earth Scan publishers (2008).
6. Manufacturing strategy: How to formulate and implement a winning plan, Thom McIlvaling, Productivity Press Portland, Oregon-2017.
7. Manufacturing strategy , Voss C. A, Chapman & Hall-1992
8. Manufacturing the future, Steve Brown, Prentice Hall, 2000
9. Manufacturing strategy, Terry Hill, Homewood, IL- 1989
10. Becoming Lean - Inside Stories of U.S. Manufacturers, Jeffrey K. Liker, Productivity Press, Portland, Oregon
11. G. Atkinson, S. Dietz, E. Neumayer, — "Handbook of Sustainable Manufacturing", Edward Elgar Publishing Limited, 2007.
12. D. Rodich, "Industrial Development for the 21st Century: Sustainable Development Perspectives", UN New York, 2007.
13. Rogers, P.P., Jalal, K.F. and Boyd, J.A., "An Introduction to Sustainable Development", Earth scan, London, 2007.
14. P. Lewis, "Sustainable Development Indicators in Ecological Economics", Edward Elgar Publishing Limited.
15. S. Asefa, "The Economics of Sustainable Development", W.E. Upjohn Institute for Employment Research, 2005.

IPPBTP2 ADVANCE OPERATION RESEARCH

Course Objectives:

The objective of this course is

1. To explain the ideas about board education in the techniques and modeling concepts and transfer and design complex systems.
2. To compile the basic concepts of LPP and various solving techniques.
3. To make use of assignment, transportation, inventory and various other techniques.
4. To illustrate the connection between basics in well the advance tools of the subject tudemonstrate the link between theory and its real world.
5. To define of single and multi variable optimization methods with and without constraints.

With effect from Academic Year 2021-22

Course Outcomes

On successful completion of this course, Students will be able to-

1. Recall and comprehend the LPP and its formulation with solving techniques.
2. Remember, understand and analyze the analytical solution of Simplex method, Assignment problem, Transportation problems and related topics questions with effective manner.
3. Understanding to apply basics as well the advance tools of the subject to demonstrate the link between theory and its real world applications.
4. Explain the overview of historical development and review of optimization techniques.

COURSE CONTENTS

Module 1

Introduction, Mathematical formulation of the problem, Graphical Solution methods, Mathematical solution of linear programming problems, Slack and Surplus variables, Matrix formulation of general linear programming Problem.

Module 2

The Simplex Method, Artificial variables, two phases Simplex Method, infeasible and unbounded LPP's, alternate optima, Dual problem and duality theorems, dual simplex method and its application in post optimality analysis, Revised Simplex method.

Module 3

Construction and solution of Three Models, Hungarian method of solving assignment problem, unbalanced assignment problem, matrix form of transportation problem, Initial basic feasible solution, Balanced and unbalanced transportation problem, u-v method for solving transportation problem, Selecting the entering variables, selecting the leaving variables, Degeneracy in transportation Problem.

Module 4

Introduction and characteristics of dynamic programming, Methods of solution to DP.

Queuing Models, Characteristics queuing models, Steady state solutions of Markovian queuing models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space, M/G/1.

Module 5

Classical Optimization Techniques, Introduction, Review of single and Multi-variable optimization methods with and without constraints.

Text Books & References

1. Operation Research, Theory and Application by J.K. Sharma, Macmillan India
2. Quantitative techniques in Management by N. D. Vohra, 1989
3. Operations Research by P.K. Gupta and D.S. Hira, S Chand and Sons
4. Operation Research : An Introduction by H.A. Taha
5. S. S. Rao Optimization Techniques, Wiley Eastern

6. Operations Research, Kanti Swarup, S Chand

IPPRTP3 TOTAL QUALITY MANAGEMENT

Course Objectives:

The objective of this course is

1. Recognize the basic knowledge of History and Evolution of Quality Control and Management.
2. Illustrate the philosophy and core values of Quality Management (QM).
3. Develop the concepts and statistical methods employed for assurance of quality in products, processes and systems in an industrial environment.
4. Determine the effect of Process Capability Analysis and Introduction of Sampling Plans.
5. Apply and analyze the Concept of Reliability and Taguchi Philosophy for Quality.

Course Outcomes:

On successful completion of this course, students will be able:

1. Develop conceptual understanding of Quality, Quality cost and value.
2. Analyze and develop control charts for Statistical Quality Control.
3. To apply the knowledge of quality control and its tools for process capability.
4. Analyze and develop sampling plans for acceptance sampling.
5. Identify the concept of TQM and philosophy of quality leaders.
6. Identify failure pattern of product, Reliability and Maintenance.
7. Evaluate Reliability and MTTF and Examine Taguchi Philosophy for Quality improvement.

COURSE CONTENTS

Module 1

Introduction: Quality Control: Definitions, Phase of quality control in industries,Quality control organization. Difference between inspection and quality control.Economics of Quality systems. Quality Assurance and its manual.

Module 2

Statistical Process Control: Sample size and frequency of sampling and control, Design and applications of control charts for variable and attributes(X,R,C np, p, u chart). Process capability studies.

Module 3

Acceptance Sampling: AQL, LQL, Producer's Risk, Consumer's Risk, and Performance Measures of Sampling Plans. OC curve and ASN curve Single sampling plans. Double sampling and sequential sampling plans. Rectifying inspection for lots. Sampling plans for continuous production. Selection of sampling plans for different situations. Economics of acceptance sampling.

Module 4

Total Quality Management: Evolution of total quality management. Historical perspective. Elements

of TQM: elimination of waste and problem exposure. Total quality control systems. Drainage wheel. Deming 14 points-pros and cons in industrial engineering context. Philip Crosby philosophy. Juran Philosophy. Ishikawa Diagram/Quality function development. Quality circles in ISO 9000. Application of TQM tourism type organizations. Various Quality Awards.

Module 5

Reliability: Distributions encountered in controlling Reliability mean time to failure. Exponential failure density, MTTF, Weibull, Failure density, Measurement and Tests. Maintenance and Reliability. Robust Design and Taguchi Method Taguchi Philosophy for Quality Improvement. Quality Loss Function, Signal-to-Noise Ratio.

Text Books & References:

1. Grant E.L. and Leave Worth, Statistical Quality Control, TMH, 1996.
2. Amitava Mitra, Fundamentals of Quality Control and Improvement, Wiley, 2010.
3. Kapur K.C. and Lamberson, Reliability in Engg. Design Wiley Eastern.
4. Juran and Godfrey, Quality Handbook, TMH, 1998.
5. Jain K.C. and Chitale A.K., Quality Assurance and Total Quality Management, Khanna Publisher, India, 2003.

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Elective – V	3	0	0	40	60	100	3
IPPRTP4 IPPRTP5 IPPRTP6	4. Mechanics of Composite Material 5. Smart Materials and Applications 6. Mechatronics in Manufacturing Systems							

IPPRTP4 MECHANICS OF COMPOSITE MATERIAL

Course Objectives:

The objective of this course is

1. Understand the fundamental properties of composite materials;
2. Apply the fundamental principles mechanics of composite materials;
3. Apply modern analytical techniques to mechanical systems with composite materials;
4. Apply computational techniques to mechanical systems with composite materials;
5. Understand the manufacturing processes and cost analysis in composite materials;
6. Demonstrate effective communication and teamwork skills through technical presentations and reports in team projects.

Course Outcomes:

On successful completion of this course, students will be able

1. Determine composite mechanical properties from constituent fiber and matrix material properties including longitudinal and lateral modulii, Poisson's ratio, and shear modulus.
2. Determine the generalized stiffness and compliance matrix relating in-plane stresses to strains for a composite layer assuming plane stiffness.

3. Apply classical laminated plate theory to determine extensional, coupling, and bending stiffnesses of a composite laminate. Also be able to perform this calculation using MATLAB for a composite laminate with many layers.
4. Fabricate composite laminates and built-up composite structures such as I-beams, box beams, or model-scale aircraft wings using a composite manufacturing procedure.

COURSE CONTENTS

Module 1

Introduction: Definition of composites, classification of composites, Fibrous/Anisotropic materials and their properties, general and block-diagonal orthotropic, transversely isotropic and isotropic materials; constitutive equations under plane stress condition for orthotropic materials, restrictions and reductions for the two-plane materials.

Module 2

Macromechanics of Laminae: Stress-strain relations, Hooke's law for Orthotropic laminae, strength of an Orthotropic laminae, experimental determination of strength and stiffness, Partial strength theories of an Orthotropic laminae: maximum stress theory, maximum strain theory, Tsai-Hill theory, Tsai-Wu Tensor theory.

Module 3

Macromechanics of Laminae: Mechanics of material approach to stiffness, determination of E_1, E_2, E_3, ΔG_{12}, mechanics of material approach to strength, two-dimensional composite strength and predictions, elastic/hygroscopic stiffness, concentration of mechanical solution.

Module 4

Macromechanics of Laminate: Classical laminate theories (CLT)-laminate stress, laminate stiffness A-B-D matrix and their implication, symmetric and non-symmetric laminates, laminate stress, laminate stiffness, laminate theory.

Module 5

Short Fiber Composites: Theories of stress/transfer, average fiber stress, modulus prediction, strength prediction, effect of aspect ratio, Ribbon-Reinforced composites.

Text & Reference books:

1. "Modern Composite Materials" by L. J Hortman and R. M Kreck.
2. "Composite Materials – Science and Engineering" by K. K Chawla.
3. "Mechanisms and Mechanics of Composite Fracture" by R. B Bhagat and S G Fishman.
4. "An Introduction To Composite Materials" by D Hull, "STRUCTURAL COMPOSITE MATERIALS" by F C Campbell.
5. "Composite Materials" by Berthelot, "Electrostatic Discharge Sensitivity of Composite Energetic Materials" by Michelle L Pantoya and Chelsea Weir.

IPPRTPS SMART MATERIALS AND APPLICATIONS

With effect from Academic Year 2021-22

Course Objectives

The objectives of this course is

1. Describe different types of smart materials in terms of underlying mechanisms, advantages and disadvantages
2. Select the most appropriate smart material systems for a design problem under specified design constraints
3. Possess a general picture of smart material systems and knowledge about current research areas and future trends
4. Design of sensors and actuators using smart materials and learn about Energy harvesting using piezoelectric materials
5. Describe Magneto rheological fluid and its applications

Course Outcomes

On completion of this course, the students will be able to

1. Design and construct simple functional structures using smart materials
2. Describe and characterize mechanical behavior of smart materials
3. Characterize interaction between smart materials and simple structures in actuation and sensing
4. Describe and characterize novel functions of smart materials using structure property relationships
5. Present and demonstrate the functions of smart structures

CHCH98 CONTENTS

Module 1

Definition of smart materials, what makes them smart, sensors, actuators and transducers, introduction to different types of smart material, Smart materials history and industrial applications

Module 2

Piezoelectric materials – Crystallography and crystal structure, mechanism of piezoelectricity, Common piezoelectric materials, Applications, Derivation of constitutive laws from energy principle and its applications as actuator, sensor, and energy harvester

Ferroelectricity, pyroelectric materials phase transformation

Module 3

Shape memory alloys – Martensitic transformation, shape memory effect, hysteresis, elasticity, Mechanical behaviour and shape memory characteristics of different shape memory alloy systems, Ti-Ni Phase diagrams

Module 4

Thermally and Magnetically activated Shape memory alloy constitutive modeling using phenomenological and thermodynamic approaches, its application as actuator, sensor, energy dissipater, and used like biomedical items, Design and Applications of Shape memory alloys

Module 5

Magneto rheological fluid, constitutive behaviour and its application as damper, Behaviour of Electro active polymer and its use as artificial muscles, Properties of Magnetostrictive materials and Optical fibre

Text & Reference Books:

1. Mel M. Schwartz, Smart Materials, CRC Press, 2009.
2. Donald J. Leo, Engineering analysis of smart material systems, John Wiley & Sons, 2007

1. Jacob Yang, Analysis of piezoelectric devices, World Scientific, 2006.
4. Ralph C. Smith, Smart material systems: model development, ciam, 2005.
5. Vijay K. Varadan, Smart material systems and MEMS: design and development methodologies, John Wiley & Sons, 2006.
6. Seung-Bok Choi & Young-Min Han, Piezoelectric actuators: control applications of smart materials, CRC Press - 2010.
7. Antonio Arnau, Piezoelectric transducers and applications, Springer, 2004.

IPPRTP6 MECHATRONICS IN MANUFACTURING SYSTEMS

Course Objectives:

The Objective of this course is

1. Understand characteristics and the components of mechatronics systems
2. Discuss recent trends in Mechatronics
3. Describe active & Passive electrical circuits
4. Describe the techniques are of used to design a mechatronics process
5. Suggest possible design solutions

Course Outcomes:

On completion of this course, the students will be able to

1. Identification of key elements of mechatronics system and its representation in terms of block diagrams
2. Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
3. Interfacing of Sensors, Actuators using appropriate DAQ micro controller
4. Time and Frequency domain analysis of system model (for control applications)
5. PID control implementation on real time systems
6. Development of PLC ladder programming and implementation of real life systems

COURSE CONTENTS

Module 1

Introduction to Mechatronics, Need of Mechatronics in measurement systems, Control systems, Traditional design.

Module 2

Feedback devices, Introduction of sensors and transducers, Performance terminology, Displacement, Positional proximity, Velocity and motion, Fluid pressure, Temperature sensors + Light sensors,Selection of sensors, Signal processing, Servo systems.

Module 3

Role of microprocessors in Mechatronics, Introduction of microprocessors and microcontrollers , Pin configuration, Instruction set,Programming of microprocessors using 8085 instructions , Interfacing

With effect from Academic Year 2021-22

input and outputdevices, Interfacing D/A converters and A/D converters. Applications - Temperature control,Stepper motor control, Traffic light controller.

Module 4

Programmable logic controllers(PLC): Introduction, Basic structure, Input/output processing, Programming, Mnemonics, timers,Internal relays and counters, Data handling, Analog input/output, Selection of PLC.

Module 5

Design and Mechatronics, Designing, Possible design solutions, Case studies of Mechatronics systems.

Text & Reference Books:

1. Histand Michael B. and Alciatore David G., "Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Edition, 1999.
2. Bradley, D.A., Dawson, D. Burd, N.C. and Loader, A.J. "Mechatronics ", Chapman and Hall, 1991.
3. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications" Wiley Eastern, 1998.
4. Lawrence J.Kamm, "Understanding Electro-Mechanical Engineering, An Introduction to Mechatronics", Prentice-Hall, 2000.
5. Ghosh P.K. and Sridhar, P.R., "Introduction to Microprocessors for Engineers and Scientists, (8085 to 8085)", Second Edition, Prentice Hall, 2001.

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Open Elective	**3**	**0**	**0**	**40**	**60**	**100**	**3**
MEPBE015	9. Business Analytics							
IPPBE01E	10. Industrial Safety							
IPPBE01F	11. Operations Research							
CEPBE01H	12. Cost Management of Engineering Projects							
MEPBE05	13. Composite Materials							
CHPBE06	14. Waste to Energy							
ECPBE07	15. IoT							
MCPBE08	16. MEMCs							

MEPBE01BUSINESS ANALYTICS

Course Objectives:

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision making tools/Operations research techniques.

With effect from Academic Year 2021-22

6. Adopt business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Outcomes:
On completion of this course, the students will be able to

1. Knowledge of data analytics.
2. Think critically in making decisions based on data and deep analytics.
3. Use technical skills in predictive and prescriptive modeling to support business decision-making.
4. Translate data into clear, actionable insights

COURSE CONTENTS

Module 1
Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organizations, competitive advantages of Business Analytics. Statistical Tools: Statistical Notations, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview

Module 2
Trendlines and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models, Descriptive analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Module 3
Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Module 4
Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Causal Variables, Selecting Appropriate Forecasting Models.
Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Module 5
Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Discrete Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Module 6
Recent Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

References:
1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G.

With effect from Academic Year 2021-22

Schmidt Jean, Christopher M. Staley, Pearson FT Press.
2. Business Analytics by James Evans, pearson Education.

IPPBTOG INDUSTRIAL SAFETY

Module1
Industrial safety: Accident: causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act1948 for health and safety, wash rooms, drinking water layout, light, cleanliness, fire grounding, pressure vessels, etc. Safety scope: scope: Fire prevention and fire fighting: equipment and methods.

Module 2
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department,Types of maintenance, Types and applications of tools used for maintenance, Maintenance costs its relation with replacement economy, Service life of equipment.

Module 3
Wear and Corrosion and their prevention: Wear- types, causes, effects, ways to minimize wear, lubricants-types and applications, Lubrication methods, general sketch, working explanations, i) Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Module 4
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump, iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Module 5
Periodic and preventive maintenance: Periodic inspection-concept and remarkpreening, cleaning and lubrication, overhauling of mechanical components,overhauling of electrical parts, common troubles and remedies of electric motor, repair complexities and its general difficulties, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets Program and schedule of preventive maintenance for mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference:
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services
2. Maintenance Engineering, H. P. Garg, S. Chand and Company
3. Pumps-Hydraulic Compressors, Audels, Mcgraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

IPPBTOG OPERATIONS RESEARCH

Course Outcomes:
At the end of the course, the student should be able to

1. Apply the dynamic programming to solve problems of discrete and continuous variables.
2. Apply the concept of non-linear programming
3. Carry out sensitivity analysis
4. Model the real world problem and simulate it.

With effect from Academic Year 2021-22

COURSE CONTENTS

Module 1
Optimization Techniques, Model Formulation, models, General L.P. Formulation, Graphic Techniques,Sensitivity Analysis, Inventory Control Models

Module 2
Formulation of a LPP - Graphical solution-revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Module 3
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem , max flow problem -CPM/PERT

Module 4
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming

Module 5
Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming,Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:
1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008
4. Hillier Lieberman Operations Research, Mcgraw Hill Pub. 2009
5. Panneerselvam, Operations Research, Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research, Prentice Hall of India 2010

CEPBT106 COST MANAGEMENT OF ENGINEERING PROJECTS

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

1. Discuss the cost concepts in the cost management process
2. Able to handle the projects by the application of project cost control methods
3. Delineate all types of costing and carryout the analysis of pricings for profitability
4. Application of PERT/CPM for cost management

COURSE CONTENTS

Module 1
Introduction and Overview of the Strategic Cost Management Process

Module 2
Cost concepts in decision-making; Relevant cost; Differential cost, Incremental cost and Opportunity cost, Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control,Provision of data for Decision-Making

Module 3
Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and managerial activities. Detailed Engineering activities. Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance.

Project contracts, Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Module 4
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing

and Absorption Costing; Break-even Analysis; Cost-Volume-Profit Analysis; Various decision making problems; Standard Costing and Variance Analysis; Pricing strategies; Pareto Analysis; Target costing; Life Cycle Costing; Costing of service sector; Just-in-time approach; Material Requirement Planning; Enterprise Resource Planning; Total Quality Management and Theory of constraints; Activity-Based Cost Management; Bench Marking; Balanced Score Card and Value-Chain Analysis; Budgetary Control;

Flexible Budgets; Performance budgets; Zero-based budgets; Measurement of Divisional profitability; pricing decisions including transfer pricing.

Module 5

Quantitative techniques for cost management; Linear Programming; PERT/CPM; Transportation problems; Assignment problems; Simulation; Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Atkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

MEPBTO5-COMPOSITE MATERIALS

Course outcomes

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

1. Explain and also implement the composite materials for the required performance based on the characteristics.
2. Adopt the composite materials in relative numbers.
3. Implement the methods of manufacturing of metal matrix composites.
4. Adopt the methods of manufacturing of polymer matrix composites.
5. Evaluate the strength of laminates.

COURSE CONTENTS

Module 1

INTRODUCTION: Definition – Classification and characteristics of Composite materials.

Advantages and application of composites; Functional requirements of reinforcement and matrix; Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Module 2

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures, Isostrain and Isostress conditions.

Module 3

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Module 4

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand lamp method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Module 5

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength.Laminate strength-ply discount truncated maximum strain criterion; strength design using capital plot;stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W Cahn – VCH, Weyl (Germany)
2. Materials Science and Engineering: An introduction, WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

References:

1. Hand Book of Composite Materials-ed-Lubin
2. Composite Materials – K.K.Chawla
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tsai.

CHE1036 WASTE TO ENERGY

Course outcomes:

1. At the end of the course, students will be able to
2. Classify the waste for fuel and identify the devices for conversion of waste to energy
3. Implement the Biomass Processes
4. Evaluate the methods of Biomass Gasification and implement their applications
5. To design, construct and operate the Biomass Combustion devices
6. Classify biomass, apply the bio energy systems design and construction

Module 1

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digesters

Module 2:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and applications - Manufacture of pyrolytic oils and gases, yields and applications

Module 3

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers -Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Module 4

Biomass Combustion: Biomass stoves – Improved chulhas, types, some exotic designs, Fluid bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Module 5

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and its status - Bio energy systems - Design and constructional features - Biomass resources and their characteristics - Biomass conversion processes - Thermo chemical conversion - Direct combustion -furnace performance - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion -Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production – Urban waste to energy conversion - Biomass energy programme in India

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. Wereko-Brobby and E. B. Hagan, John Wiley &Sons, 1996.

Shrink effect from Academic Year 2021-22

ECPBTO7 INTERNET OF THINGS (IoT)

Course outcomes:

1. At the end of the course, students will be able to
2. Understand the concepts of Internet of Things.
3. Analyze basic protocols in wireless sensor network.
4. Design IoT applications in different domain and be able to analyze their performance
5. Elaborate the need for Data Analytics and Security in IoT.
6. Understand the concepts of Internet of Things.

COURSE CONTENTS

Module 1

Review of computer communication concepts (OSI layers, components, packet communication, Networks, TCP-IP, sub netting, IPV4 addressing and challenges), IPV6 addressing, IoT architecture reference layer, Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open source hardware, Examples of IoT infrastructure.

Module 2

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG+ NETCONF, YANG, SNMP NETOPEER.

Module 3

MQTT, UDP, MQTT brokers, publish subscribe nodes, HTTP, COAP,XMPP and gateway protocols, IoT Communication Patterns, IoT Protocol Architecture, Selection of Wireless technologies (6LoWPAN, Zigbee, WIFI, BT, BLE,SIG,NFC, LORA, Lifi, Wubi

Module 4

An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IOT Security, Common Challenges in IOT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures, OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

Module 5

IoT Physical Devices and Endpoints: Introduction to Arduino and Raspberry Pi: Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry Pi with focus on interfacing external gadgets, controlling output, and reading input from pins.

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs Webserver: Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API.

IoT application and its Variants: Case studies: IoT for smart cities, smart grid, health care, agriculture, smart metro,M2M, Web of things, Cellular IoT, Industrial IoT, Industry 4.0,IoT crowdsets.

References:

- "Internet of Things - A Hands-on Approach", Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- "Internet of Things", Srinivasa K G, CENGAGE Learning India, 2017
- " IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Jeff Jeffrey, Pearson Education (Cisco Press Indian Reprint), (ISBN: 978-9386873743)
- "Getting Started with Raspberry Pi", Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9788184230758
- "From Machine to Machine to Internet of Things", Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, Elsevier Publications, 2014

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
	Audit Course/Value Added Course	**2**	**0**	**8**	**40**	**60**	**100**	**2**
ELPRTX1	**English for Research Paper Writing**							
PEPRTX2	**Stress Management by Yoga**							
CEPRTX3	**Disaster Management**							
LAPRTX4	**Constitution of India**							

ELPRTX1 ENGLISH FOR RESEARCH PAPER WRITING

Course outcomes:

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

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title

COURSE CONTENTS

Module 1

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Module 2

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

Module 3

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check, key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

Module 4

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

Module 5

Useful phrases, how to ensure paper is to good as it could possibly be the first- time submission

With effect from Academic Year 2021-22

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM, Highman' ebook
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

PEPBHX2STRESS MANAGEMENT BY YOGA

Course Outcomes

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

1. To achieve overall health of body and mind
2. To overcome stress
3. Develop healthy mind in a healthy body thus improving social health also
4. Improve efficiency

Module 1

Definitions of Eight parts of yog. (Ashtanga)

Module 2

Yam and Niyam.
Do's and Don't's in life:
i) Ahimsa, satya, astheya, brahmacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Module 3

Asan and Pranayam
i) Various yog poses and their benefits for mind & body
ii)Regularization of breathing techniques and its effects-Types of pranayama

Suggested reading

1. "Yogic Asanas for Group Training-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

CEPBHX3 DISASTER MANAGEMENT

Course Outcomes:

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

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

With effect from Academic Year 2021-22

COURSE CONTENTS

Module 1

Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Module 2

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanoes, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Module 3

Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunamis; Post-Disaster Diseases And Epidemics.

Module 4

Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard;Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Module 5

Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Module 6

Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" "New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)" Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep&Deep Publications Pvt. Ltd., New Delhi.

EAPEN4 CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the processes addressing the restrictions of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals'constitutional role and entitlement to civil and economic rights as well as the emergence of subaltern'in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes

Seven Affiliated Years Academic Year 2021-22

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

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

COURSE CONTENTS

- History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)
- Philosophy of the Indian Constitution: Preamble, Salient Features
- Contents of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
- Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, appointment and Transfer of Judges, Qualifications, Powers and Functions.
- Local Administration: District's Administration head, Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat, Position and role, Block level, Organizational Hierarchy (Different departments), Village level, Role of Elected and Appointed officials, Importance of grass root democracy.
- Election Commission: Election Commission, Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission, Role and Functioning, Reviews and Results for the welfare of SCST/OBC and Women.

References:

- The Constitution of India, 1950 (Bare Act), Government Publication.
- Dr. S. N. Busi, Dr. B. R. Ambedkar Framing of Indian Constitution, 1st Edition, 2015.
- M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
- D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
(PPRPT)	Vital Project	3	0	0	40	60	100	3

With effect from Academic Year 2021-22

IPPBPT1 MINI PROJECT

Course Objectives:

The Objective of this course is

1. To develop design skills according to a Creative Design Implementation System (CDIS) compliant methodology.
2. To implement engineering skill and knowledge to complete the identified project work while encouraging creativity and innovation.
3. To develop spirit of team work, communication skills through group-based activity and foster self- directing learning and critical evaluation.

Course Outcomes:

On completion of this course, the students will be able to

1. Identify a problem based on the need analysis of community industry research.
2. Create a flowchart of methodologies for solving the identified problem.
3. Demonstrate team work with work division, team meetings and communication among team members.
4. Write technical report for the project work and present the same through power point presentation or posters.

Course Code	Subjects	Periods/Week			Evaluation			Credits
		L	T	P	IA	ESE	Total	
IPPBLT1	Robotics Lab	0	0	4	40	60	100	2

IPPBLT1 ROBOTICS LAB

Course Objectives:

The Objective of this course is

1. Learn about basic and recent sensors.
2. Learn about application of robot.
3. Apply the basic engineering.
4. The drive systems used in industrial applications.
5. Simulation Software for industrial Robots.

Course Outcomes:

On completion of this course, the students will be able to

At the end of this course, students will demonstrate the ability to

1. Develop Ladder diagrams for PLC Programming.
2. Work with simple Automation Systems using PLC.
3. Analysis Forward and Inverse Kinematics for Basic Robots.
4. Programming and Analysis of Industrial Robots using Software.
5. Visualize the configurations of various types of robots.

[illegible] Year 2021-22

4. Describe the components of robots like mass, linkages, drive systems and end effectors

List of Experiments:

(1) Assignment on introduction to robot configuration

(2) Demonstration of robot with 2 dof, 3 dof, 4 dof etc

(3) Two assignments on programming the robot for applications

(4) Two assignments on programming the robot for applications

(5) Two programming exercises for robots

(6) Two case studies of applications in industry

(7) Exercise on robotic simulation software