SCHEME OF EXAMINATION B.Tech – I Year (1st Sem.), Common to All Branches,Course – A, w.e.f. Session: 2015-2016

S. No	Subject Code	Subjects	Periods /Week			Evaluation Scheme						Grand Total	Credits
						Internal Assessment					E.S.E		
		Theory	L[1]	T[2]	P[3]	C.T.[5]	M.S.E[4]	TA[7]	L.A.[6]	Total			
1	ENATHS01	Professional Communication in English	3	0	0	10	20	10	-	40	60	100	3
2	CHATBS01	Engineering Chemistry	3	0	0	10	20	10	-	40	60	100	3
3	MEATES01	Engineering Mechanics	3	1	0	10	20	10	-	40	60	100	4
4	CSATES02	Fundamentals of Computers	3	1	0	10	20	10	-	40	60	100	4
5	EMATBS02	Engineering Mathematics - I	3	0	0	10	20	10	-	40	60	100	3
		Practical											
1	CHALBS01	Engineering Chemistry Lab	-	-	3	-			30	30	20	50	2
2	MEALES01	Engineering Mechanics Lab	-	-	3	-			30	30	20	50	2
3	MEALES03	Engineering Drawing	-	-	3	-			30	30	20	50	2
												Total Credits	**23**

SCHEMEOF EXAMINATION B.Tech – I Year (2nd Sem.), Common to All Branches, Course – B, w.e.f. Session: 2015- 2016

S. No	Subject Code	Subjects	Periods /Week			Evaluation Scheme						Grand Total	Credits
						Internal Assessment					E.S.E		
		Theory	L[1]	T[2]	P[3]	C.T.[5]	M.S.E[4]	T.A[7]	L.A.[6]	Total			
1	CHBTHS02	Environmental Studies	3	0	0	10	20	10	-	40	60	100	3
2	MEBTES04	Engineering Thermodynamics	3	1	0	10	20	10	-	40	60	100	4
3	EEBTES05	Basic Electrical & Electronics Engineering	3	1	0	10	20	10	-	40	60	100	4
4	PHBTBS03	Engineering Physics	3	0	0	10	20	10	-	40	60	100	3
5	EMBTBS04	Engineering Mathematics – II	3	0	0	10	20	10	-	40	60	100	3
		Practical											
1	EEBLES05	Basic Electrical & Electronics Engg. Lab	0	0	3	-			30	30	20	50	2
2	PHBLBS03	Engineering Physics Lab	0	0	3	-			30	30	20	50	2
3	MEBLES06	Workshop Practice	0	0	3	-			30	30	20	50	2
												Total Credits	**23**

[1]-Lecture Hours, [2]-Tutorial Hours, [3]- Practical Hours, [4]- Mid Sem. Exam, [5]-Class Tests/Assignments, [6]-Lab Work Assessment, * - Mandatory course

SEMESTER-I

Syllabus	SEMESTER-I								
Subject code	ENATHS01	Credit: 3			SESSIONAL - TA				ESE
Subject	PROFESSIONAL COMMUNICATION IN ENGLISH	L	T	P	CT	MSE	TA	Total	
		3	0	0	10	20	10	40	60

UNIT-1: Business Communication: Some key concepts

Meaning and process of communication, Types, channels, Medium of Communication, Barriers of communications, Professional communication; types and principles.

UNIT-2: Business Letters

Elements and layout of a business letter, Application, enquiries, calling quotation, sending quotation, orders complains and adjustment.

UNIT-3: Report writing

Technical reports; essentials, characteristics and structure. Observation report survey report, trouble report, project report.

UNIT-4: Reading comprehension:

Developing comprehension skill through reading of passanges, summarizing, précis writing etc.

UNIT-5: Speaking

The process of speaking. Various phonetory orangs. Introduction to phonetics, classification of pure English sounds. Relation between sound, symbol and alphabet.

Suggested Books and References:

1. D'Souza Evnice and Shahani, G; "Communication Skills in English" Noble Publishing House.

2. Fiske, John, "Introduction to Communication Studies" Rotledge London.

3. Sharma, R.C. and Mohan,, K "Buisness Corres, Pondence and Report Writting", Tata Magraw Hill, New Delhi.

4. Gartside, "Model Business Letter", Pitman London, 1992.

5. Chhabra, Dr. T.N., "Professional Communication, Sun India Publications,New Delhi.

Syllabus	SEMESTER-I								
Subject code	CHATBS01	Credit: 3			SESSIONAL - TA				ESE
Subject	ENGINEERING CHEMISTRY	L	T	P	CT	MSE	TA	Total	
		3	0	0	10	20	10	40	60

Unit - 1:

Hybridization, Valence Shell Electron Pair Repulsion (VSEPR) theory and its application in predicting shape and geometry of molecules. Molecular Orbital Theory - bond order, magnetic properties and MO diagram of homo-nuclear diatomic molecules and ions.

Unit - 2:

Inductive effect, field effect, hyper-conjugation and resonance. Stability of reaction intermediates - Carbocation, carbanion and Free Radicals. Name reactions – Aldol condensation, Benzoin condensation, Cannizzaro reaction and Perkin reaction.

Unit - 3:

Optical isomerism - definition and example of optical activity, plane of symmetry, enatiomers, diastereomers, meso compound and racemic mixture. R-S nomenclature. Geometrical isomerism - cis-trans isomerism and, E-Z nomenclature. Conformational analysis of ethane and n-butane.

Unit - 4:

Definition of polymers, theimoplastic and thermosetting polymer, addition and condensation polymers, ionic and free radical mechanism of polymerisation. Example of some polymers, viz., Kevlar, Bakelite, Urea-formaldehyde resin and vulcanisation of natural rubber.

Unit - 5:

Electromagnetic radiation, [fV Spectroscopy - Electronic transitions, auxochromes, chromophores, bathochromic and hypsochromic shift, Woocl r,vorcls-Fieser rule for calculating Ln*.. for conjugated dienes and u,B-unsaturated aldehydes and ketones. Note: Problems related to above units shall be asked in examination.

Books recommended:

1. Kalsi, P.S.; "stereochemistry conformation and Mechanism,,, New Age Int. (p), Ltd. New Delhi
2. Puri, B. R.; sharma, L. R. And pathania, M. s. ,,principals of physical Chemistry", Shoban Lal Nagin Chand & Co.
3. Mukherji, S. M. And Singh, S. P., "Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., New Delhi 2007.
4. Alberty R.A. and Silbey R. J., "physical chemistry,', John wiley & Sons, Inc., Singapore, 1996.
5. cotton F.A., wilkinson G. and Gaus p.L., ',Basic Inorganic chemistry,', John Wiley & Sons, Inc., Singapore; 3rd F,d.,1996.
6. Graham-Solomon T.W., "Fundamentals of Organic Chemistry", John Wiley & Sons, Inc., Singapore, 1997. l. odian T.w., "Principles of polymerization", John wiley & Sons, Inc., New york, 1981.
8. Sykes P., "A Guidebook to Mechanism of Organic Chemistry", Longman Inc., New York, 1981.
9. Dye J'R. r, "Application of absorption Spectroscopy of Organic Compounds", Prentice Hall of India,1965.
10. Williams D.H. and Fleming I., "Spectroscopic Methods in Organic Chemistry", Tata McGraw Hill Edition, New Delhi, 4th Ed., 19gg.
11. Atkins P.w., "Physical Chemistry", oxford Univ. press, 4th Ed., 1990.
12. Morrison R.T. and Boyd R.N., "Organic Chemistry", Prentice Hall of India, 6th Ed,lgg2.
13. Rao C.N.R. and Agarwala U. C., "Experiments in General Chemistry", East-West Press, New Delhi, 1969.

Syllabus	SEMESTER-I								
Subject code	MEATES01	Credit: 4			SESSIONAL - TA				ESE
Subject	ENGINEERING MECHANICS	L	T	P	CT	MSE	TA	Total	
		3	1	0	10	20	10	40	60

UNIT-1: Force, classification of force, laws of the forces, equilibrium, moment, varignon's theorem, parallel force, couple, General case of equilibrium and their problems.

UNIT-2: Trusses – Analysis by methods of joints and methods of sections. Frames – Analysis of frames, difference between truss & frames.

UNIT-3: Friction, law of friction, General problems on friction, wedge friction, Belt friction, Ratio of tension of belt, power transmitted by a belt, Condition of maximum power transmission by belt. Screw friction – Expression for maximum efficiency of a screw jack, and its problems. Simple lifting machine – Velocity Ratio, Mechanical Advantage, Efficiency, reversibility of a machine, wheel and axle, pulley system & its types, single purchase & double purchase winch crab.

UNIT- 4: Centroid and centre of gravity, Methods & procedure of finding C.G by method of moments and method of integration for various geometrical areas. Moment of Inertia – various theorems on M.I, Radius of gyration, polar M.I, Centroidal axis, Area moment of inertia, product of Inertia & their problems, Introduction of mass moment of inertia.

UNIT-5: Dynamics of body, D 'Alembert's principle, rectilinear motion, work and energy, impulse & momentum and principles of conservation of momentum, collision of elastic bodies.

Recommend Text Books

1. Engineering Mechanics – Beer Johnson, TNH publisher
2. Engineering Mechanics – K.L. Kumar, TMH publisher.
3. Engineering Mechanics - Mokashi, TMH, Publisher
4. Engineering Mechanics – Timoshenko & Young, East West publisher
5. Engineering Mechanics - Irvin Shames, PHI publisher
6. Engineering Mechanics – A.K. Tayal. Umesh publication

Syllabus	SEMESTER-I								
Subject code	CSATES02	Credit: 4			SESSIONAL - TA				ESE
Subject	FUNDAMENTALS OF COMPUTER	L	T	P	CT	MSE	TA	Total	
		3	1	0	10	20	10	40	60

Unit- 1: Number Systems

Introduction Decimal Number System, Binary Number System, Conversion of Binary Number to Decimal Number , Conversion of Decimal Number to Binary Number System, Addition of Binary Numbers, Binary Subtraction, Use of Complements to Represents Negative Numbers, Conversion of Binary Fraction to Decimal Fraction, Conversion of Decimal Fraction to Binary Fraction System, Octal Number System, Hexadecimal Number System, Binary Coded Decimal (BCD Codes) EBCDIC Code, Gray Codes.

Unit- 2: Central Processing Unit (CPU) & Memory

Introduction, CPU Organization, Addressing Modes. Interrupts & Exceptions, Organization of Intel-8085 Microprocessor. Memory: Primary Memory, Secondary Memory, Cache Memory, Virtual Memory, Registers.

Unit -3: Introduction to Programing Language

Introduction to Programming Language: Low Level Programming Language, High Level Language, Fourth Generation Language, Introduction to Software, Application Software and System Software, Compiler, Interpreter, Assembler, Device Driver.

Unit -4: Operating Systems

Definition, Functions and Objective, Evolution of Operating System, Batch Processing, SPOOLING, Multiprogramming, Multiprocessing, Time Sharing, Real Time Processing.

Unit -5: Algorithm and Flowchart

Introduction to Algorithm and Characteristics, Introduction to Flow Chart: Symbols, Rules of Drawing Flow Chart, Advantage and Limitation of Flow Chart, Decision Tables.

Reference Books:

1. Computer fundamentals by P.K.Sinha
2. Computer fundamentals by B.Ram
3. Fundamentals of Computers by V.Rajaraman
4. Fundamental of computers & Programming with c by A.K.Sharma

Syllabus	SEMESTER-I								
Subject code	EMATBS02	Credit: 3			SESSIONAL - TA				ESE
Subject	ENGINEERING MATHS-I	L	T	P	CT	MSE	TA	Total	
		3	0	0	10	20	10	40	60

UNIT-1: Differential Calculus: Successive Differentiation Leibnitz Theorem, Roll's Theorem, Lagrange's Mean value Theorem, Expansion of functions by Maclaurian and Taylor's series. Tangents and Normal's, Maxima and minima of one variable.

UNIT-2: Indeterminate forms, Asymptotes, Radius of curvature, Partial differentiation, Total differentiation.

UNIT-3: Integral Calculus: Reduction formulae, Curve Tracing, Length, Area, Surface volume, Theorem of Pappas or Guldin. Gamma function, Beta function.

UNIT-4: Differential Equations: Differential Equations of first order and its applications, Linear equation of second order, Simultaneous differential equation.

UNIT-5: Partial differential equation of first order, linear homogenous partial differential equation, Application of partial differential equation.

Books Recommended:

1-Diffrential Calculus by Gorakh Prasad.

2-Integral Calculus by Gorakh Prasad.

3-Diffrential Equation by P.N. Chattrjee.

4-Engineering Mathematics by Bali & Iyangar.

5- Engineering Mathematics by H.K. Das.

6-Higher Engineering Mathematics by B.S. Grewal.

Syllabus	SEMESTER-I						
Subject code	MEALES03	Credit: 2			SESSIONAL - TA		ESE
Subject	ENGINEERING CHEMISTRY LAB	L	T	P	IA	Total	
		0	0	3	30	30	20

List of Experiments:

Group - A:

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution.
2. To determine the Normality and Strength (g/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (N/30) solution 'B' taking KMnO4 solution as an intermediate.
3. To determine the concentration of hypo solution ($Na_2S_2O_3.5H_2O$) iodometrically with given Iodine (N/50) solution.
4. Find out the Temporary hardness of given water sample using 0.01M 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 Dibenzalpropanone.
9. {4+21 Cycloaddition Reaction: Diels-Alder reaction.
10. Preparation of Asprin dnd calculate its yield.

Group - C:

11. To calculate the λ_{max} of a given compound using UV-visible spectrophotometer.
12. To separate the metallic 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

Syllabus	SEMESTER-I						
Subject code	MEALES03	Credit: 2			SESSIONAL - TA		ESE
Subject	ENGINEERING MECHANICS LAB	L	T	P	IA	Total	
		0	0	3	30	30	20

1. Verification of Law of Parallelogram of force.
2. Verification of law of triangle of forces.
3. Verification of law of polygon of forces.
4. Verification of law of moment.
5. Practical verification of forces in the member of nib crane.
6. Practical verification of forces in the member of roof truss.
7. Determination of coefficient of friction between two given surface.
8. Determination of coefficient of wheel and axle.
9. Determination of coefficient of single purchase winch crab.
10. Determination of coefficient of double purchase winch crab.
11. Determination of coefficient of simple screw jack.

Syllabus	SEMESTER-I						
Subject code	MEALES03	Credit: 2			SESSIONAL - TA		ESE
Subject	ENGINEERING DRAWING	L	T	P	IA	Total	
		0	0	3	30	30	20

UNIT- 1: CONVENTIONAL LINES, DRAWING SHEETS – THEIR LAYOUT &PLANNING:

Technical lettering – Introduction, single stroke letters, capital and lower letters Scales – Introduction, Representative fraction, construction of scales, Types- plain & diagonal scale. Cycloid curve- Cycloid, Epicycloids & Hypocycloid, and Involutes to a plain curve. Spiral curve – Archimedean spiral and logarithmic spiral.

UNIT-2: Projection of points: Concept of quadrant system, first angle and third angle projection, projection of point in all quadrants. General procedure to draw projection of points on HP & VP. Projection of lines – Different situation of lines in spaces.

UNIT- 3: Theory of orthographic projection & projection of planes.

UNIT –4: Projection of solids & section of solids

UNIT – 5: Development of Surfaces & Isometric Projection

Recommended Text Book

1. Fundamental of Engineering Drawing – Luzzadar & Dulf, PHI

2. Engineering Drawing – N.D. Bhatt, Charottar Publishing House

3. Engineering Drawing – Arshad Siddiquee, Zahid Khan & Ahmed, PHI

4. Engineering Drawing – P.S. Gill, S.K. Kataria & Sons publishers.

SEMESTER-II

Syllabus	SEMESTER-II								
Subject code	MEBTES04	Credit: 3			SESSIONAL - TA				ESE
Subject	ENVIRONMENTAL STUDIES	L	T	P	CT	MSE	TA	Total	
		3	0	0	10	20	10	40	60

UNIT-1: Environment and ecology: Segments of environment. Concept, structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem, food chains, food webs and ecological pyramids. Types, characteristic features, structure and function of terrestrial and aquatic ecosystem.

UNIT-2: Environmental Pollution: Definition, cause, effects and control measures of Air pollution, Water pollution and Land pollution. Smog (Oxidizing & Reducing), Acid rain, Greenhouse effect, Ozone depletion, BOD, COD, Eutrophication, and Solid waste management.

UNIT-3: Green Chemistry: Introduction, Principles of green chemistry, Introduction to green solvents and green catalysis: Water, Ionic liquid, CO2, bio-catalysis.

UNIT-4: Green technologies: Photochemistry, Sonochemistry, and Microwave assisted reactions.

UNIT-5: Renewable energy resources: Solar, Wind, Hydro, Geothermal, Ocean, Fuel cells.

Books

1. G. M. Matlers, Introduction to Environmental Engg. & Sciences, Prentice Hall of India Pvt. Ltd.

2. B. J. Novel, Environmental Sciences, Printice Hall Inc.

3. A.K. De, Environmental Chemistry, New Age International (P) Ltd., 5th Ed.

4. Thomas G. Spiro, William M. Stigliani, Chemistry of the Environment, 2nd Edition Prentice Hall of India pvt. Ltd.

5. S. V. S Rana, Essential of Ecology and Environmental Sciences, 4th Edition, PHI, Learning Pvt. Ltd.

6. S.S Dara, Environmental chemistry and Pollution Control, S. Chand & Company Ltd.

7. V. K. Ahluwalia, Green Chemistry: Environmentally Benign Reactions, Ane Books India, New Delhi, 2006.

8. M. M. Srivastava, R. Sanghi, Chemistry for Green Environment, Narosa, New Delhi, 2005

9. D. P. Kothari, Rakesh Ranjan, and K. C. Saigal, Renewable Energy Sources and Emerging Technologies, Prentice Hall of India Pvt. Ltd.

10. M.C. Das & P.C. Mishra, Man & Environment, McMillan India Ltd.

Syllabus	SEMESTER-II								
Subject code	MEBTES04	Credit: 3			SESSIONAL - TA				ESE
Subject	ENGINEERING	L	T	P	CT	MSE	TA	Total	
	THERMODYNAMICS	3	1	0	10	20	10	40	60

UNIT-1: BASIC CONCEPTS AND DEFINITION: Thermodynamic System, Surrounding and Universe, Phase, Microscopic and Microscopic Point of View, Thermodynamic Equilibrium, Property, state, Path, Quasi-static Process, Reversible and Irreversible process. Heat and work- Forms of work during quasi-static or reversible process, work as a path function, Heat, various thermodynamic processes. Temperature and Zeroth law of thermodynamics, First law of thermodynamics- first law of thermodynamics undergoing cyclic process, first law of thermodynamics undergoing a process, Internal energy of a perfect gas, Application of first law to a closed system, First law of thermodynamics for flow process- flow processes and control volume, flow energy and flow work, first law of thermodynamics applied to open system, General study flow energy equation, application of study flow energy equation

UNIT-2: SECOND LAW OF THERMODYNAMICS: Limitation of first law and essence of second law, thermal reservoir, heat engine, thermal efficiency of heat engine, heat pump and co-efficient of performance, statement of second law, equivalence of Kelvin and clausius statement, types of Irreversibility, Carnot cycle, Corollary 1 & 2, Entropy -Clausius inequality, Entropy Principle, temperature and entropy diagram, application of entropy principle.

UNIT-3: PROPERTIES OF PURE SUBSTANCE: Properties of steam – types of steam, wet, saturated and superheated steam, phase transformation at constant pressure, T-s and h-s diagram, sensible heat, latent heat, superheat, internal energy, enthalpy, dryness fraction. Steam Processes – Constant volume, adiabatic, isothermal, polytropic, entropy of steam.

UNIT-4: Vapour Power cycle: Carnot vapour cycle, rankine cycle , effect of operating conditions on ranking efficiency, principle & method of increasing the thermal efficiency, deviation of actual cycle from theoretical cycle, thermal efficiencies and specific steam

Consumptions, requirement of an ideal working fluid, the reheat cycle, binary vapour cycle

UNIT-5: Gas power cycles & Boilers: Air Standard Cycle- Otto, Diesel and Dual, Comparison among cycles, Boilers, Types, Requirements of boiler, boiler efficiency, boiler mountings and accessories.

Recommend Text Books

1. Engineering Thermodynamics - P.K. Nag, TMH publisher.
2. Engineering Thermodynamics – C.P. Arora, TMH publisher.
3. Engineering Thermodynamics - Cengel, TMH, Publisher
4. Engineering Thermodynamics - Jones Dugan, PHI publisher
5. Fundamentals of Engg Thermodynamics - R. Yadav, C. P House publisher
6. Applied Thermodynamics – Onkar Singh, New Age Publishing Co.

Syllabus	SEMESTER-II								
Subject code	EEBTES05	Credit: 3			SESSIONAL - TA				ESE
Subject	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P	CT	MSE	TA	Total	
		3	1	0	10	20	10	40	60

Unit 1 - DC Networks: Kirchoff's Laws, node voltage and mesh current methods, star-delta transformation, classification of Network Elements, Superposition theorem, Thevenin and Norton-theorems, maximum power transfer theorem, only independent sources, source conversion.

Unit 2 - Single Phase AC Circuits: RMS series and parallel circuits, representation notation, series and parallel resonance. Value, average value, form factor, solution of R,L,C of impedance, phasordiagram, power in complex

Three phase AC Circuits: Delta and star connections, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasordiagram, measurement of power in three phase circuits.

Unit 3 -Magnetic Circuits: B-H Curve, solution of magnetic circuits; Hysteresis and Eddy current losses. Difference between electric and magnetic circuits, behaviour of ferromagnetic material.

Single Phase Transformers Faradays' laws of electromagnetic induction, Transformer construction, emf equations, rating, phasor diagram on no load and full load, equivalent circuit, regulation, losses, efficiency, open and short circuit tests, autotransformer.

Unit 4 - D.C. Machines: Construction, DC Generator, emf equation; DC motor and its torque equations, classification and application, characteristics and speed control of DC motors,

Unit 5 - Semiconductor Devices: V-I characteristics of P-N Junction diode, diodeparameters, equivalent circuits, zener diode, working and characteristics, applications.

Rectifiers: Analysis of half wave & full wave rectifier with resistive load, efficiency, ripple factor, filter circuits.

Suggested Text Books and References:

1. Electrical Technology by B.L.Theraja, volume 1 and 2.
2. Electrical Technology by Ian Mckenzie-Smith and Edward Hughes.
3. Basic Electrical Engineering by I.J.Nagrath (TMH)
4. Fitzrald and Higgonbothom: Basic Electrical Engineering, 5th Edition, MGH.
5. Del Torro, Vincent: Electrical Engineering Fundamentals, 2nd Edition, PHI.
6. Cotton H: Advance Technology, ISSAC Pitman, London.
7. Electronic principles: A. V. Malvino
8. Electronic Devices: Bell
9. Electronic Devices & Circuits: Sanjeev Gupta
10. Electronic Devices & Circuits: Robert. L. Boylestad

Syllabus	SEMESTER-II								
Subject code	PHBTBS03	Credit: 3			SESSIONAL - TA				ESE
Subject	ENGINEERING PHYSICS	L	T	P	CT	MSE	TA	Total	
		3	0	0	10	20	10	40	60

Unit - 1: Special Theory of Relativity

Reference frames, Concept of ether, Michelson- Morley experiment, Einstein's postulates, Lorentz Transformation, Length contraction, Time dilation, variation of mass with velocity, and Mass-Energy equivalence.

Unit - 2: Interference of Light

Introduction of Interference, Young's experiment, theory of Interference, Coherent and non-coherent sources, Fresnel's Bi-prism, Newton's ring.

Unit - 3: Diffraction of Light

Introduction of diffraction, Fresnel and Fraunhofer diffraction, resultant of n-harmonic waves, diffraction due to Plane diffraction grating.

Unit - 4: EM wave and Laser

Equation of continuity for charge conservation, Maxwell's Electromagnetic equations and their physical significance, Electromagnetic waves in free space.

Introduction, elementary idea of spontaneous and stimulated emission, active medium, population inversion, Einstein's coefficients, Applications of lasers.

Unit -5: Solid State Physics and Devices

Energy band gap of metals, insulators and semiconductors, Intrinsic and Extrinsic semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, Electrical conductivity in conductors and semiconductors, Construction, working and Applications of P-N Junction diodes and transistor.

Text Books and References

1) Engg. Physics by S. K. Srivastava and R. A. Yadav, New Age Pub. New Delhi

2) Engg. Physics by Uma Mukherjee, Narosa Publication

3) Engg. Physics by M. N. Avadhanulu, S. Chand Pub.

4) Engg. Physics by R. K. Gaur and S. L. Gupta, Dhanpat Rai Pub.

5) Electricity and Magnetism by Rangwala and Mahajan, Tata McGraw Hill, 1998

6) Concepts of Physics Part -II by H. C. Verma, Bharati Bhawan (P&D), 1998

7) Modern Physics by Beiser, McGraw Hill Inc. New York, Publication 1995

8) Modern Physics by Mani and Mehta, East-West Press Pvt. Ltd. 1998

Syllabus	SEMESTER-II								
Subject code	EMBTBS04	Credit: 3			SESSIONAL - TA				ESE
Subject	ENGINEERING MATHS-II	L	T	P	CT	MSE	TA	Total	
		3	0	0	10	20	10	40	60

UNIT-1: Linear Algebra: Vector space, Linear dependence and Linear Independence Linear transformation, Rank & Inverse by elementary transformation, System of Linear equations-inconsistency, Eigen valve and Eigen vectors, Caley-Hamilton theorem and its application to find inverse.

UNIT-2: Theory of Equations: Polynomial & Polynomial equation, Division Algorithm, roots of equations, Reminder theorem, Factor theorem, Synthetic division, Fundamental theorem of Algebra. Multiplication of roots, Reciprocal equations, Symmetric function of the roots, Descarte's Rule of sign, Cardon's Method, Ferrari's Method Descarte's Method.

UNIT-3: Vector Calculus: Vector functions, Differentiation of vectors, Velocity and acceleration, Scalar and vector field, Gradient of Scalar field, Directional derivative, properties of gradient, Divergence of vector, Point Function, curl of vector point function, properties of divergence and curl, Integration of vector function, Line integral, Surface Integral, Green, Gauss theorem and Stoke's theorem (without proof) and their simple applications.

UNIT-4: Complex Number : Complex number and its properties, conjugate complex number, Standard form of complex number, De Moivre's theorem, Roots of complex number, Exponential function of complex variable, Circular function of complex variable, Hyperbolic function of complex number, Logarthim of complex number C + iS method of summation.

UNIT-5: Sequence, Convergent, Divergent, Oscillating sequence, Infinite series, Ratio test, Root test, Comparison test, Raabe's Logarithmic test, Couchy's Root test, Gauss's Test, Leibnitz Test Conditionally convergant.

Book Recommended:

1. Engineering Mathematics by H. K. Das
2. Engineering Mathematics by Bali & Iyengar
3. Higher Engineering Mathematics by B. S. Grewal

Syllabus	SEMESTER-II						
Subject code	EEBLES05	Credit: 2			SESSIONAL - TA		ESE
Subject	BASIC ELECTRICAL & ELECTRONICS ENGG. LAB	L	T	P	IA	Total	
		0	0	3	30	30	20

List of Laboratory Experiments:

1. To verify OHM's Law
2. To verify Kirchoff's Current Law
3. To verify Kirchoff's Voltage Law
4. To Verify Superposition Theorem
5. To Verify Maximum Power Transfer Theorem
6. To verify Thevenin's Theorem
7. To verify Nofton's Theorem
8. To find V-I Characteristics of incandescent lamp.
9. To find out R, L, C and power factor in series R-L-C Circuit.
10. To Measure Phase, Line quantities and Three Phase power in Star & delta connected Load
1 1. To perform OC & SC Test in single phase transformer.
12. To perform Load Test in Single Phase Transformer
13. To Perform Polarity Test in Single Phase Transformer
14. To Study Three Phase Squirrel Cage induction motor
15. Full & Half wave rectifiers

List of books for laboratory:

1. Laboratory courses in Electrical Engg: Tarnekar, Kharbanda, Bodkhe & Naik.
2. A text book of practicals in Electrical Engg: Dr. N.K.Jain

Syllabus	SEMESTER-II						
Subject code	PHBLBS03	Credit: 2			SESSIONAL - TA		ESE
Subject	ENGINEERING PHYSICS LAB	L	T	P	IA	Total	
		0	0	3	30	30	20

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 wavelength of sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating.
5. To demonstrate the diffraction pattern and determine the wavelength of different colours of mercury light using diffraction grating.
6. To determine the wavelength and number of lines per cm on a diffraction grating using semiconductor laser diode.
7. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
8. To determine the Energy band gap (Eg) of a semiconductor material using P-N junction diode.
9. To determine the e/m ratio by Thomson's method
10. To study the P-N junction diode characteristics, in forwarded and reverse bias conditions.
11. To study the Zener diode characteristics.
12. To study the characteristics and gain of Transistor in C-B and C-E mode.
13. To study the FET characteristics and determine different parameters.
14. To study the MOSFET characteristics

Text Books and References

1. Engg. Physics Practical by M. N. Avadhanulu, S. Chand Pub.
2. Unified Practical Physics by R. P. Goyal
3. Engg. Physics Practical by Ruby Das et al.
4. Engg. Physics Theory & Experiments by S. K. Srivatava, New Age International

INSTITUTE OF TECHNOLOGY

GURU GHASIDAS VISHWAVIDHALAYA

(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING

STUDY & EVALUATION SCHEME

W.E.F. SESSION 2016-2017

Year: B.Tech. II year

SEMESTER-III

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP3THS..	Elective-HS3	3	0	0	40	60	100	3
2.	IP3TBS01	Statistical Methods	3	1	-	40	60	100	4
3.	IP3TES11	Strength of Materials	3	1	0	40	60	100	4
4.	IP3TES12	Materials Science and Metallurgy	3	0	0	40	60	100	3
5.	IP3TPC11	Theory of Machine	3	0	0	40	60	100	3
6	IP3TPC12	Manufacturing Processes-I	3	0	0	40	60	100	3
Total			18	02	0	240	360	600	20
PRACTICALS									
1.	IP3LPC11	Theory of Machine	-	-	03	45	30	75	2
2.	IP3LES12	Strength of Materials	-	-	03	45	30	75	2
Total					06	90	60	150	04

Elective-Humanities Science (HS)	
S.N.	**IP3THS...**
11.	Engineering Economics
12.	Work Study and Ergonomics

IP3THS11 ENGINEERING ECONOMICS (Elective)

Unit 1: Basic Concepts and Definitions, Methodology of Economics, Demand and Supply – elasticity,Theory of the Firm and Market Structure, Price and output determinations in different types of market

Unit 2: Public Sector Economics –Welfare economics, Central and commercial ~~marks~~ Banks and their functions, Industrial policies, theory of localization, weber &surgent Florence theory, investment analysis-NPV, ROI, IRR, Payback period, SWOT analysis.

Unit 3: Monetary and Fiscal Policy;Tools, impact on the economy , Inflation, Business Cycle, Cash Flow-2,3,4 Model.

Unit 4: Business Forecasting – Elementary techniques. Cost and Revenue Analysis, Capital Budget, Break Even Analysis.

Unit5: Indian economy; Urbanization, Unemployment–Poverty, Regional Disparities, Unorganized Sectors- Role of Plans, Reforms-Post Independent period.

Text Books:

1. Mankiw Gregory N.(2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. PareekSaroj (2003), Textbook of Business Economics, Sunrise Publishers

Recommended Books:

1.Kapila U. Indian economy since Independence. Academic Foundation, New Delhi
2.Misra, S. K. and Puri V. K. Indian Economy — Its Development Experience. Himalaya
3.Publishing House, Mumbai
4.Dutt R. and Sundharam K. P. M. Indian Economy. S. Chand & Company Ltd., New Delhi.
5.Mathur R. Indian Economic Policy and Reform. RBSA Publisher, Jaipur
6.Jalan B. Indian Economic Policy. Penguin Books Ltd
7.Government of India, Economic Survey (Annual), Economic Division, Ministry of Finance, New Delhi.

IP3THS12 WORK STUDY AND ERGONOMICS (Elective)

Unit I

Introduction to man machine systems and ergonomics, Human factors in design and engineering, Needs 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 collection, data reduction and analysis techniques, Gross human anatomy, Anthropometry, Bio mechanics, muscle strength and exertion potential of different limbs.

Unit III

Workcapacity, Environmental effects, exercises for evaluation of pastural form and work spaces, Environmental conditions including temperature, illumination, noise and vibration.

Unit IV

Perception and information processing, design of displays, hand control, typography, and readability, layout and composition.

Unit V

Exercises in evaluation of human response toproduct interface, product safety and product liability, Design consideration for appearance, colour, texture andforms.

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***, Cambium Press.

IP3THS13 EMPLOYEE RELATIONS (Elective)

UNIT-I

Conceptual framework of employment relations: Concept, Scope and Approaches to Industrial Relations,Evolution of Industrial Relations and Current Developments,Constitutional and Legal Framework of Industrial Relations :Conventions, ID Act, Trade Union Act

UNIT-II

Trade unionism: Trade Union Development and Functions,Trade Union Structure and Recognition,Managing Trade Unions,Managerial Unionism,Employers' Organisations

UNIT-III

Collective bargaining: Nature and Content of Collective Bargaining,Negotiation Skills,Issues and Trends in Collective Bargaining

UNIT- IV

Employee Involvement: Evolution, Structure and Process,Design and Dynamics of Participative Forums,Strategies for Implementing Participation

UNIT-V

Grievance Handling And Discipline: Grievance Function in Industrial Relations,Conciliation, Arbitration and Adjudication,Discipline in Industry

Recommended Books:

1. Employee Relations Management, Singh P. N. , Pearson Education India
2. Personnel Management Theory And Practice, 3 Vols. Set, Arun Kumar, Rachana Sharma, Atlantic Publishers & Distri
3. Industrial Relations And Personnel Management, Simon A George M V Pylee, Vikas Publishing House Pvt Ltd

IP3TBS01 STATISTICAL METHODS

UNIT-I

Introduction to statistics , mathematical statistics , variable , frequency distribution , exclusive and inclusive class intervals type of series graphical representation histogram frequency polygon give measure of central tendency variation type of average, Mean median mode for grouped and un grouped data , geometric mean , harmonic mean , measure of description Skewness and Kurtosis.

UNIT- II

curve fitting and Method of least square – straight line parabola correlation – scatter cliagrem's Karl Pearson's coefficient of correlation. Limits for correlation coefficient. Coefficient of correlation for bivariate frequency distribution, rank correction. Regression linear regression, Equation to the line of Regression. Regression coefficient, Angle between two lines of Regression

UNIT- III

Theory of Probability – Mathematical and statistical definition of probability Sample space. finite sample space sample point, Events Theorem of total probability. Sample and compound event. Conditional probability. Theorem of compound probability. Boy's theorem. Use of binomial theorem.

UNIT- IV

Theoretically Distribution – Binomial Distribution Mean, Standard deviation and Pearson's β and γ coefficient. Poisson distribution, mean, variance normal Distribution.

Unit V Random and simple sampling – mean and standard deviation in simple sampling of attribute test of significance for large sample test of significance based on Chi square, T, F, and Z Distribution Degree of freedom, condition for applying

UNIT- V

Simulation Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte Carlo simulation, simulation of Inventory system, simulation of Queuing system.

Recommended Books:

1. Mathematical Statistics by M. Ray
2. S. C. Gupta and Kapoor – Fundamental of Mathematical Statistic
3. A.A. AFFI – Statistic Analysis
4. Probability & Statistics by Biswal, PHI

IP3TES11 STRENGTH OF MATERIAL

UNIT-I

Simple stresses and strains: Concept of stress and strain: principle of stress and strain diagram, Hooke's law, Young's modulus, Poisson ratio, stress at a point, stresses and strains in bars subjected to axial loading, Modulus of elasticity, Relationship between elastic constants, stress produced in compound bars subjected to axial loading, Temperature stress and strain calculations due to applications of axial loads and variation of temperature in single and compound walls.

Compound stresses and strains: Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr's circle of stress and strain, Two dimensional stress-strain system, principal strains.

UNIT-II

Bending moment and shear force diagrams: Bending moment and shear force diagrams, S F and B M diagram for different types of loading under different conditions with problems.

Theory of bending stresses: Assumptions in the simple bending theory, derivation of formula: itsapplication to beams of rectangular, circular and channel sections, composite/fletched beams, bending and shear stresses in composite beams.

UNIT-III

Slope and Deflection of beams: Definition, double integration, area moment method, Macaulay's methods,Conjugate beam,method of Superposition.

Strain energy: Resilience stress due to suddenly applied loads,Castigliano's theorem, Maxwell's theorem of reciprocal deflection.

UNIT-IV

Torsion: Derivation of torsion equation and its assumptions. Applications of the equation of thehollow and solid circular shafts, torsional rigidity.

Close-coiled-helical springs: Analysis and derivation of expression of closed coil helical spring and their problems.

Columns and struts: Columns under uni- axial load, Buckling of Columns, Slenderness ratio andconditions. Derivations of Euler's formula for elastic buckling load, equivalent length, Rankine Gordon's empirical formula.

UNIT-V

Thin pressure vessel: Derivation of formulae and calculations of hoop stress longitudinalstress in a cylinder, and sphere subjected to internal pressures increase in Diameter and volume.

Theories of Failure: Various theories with problems.

Recommended Books:

1. Pytel A H and Singer F L, *"Strength of Materials"*, 4th Edition, Harper Collins, New Delhi.
2. Beer P F 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 Dlehi.
5. Jindal U C, *"Introduction to Strength of Materials"*, 3rd Edition, Galgotia Publishing Private Limited New Delhi.

6. Strength of materials Ryder,G.H.,
7. Elements of Strength of material Timoshenko, East West press
8. Mechanics of solids, Popov, PHI Publications

IP3TES12 MATERIAL SCIENCE AND METALLURGY

UNIT-I

Introduction: Classification of engineering Materials, metals, non metals, plastics, ceramics and composites. Crystalline structure of solids: concepts of unit cell and space lattice, miller indices, crystal structure determination by X-ray diffraction. Crystal structure of ferrous and non-ferrous metals, crystal imperfections.

Plastic Deformation: Mechanisms of plastic deformation, role of dislocation, slip and twinning,

slip mechanism, strain hardening.

UNIT II

Phase Diagrams, Phases, phase rules, concept of equilibrium, Phase diagram, lever rule, eutectic, eutectoid, peristaltic and peritectoid systems, iron–carbon diagram, and simplified IC diagram. Heat Treatment Isothermal Transformation of austenite(TTT diagram), Transformations of austenite upon continuous cooling, annealing, normalizing, hardening, tempering, hardenability of steel, Surface hardening, tempering, case hardening, Jominy test for hardenability, recovery, recrystallization and grain growth, Age hardening.

UNIT III

Corrosion: Principles of corrosion forms of corrosion, factors affecting the rate of corrosion. Corrosive agents and protection against corrosion.

Creep: Introduction to creep mechanism, creep curves,creep resistant materials, introduction to

fatigue, cold working of metals and hot working.

UNIT IV

Engineering Materials

Ferrous: Cast irons, carbon and alloy steels and their coding

Non-ferrous: Aluminum, copper, nickel, chromium, zinc, lead, tin, tungsten, etc. and their alloys.

Classification, structure, general properties and applications of polymers, ceramics and composites.

UNIT V

Powder Metallurgy: Characteristics of metal powder, Particle size, shape and size distribution, Characteristics of powder mass such as apparent density, tap density, flow rate, friction conditions. Properties of green compacts and sintered compacts.

Machining, milling, atomization, electro-deposition, reduction from oxide, carbonyl process, production of alloy powders, New development.

Powder rolling, powder forging, powder extrusion and explosive forming technique.

Recommended Books:

1 Raghavan. Material Science and Engineering.

2. Swamp. Elements of Metallurgy

3. Vanvlack, Elements of Material Science and Engineering.

4. Aagarwal, B.K Introduction to engineering Materials

IP3TPC11 THEORY OF MACHINE

UNIT- I

Basic Concepts: Kinematics of machine, Kinematic link and their different types, types ofkinematic pair, kinematic chain, mechanism and inversions of four bar chain and slider crank mechanism. Degree of freedom, synthesis of linkages – number synthesis, Grashof's criterion and introduction to dimensional synthesis. Brief introduction to mechanism with lower pairs, pantograph, devis & Ackerman'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, rubbing velocity at a pin joint, velocity of a point on a link by instantaneous center method, properties and types of I-Center, 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, formsof teeth, construction and properties of an involute, construction and properties of cycloidal teeth, 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, undercutting, terminology of helical and worm gears.

UNIT- III

Gear Trains: Definition of simple, compound, reverted and epicyclic gear trains, velocity ratio ofepicyclic 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, Walt, porter proell, hartnell governor.

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

Recommended Books:

1. Bevan T, "*The Theory of Machines*", CBS Publishers and Distributors.
2. Shigley J E and Vickar J J, *"Theory of Machines and Mechanism"*, . McGraw Hill, New Delhi.
3. Wilson C and Sadler J, *"Kinematics and Dynamics of Machine"*, . Prentice Hall.
4. Ratan S S, *"Theory of Machines"*, 1st Edition, Tata McGraw Hill, New Delhi.
5. Rao J S and Dukkipati R V, *"Mechanism and Machine Theory"*, . New Age International (P) Limited, Delhi.
6. Mechanisms & machines by Ghosh and Mallick, East west Press
7. Theory of machine by Rattan lal T.M.G.H. Publications

IP3TPC12 MANUFACTURING PROCESSES-I

UNIT-I

Lathe: Lathe design and terminology Specification, types of Lathe: center 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, indexing and types, calculation of MRR.
Boring: Introduction to boring, reaming, tapping and taps, other hole making operations.

UNIT-II

Broaching: Introduction, Machines and processes.
Grinding: Classify grinding machines,constructional 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, theories of Hot & Cold rolling, rolling mills & its types, two-hi, four-hi, six-hi and twenty-hi rolling mill, calculation of rolling parameter.& 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, economic 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. Vanvlack, Elements of Material Science and Engineering.
4. Aagarwal, B.K Introduction to engineering Materials.

IP3LPC11 THEORY OF MACHINE LABORATORY

1. Study of Gyroscopic effect and determination of gyroscopic couple.
2. Determination of jump sped of cam-follower system.
3. Dynamic balancing of the rotating mass system.
4. To determine radius of Gyration "K" of given pendulum.
5. To study the free vibration and to determine the natural frequency of vibration of Tow-Rotor system. 6. To study the torsional vibration and to determine the natural frequency vibration of single rotor system.
6. Study of longitudinal vibration and to determine the frequency of vibration.
7. To study the damped torsional vibration and determine the damping coefficient.
8. To verify the relation $T = 2 \Pi \sqrt{1/g}$ for a simple pendulum.
9. Determination of whirling speed of shafts.

IP3LES11 STRENGTH OF MATERIALS LABORATORY

1. Determination of Young's modulus, tensile, strength and percentage elongation for steel, aluminum, brass and cast iron specimens on universal testing machine. Also plot the stress strain diagram.
2. To perform the compression test for cast iron specimen on universal testing machine.
3. To determine the deflection for mild steel specimen and verify the beam formula for specimen in bending.
4. To determine the stiffness of the following:
   (i)Cantilever beam (ii) Spring under compressive and tensile loading
5. To measure the total energy absorbed in fracturing of the ductile specimen on Charpy and Izod setup.
6. To plot and study the S-N curve for steel, aluminum and fibre reinforced composite material at 25%, 50%, 60% and 75% of ultimate tensile strength of the specimen.
7. Preparation of specimen for hardness test.
8. Testing of prepared specimens for Brinell hardness and Rockwell hardness.
9. To study the behavior of steel and aluminum specimen under torsion.

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DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
STUDY & EVALUATION SCHEME
W.E.F. SESSION 2016-2017

Year: B.Tech. II year
SEMESTER-IV

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP4TPE1..	Elective-PE-1	3	0	0	40	60	100	3
2	IP4TBS02	Numerical Analysis and Computer Programming	3	1	0	40	60	100	4
3	IP4TPC21	Machine Drawing	3	0	0	40	60	100	3
4	IP4TPC22	Industrial Engineering	3	0	0	40	60	100	3
5	IP4TPC23	Manufacturing Processes-II	3	0	0	40	60	100	3
6	IP4TPC24	Fluid Mechanics	3	1	0	40	60	100	4
Total			18	02		240	360	600	20

PRACTICALS									
1.	IP4LPC21	NACP	-	-	03	45	30	75	2
2.	IP4LPC24	Fluid Mechanics	-	-	03	45	30	75	2
Total					06	90	60	150	04

Elective-Professional Elective (PE)-1	
S.N.	IP4TPE1..
11.	Occupational Health and Safety
12.	Business communication and presentation skill
13.	Business ethics and corporate governance

IP4TBS02 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 polynomials and transcendental equations by Graphical methods and Bisection, Regula-falsi, secant and Newton-Raphon methods, solution of Linear simultaneous, linear algebraic equations by gauss Elimination Gauss-Jordan and Gauss-Siedel iteration method.

UNIT-II

Empirical Laws, Curve Fitting & Interpolation

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

UNIT-III

Numerical Solution of Ordinary Differential Equations

Numerical Integration by Trapezoidal rule, Simpson's ($1/3^{rd}$ & $3/8^{th}$) rule and its error estimation. Application of difference relations in 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

I/O Statement, Mathematical Relational & Conditional statement & Expressions. Switch Loops and Control Statement. Introduction to one dimensional array and two dimensional arrays. Basic of I/O file Handling.

Recommended Books:

1. Numerical Methods in Engineering & Science-Dr. B.S.Grewal-Khanna Publishers.
2. Numerical Methods-P.Kandasamy,K.Thilagavathy & K. Gunavathy-S.Chand & Co.
3. Let us C-Yashwant kanitkar
4. Introductory Methods of Numerical Analyisi-S.S.Sastry,3^{rd} Edn.-PHI-New Delhi.
5. Numerical Methods Analysis-James B.Scarborough, Oxford & IBH Publishing Co.-New Delhi.
6. Theory & Problem in Numerical Methods-T Veerarajan,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.

IP4TPC21 MACHINE DRAWING

Unit- I

Drawing conventions, sectional views and sectioning, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings springs, Convention of gears in mesh, representation of geometrical tolerances on drawings.

Unit-II

Rivet heads and riveted joints: Lap and butt joint with single and double straps.
Welding joints and their representation, symbols of different joint.
Machining symbols, Surface roughness, grades , material symbols.

Unit- III

Screw thread and screw fastening, different types of thread profile and nuts, bolts.
Sectional views: keys, cotter joints, knuckle joints
Shaft coupling, flanged coupling, different types of shaft coupling.
Shaft bearing, bushed bearing, plumber block, foot step bearing.
Pulleys: fast & loose pulleys, stepped pulley's belt pulley, rope pulley.

Unit-IV

Assembly drawing of Engine parts like piston, stuffing box, cross-heads, eccentrics, connecting rod:
Assembly drawing of stop valve, feed check valve, safely valve, blow off cock.
Assembly drawing of lathe tail stock post.

Unit- V

Concept of computer aided drafting(CAD), implementation of CAD, atleast five projects from the above specified topics using CAD software.

Recommended Books:

1. Shigley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machine Design.

IP4TPC22 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 Gilberth and their contribution.

Unit-II Method Study

Definition & basic procedure, selection of jobs, recording technique; 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; Simo 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 studied; determination of standard time; predetermined motion time systems. Conducting work sampling study & establishing standard time.

Unit-IV Wages & Incentives

Characteristics of a good wage or incentive system, method of wage payment. Concept of wage incentive schemes; financial and non financial; Taylor differential piece rate, Halsey premium plane; Merric's multiple piece rate system. Group incentive scheme.

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

Unit-V

Value engineering: Introduction, concept of value, value analysis approaches, job plan, value tests.
Industrial safety, analysis of cost of accident, horzards in various fields like fire, electrical shocks, chemical, organization for safety, plant safety, govt. legistion for safety, safety rules.

Recommended Books:

1. I.L.O., "Introduction to work study", Oxford Press.
2. Mundel, "Motion and time study", Prentices 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

IP4TPC23 MANUFACTURING PROCESSES-II

UNIT -I

Foundry:

Molding method and materials, Sand-clay-water system, Additives, pattern making and types, Pattern allowances & design considerations, types of molding sand & their properties, testing, cores and sand core boxes, core making, molding machine, Elements & design of gating system.

Melting furnaces and practices: Melting cast iron, steel and non ferrous material, cupola, charge calculation, open furnaces, converter and crucible furnaces, electric, direct arc furnace, inductive furnace.

UNIT -II

Casting: Introdution to pattern and its types, allowances, Centrifugal and investment casting, shell, plastic and mould methods, melting of cast iron, element of gating system, types and design of riser, solidification of casting, clearing of casting, principle of die casting, gravity and pressure die Casting, Die casting consideration, casting defects.

UNIT –III

Welding: Classifications, principle and equipments, different type of welding process and their equipments, features, Arc Welding, Resistance welding, TIG, MIG, Submerged arc welding, friction welding, soldering, brazing and adhesive bonding, Welding defects.

UNIT -IV

Sheet –metal working: Role of sheet metal components, Cutting mechanism, Description of cutting processes like blanking, piercing, lancing etc. Description of forming processes like bending cup drawing, coining, embossing etc, Basic elements of Presses for sheet metal working. Part feeding systems, Punch and die clearances, die elements.

UNIT –V

Non-conventinal machining: Introduction, Classification and comparison of different non-conventional

machining, theory and analysis, basics, and MRR of EDM, ECM, LBM, AJM, ECG, EBM.

Recommended Books:

1. Rao, P.N., Manufacturing Technology vol.1 TMGH
2. Ghose and Mallick, Manufacturing Science, East West Press
3. Roy, A. Lindberg ,Material and Process of manufacturing, PHI
4. Serope Kalpakjian , Manufacturing Engineering & Technology, Pearson.

IP4TPC24 FLUID MECHANICS

Unit-I

Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume
and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. FluidStatic's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forceson plane and curved surfaces (Problems on gravity dams and tainter gates); buoyant force, Stability of floatingand submerged bodies, Relative equilibrium.

Unit-II

Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two
and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets their utility & method of drawing flow nets.

Unit-III

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes andother applications.

Flow Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.), flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venture-meter, weirs and notches).

Unit-IV

Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use
of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations(submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.).

Unit-V

Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

Turbulent Flow: Basics of turbulence, Reynolds stresses, Prandtl's mixing length hypothesis, friction velocity, law of walls.

Recommended Books:

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
6. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI
8. Gupta; Fluid Mechanics; Pearson.

IP4TPE11 OCCUPATIONAL HEALTH AND SAFETY (Elective)

UNIT-I

Introduction: Environmental law: Legal control of Hazardous substances and processes,Environmental Issues and judicial trends. Health and safety law, common liabilities andwork place 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 policy, Investigation reporting and recording of accidents, Health and safety monitoring. Comprehensive exposure assessment, Principles of evaluating workers exposure, Risk assessment in the work place, Majorincidents and procedures, Health and safety training and communication, the cost ofaccidents. Principles of accident prevention, safe system of work, Surveys and audits.

UNIT-III

Occupational Health and Hygiene: The organization of working environment, temperature, lighting and ventilation, welfare amenity provision, cleaning and hygiene. Toxicology and health, Occupational disease and conditions: Occupational Audiometry, NIHL, Cardiovascular Disease, 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, stress, safety technology.

UNIT-IV

Assessment of Exposure: Measurement of noise and vibration exposure. Noise and vibration andcontrol, Heat stress monitoring, dust exposure and respiratory health. Work Posture, Musculoskeletal disorders, Strain Index, Lifting Equation, Maximum acceptable weight limits, Occupational Audiometry. Cardiovascular health, Occupational determinants of heart rate variability, pulmonary functions and respiratory health

UNIT-V

Government schemes and norms related to health and nourishment, Policies of government in special context to Chhattisgarh state

Recommended Books:

1. Jeremy W. Stranks, "Handbook of Health and safety Practice" Pitman Publishing.
2. Dharmendra S Sengar, " Environmental law" Prentice Hall of India, New Delhi.
3. Malcolm J Crocker, "Noise and Noise Control" CRC Press.
4. Marek Malik, " Clinical Guide to cardiac Autonomic Tests" Kulwer Academic Publishers.
5. Marek Malik,"Hear rate variability" Futura Publishing Co. NY
6. Cyril M Harris, "Handbook of Noise control" McGraw-Hill Book Company, NY
7. Maryanne Maltby, "Occupational Audiometry" Butterworth-Heinemann Immprint of Elsevier.

IP4TPE12 BUSINESS COMMUNICATION AND PRESENTATION SKILL (Elective)

Unit- I

Business communication covering, Role of communication in information age; concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication and sola

Unit -II

Style and organization in technical communication covering, Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report

Unit -III

Communication and personality development covering, Psychological aspects of communication, cognition as a part of communication; Emotional Intelligence; Politeness and
Etiquette in communication; Cultural factors that influence communication; Mannerisms 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 covering, 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 to suit theaudience and context; 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. Farhathullah, T. M. *Communication skills for Technical Students*
6. Michael Muckian, John Woods, *The Business letters Handbook*
7. Herta A. Murphy, *Effective Business Communication*
8. *MLA Handbook for Writers of Research Papers*

IP4TPE13 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 conflict of interest, property rights theory, nexus of contracts, agency theory, Berle and Means' theory, concept of separation of ownership and control, shareholder, stakeholder debate.

UNIT-III

Pillars of Governance in Organizations: Owners, ownership structure, types of owners, ownership vs. control, board of directors, types of directors, board roles and board attributes, board committees, executive management,role of CEO, succession planning, managerial myopia, institutionalinvestors, types, categories, features and role.

UNIT-IV

Work Ethos: Values and ethics, model of management in the Indian socio, political environment, need for values in global change, Indian perspective, values for managers, holistic approach for managers in decision making.

UNIT-V

Business Ethics and CSR: Corporation as a social institution, accountability and sustainability, relevance of triple bottom line reporting to CSR, codes of conduct, applications of ethical theories to decision making, ethical issues related to employment, healthcare and advertisement.

Recommended Books:

1.Praveen B. Malla, Corporate Governance: Concept, Evolution and India Story, Routledge, 2010.

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

3. Robert Monks, Nell Minow, Corporate Governance, Wiley Publications, 2009.

IP4LPC21 Machine Drawing

List of Experiments:

1. Introduction to Compute Aided Drafting software for 2D and 3D Modeling
2. Computer Aided Drafting of simple machine parts
3. 3D Modeling of simple solid shapes
4. Design and drawing of parts contained in the syllabus

IP4LPC24 FLUID MECHANICS- LAB

List of Experiment (Expandable):

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of meta-centric height
8. Determination of Friction Factor of a pipe
9. To study the characteristics of a centrifugal pump.
10. Verification of Impulse momentum principle.

INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)
DEPARTMENT OF INDUSTRIAL &PRODUCTION ENGINEERING
STUDY & EVALUATION SCHEME
W.E.F. SESSION 2017-2018
Year: B.Tech. III year

SEMESTER-V

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP5TPC31	Metal Cutting	3	0	0	40	60	100	3
2	IP5TPC32	Fluid Machinery	3	0	0	40	60	100	3
3	IP5TPC33	Machine Design- I	3	0	0	40	60	100	3
4	IP5TPE2..	Elective-PE2	3	0	0	40	60	100	3
5	IP5TPE3..	Elective-PE3	3	0	0	40	60	100	3
6	IP5TOE1..	Elective-OE1	3	0	0	40	60	100	3
Total			18	0		240	360	600	18
PRACTICALS									
7.	**IP5LPC31**	Metal Cutting	-	-	03	30	20	50	2
8.	**IP5LPC32**	Fluid Machinery	-	-	03	30	20	50	2
9.	**IP5LPC33**	SEMINAR			03	50		50	2
Total					09	110	40	150	06

Elective-Professional Elective (PE)-2		Elective-Professional Elective (PE)-3		Elective- Open Elective (OE)-1	
S.N.	**IP5TPE…**	**S.N.**	**IP5TPE…**	**S.N.**	**IP5TOE…**
21.	Turbo Machines	31.	Total Quality Management	11.	Financial Management
22.	I.C. Engine	32.	Industrial Automation	12.	Managerial Economics
23.	MEMS and Nanotechnology	33.	Mechatronics	13.	Financial Accounting and Costing

Dalbir Singh Rekhi 22/05/17

UNIT-I

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

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

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, stresses and strain in chips, shear and strain rate, power and energy calculation.

Theory of multipoint machining- mechanism of drilling, machining time, 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. tool dynamometer and their types and working.

Cutting fluids- functions characteristics and types of cutting fluids and their application, 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, toll life and 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 step type chip breakers. Working principal of chip breakers, effect of chip breaking.

UNIT-V

Machinability -definations ,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 PHI
2. Manufacturing Science, Ghosh Mallick, E.W.P.

4. Production Technology- Degarmo, P.H.I.
5. Text Book of Production Engineering- K.C. Jain & Chitale, P.H.I.
6. Machining & M/C Tools- A.B.Chattopodhyay- Willey

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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 of 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 Ship.

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, Component 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 Kothandraman & Rudra Mourthy,New Age Publication.

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5. Experiment in Hydraulics & Hydraulic M/C- Shesha Prakash- PHI
6. Fluid Mechanics & Turbo M/C- Das- PHI
7. Fundamentals of Turbo M/C- Venkanna- PHI
8. Introduction to Hydraulics & Pneumatics- Ilargo & Soundarajan- PHI

IP51PC33 - Machine Design-I

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, direct, bending and torsional stress equation, impact and shock loading, calculation of principle stresses for various load combination, eccentric loading, design of curved beams, crane hook and 'c' 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 join, strength and efficiency of riveted joint. Design of butt and lap joint for a boiler, 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 Gib 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.Shigley, TMH
4. Machine Design: Khurmi & Gupta, Khanna Publisher.
5. M/C Design- Sharma & Agrawal, Dhanpat Rai Publications.
6. Design of M/C Elements- Sharma & Purohit- PHI

IP5TPE21 - Turbo Machinery

UNIT-I

Nozzles & Diffuser: Nozzles & Diffuser types, their efficiency, critical pressure & velocity, relationship between area, velocity & pressure in nozzles 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 turbine: Force on the blade and work done, blade or diagram efficiency, gross stage efficiency, influence of ration 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 diagram, degree of reaction, Impulse-Reaction turbines with similar blade section 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

State points Locus & Reheat factors: Factor-stage, efficiency of impulse turbine, stage point locus of an impulse turbine, state point locus for multistage turbine reheat factor. Internal efficiency, overall efficiency, relative efficiency, Design procedures of impulse & impulse 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 inter cooling and effect of these modification on efficiency and output, closed cycle gas turbine.

UNIT –V

Turbo compressors: Introduction, classification of Centrifugal Compressor- Component 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 compressor.

t 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. Ganeshan – TMH.
4. Fundamentals of Turbo Machinery- Venkanna, PHI.

IP5TPE22 - 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, application of IC engines.

Air Standard Cycle: Otto cycle, diesel cycle, dual cycle, comparison between otto, diesel and dual cycles, fuel-air cycles 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, preignition, knocking in S.I. engines, variables affecting knock, combustion chambers.

Carburetor: Principle of carburetion, elements of carburetor, parameters affecting carburetion, air-fuel mixtures, expression 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 timings, physical and chemical aspect of detonation, effect of engine and fuel variable on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., Action of dopes, pre-ignition, its causes and remedy, salient features 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 effecting engine friction, mechanism of lubrication, lubrication system.

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

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

IT- V

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

Engine friction and lubrication, Engine cooling system.

Text Books:

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

IP5TPE23 - 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, MOEMS, MEMS design consideration.

Micromachining, photolithography, structural and sacrificial materials, methods of lithography. Thin film deposition, and its developments process, LPCVD, PECVD, impurity doping , etching ,problem with bulk micromachining, vapour bonding, LIGA.

UNIT- II

System modelling and properties of material- System types and basic modelling elements in mechanical, thermal, fluid system. Translational and rotational pure mechanical system, hybrid system, analogy between mechanical and electrical system.

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

UNIT- III

Mechanical sensors and actuators- Introduction, principals, micro plates, capacity impacts, piezoelectric materials, and their properties, MEMS gyroscope.

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

UNIT- IV

Magnetic sensors and actuators- Different types and principals.

RF MEMS –Introduction, RF based communication system, MEMS inductors, and tuner filter, Resonator.

UNIT-V

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

Text Books:

1. MEMS- Mahalik- McGrawHill.
2. MEMS & MOEMS Technology & Application- Rai Choudhary, PHI.

IP5TPE31 - 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 attribution 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.

Acceptances Sampling: Concept of sampling, O-C curve & its construction, Sampling plans, single, doubles & multiple sampling plans.

UNIT - III

Contribution of Various Quality Management Gurus: Juran Triology, Deming's 14 Points, P-D-C-A Wheel, Taguchi's philosophy, Design of experiment, old and new Seven QC Tool of Quality, Philip Crosby's zero defect, seven types of waste, 5's, 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-technique.

Text Books:

1. SQC by Grant & Leowowworth - Tata Mc. Hill
2. Quality Planning & Analysis by Juran & Gryana - Tata Mc. Hill
3. Total Quality Control By A. Feigenbaum - Mcgraw Hill
4. SQC by M.Mahajan – Dhanpat rai publication
5. Total Quality Management – Besterfield Tata Mc. Hill
6. Total Quality Management – Purnima charantimath (LowPearson Education)
7. Total Quality Management – Krishnaiya-PHI
8. Total Quality Management – Suganthi & Sannuel-PHI

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IP5TPE32 - 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 Oil 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 equations using Karnaugh Maps.

UNIT –IV

Microprocessors and Microcontrollers (Only basic understanding and applications) : Concept of Microprocessor based control and its application; 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- Mikel P. Grover, PHI
2. Automation Production System and CIM- Mikel P. Grover, PHI

IP5TPE33 - Mechatronics

UNIT-I

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

UNIT-II

Introduction to Mechatronics Systems: Measurement systems control systems 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 convertors 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 system, engine, management system.

Text Books:

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

IP5TOE11 - Financial Management

UNIT –I

Introduction: Scope and objective, organisation of finance function, Time value risk and return and valuation of money, 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

3. Financial Management by Kuchhal, Vikas Publication
4. Financial Management- Paresh Shah-Willey India Pvt. Ltd.

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IP5TOE12 - 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, ACMS Production Function, Investment Function.

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 Problem) - Managerial Significance and Limitation of BEA.

UNIT-III

Introduction to Market & Pricing Policies: Element of Market , Types of Market, Concept of Market, Classification of Market based on the nature of competition, Types of Competition, Features of Perfect Competition, Feature 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 Element 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 Organization, Public Sector Organization.
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 Account, Trading Account, Profit and Loss Accounts and Balance Sheet.

nancial Analysis Through Ratios: Classification of Financial Ratios, Liquidity Ratios, Leverage 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 Yogesh Maheshwari, PHI
2. Managerial Economics By Joel Dean, PHI
3. Managerial Economics By Craig H. Petersen, W. Cris Lewis, Sudhir K Jain
4 Financial Accounting For Management By Ambrish Gupta, Pearson Eduction
5 Managerial Economics By H. Craig Peterson & W. Cris Lewis, PHI
6 Managerial Economics By Suma Damodaran, Oxford University Press
7 Managerial Economics and Financial Analysis By Aryasri, TMH

IP5TOE13 - Financial Accounting and Costing

UNIT-I

Financial Accounting: Introduction to Book keeping, Double-entry accounting, Journal & Ledger posting, Financial Statements &Analysis, Trial balance, preparation of Trading and Profit & Loss account and Balance Sheet.

UNIT-II

Ratio Analysis: Balance sheet ratios-current ratio, Fixed Asset ratio, Liquidity ratio, Capital Gearing Ratio, Profit-loss account ratios-Gross Margin ratio, Net Margin Ratio, Combined ratios-Return on Investment ratio, Net Profit to Total Assets ratio, Creditors turnover ratio.

UNIT-III

Costing: Objectives of costing, Elements of costing, methods of costing, preparation of cost sheet, job costing, Marginal costing, absorption costing, Process costing and Standard Costing-Material, labour, overhead cost variance, Activity Based Costing and Target Costing, Cost-Profit-Volume analysis and problems on cost-volume-profit analysis.

UNIT-IV

Working Capital Management: Introduction, concepts of working capital, operating and cash conversion cycle, permanent and variable working capital, balanced working capital position, determinants of working capital, Estimating working capital needs, Policies for financing current assets, Issues in working capital management.

UNIT-V

Capital Budgeting: Nature and scope of capital budgeting, features of capital budgeting, Methods of capital budgeting-DCF, NON-DCF techniques-Accounting rate of Return, Net present Value, Payback period, discounted payback period, Profitability Index.

Text Books:

1. T. Vijaya Kumar, Accounting for Management, 1/e, Tata McGraw-Hill, 2009.

2. I. M. Pandey, Financial Management, 9/e, VikasPulishing House, 2009.

3. M.Y. Khan and P. K. Jain, Cost Accounting, 2/e, TMH, 2014.

4. M.Y. Khan and P. K. Jain, Management Accounting: Text, Problems and

Cases, 6/e TMH, 2013.

5. M.Y. Khan, P. K. Jain, Basic Financial Management, 3/e, TMH, 2000.

INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)

DEPARTMENT OF INDUSTRIAL &PRODUCTION ENGINEERING
STUDY & EVALUATION SCHEME
W.E.F. SESSION 2017-2018
Year: B.Tech. III year

SEMESTER-VI

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP6TPC41	Machine Design- II	3	1	0	40	60	100	4
2	IP6TPC42	Measurement , Metrology & Control	3	1	0	40	60	100	4
3	IP6TPC43	Welding Engg.	3	0	0	40	60	100	3
4	IP6TPE4..	Elective-PE4	3	0	0	40	60	100	3
5	IP6TPE5..	Elective-PE5	3	0	0	40	60	100	3
6	IP6TOE2..	Elective-OE2	3	0	0	40	60	100	3
		Total	18	2		240	360	600	20
PRACTICALS									
7.	IP6LPC42	Measurement and metrology lab	-	-	03	45	30	75	2
8.	IP6LPC43	Welding Engg. Lab	-	-	03	45	30	75	2
		Total			06	90	60	150	04

Elective- Professional Elective (PE)-4		Elective- Professional Elective (PE)-5		Elective- Open Elective (OE)-2	
S.N.	IP6TPE4..	S.N.	IP6TPE5..	S.N.	IP6TOE2…
41.	Material Management	51.	Automobile Engg	21.	Enterprise Resource Planning
42.	Plant Layout& Material Handling	52.	Power Plant Engg	22.	Management Information System
43.	Maintenance And Reliability Engineering	53.	Heat & Mass Transfer	23.	Six Sigma And DOE

Note: After the completion of semester exams, students will have to join industrial training of about minimum 4 weeks (5day week and 8 hours a day) in industry. The presentation and report of this will be given in 7th sem during defined schedule by Head of Department. The due credit will be awarded in 7th semester.

IP6TPC41- Machine Design-II

UNIT–I

Spring: Spring Materials and Their Mechanical Properties, Equation 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 Failures, Selection of Material, Number of Teeth, Face Width, Beam Strength of Gear Tooth, Effective Load on Gear Tooth, 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 Tooth, 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 Tooth.

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 Scales – Contact Type and Clearance Type.

Journal Bearings: Types of Lubrication, Viscosity, Hydrodynamic Theory of Lubrication, Summerfield 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 Drive: Flat and V-belts, Belt Constructions, 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.

3. Principles of Mechanical Design by R. Phelan – McGraw Hill Pub.
4. Machine Design By Spotts-PHI
5. Machine Design, by Nortan.

IP6TPC42 Metrology, Measurement and Control

UNIT–I

Introduction to Measurement and Measuring Instruments, Generalized Measuring Systems and Functional Element, 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 Strain, 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: Bi-Metallic Thermometers, Thermocouples, Thermistors and Pyrometers.

UNIT–III

Metrology :Standards of Linear Measurement ,Line and End Standards System of Limit 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 Application.

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 system and their mathematical modelling, response characteristics of components and systems through classical solution.

Text Books:

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

IP6TPC43 Welding Engineering

UNIT-I

Classification of welding: gas welding, Arc Welding and Equipments, types of welding Flames, Welding Techniques, Welding Torches and Blowholes. Submerged Arc Welding, TIG, MIG, Plasma Arc Welding and its Application.

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: Weld ability 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 discontinuities in welds, Trouble shooting.

UNIT-V

Design of Weldment: Weld Geometry, Eccentric Loading Designing Torsion and bending, Designing welding fixtures.

Testing, Inspection and Specification: Destructive and Non-destructive methods of testing Weldment, 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.

Text Books:

1. American Welding Society, Hand Book VII Edition Vol. II.
2. Nadkarni S.V., Modern Arc Welding..
3. Welding Engg. , Little, TMGH.
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-I, TMH

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 seasonal 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, incoming material control,stores accounting and stock verification, obsolete, 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 echelon spares inventory.

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. Material and process selection in VE design, material, process & supplier decisions.

Text Books:

1. Materials Management an integrated approach, Gopalkrishnan.P & Sundaresan.M (2002) Prentice Hall India Limited, NewDelhi.

2. Materials Management Text and Cases, Chitlae,A.K & Gupta,R.C. (2009) Prentice Hall India Limited. NewDelhi.
3. Maintenance and Spare parts Management, Pathak () Prentice Hall India Limited, NewDelhi.
4. Production and Operations Management, Chary.S.N. ( ) Tata McGraw Hill.
5. Material management: An integrated approach, Dutta ()

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 descision, facility location models, economics and cost analysis, rural and urban location pattern in India.

UNIT–II

Layout Designs –Industrial plant design consideration, types of production types of layout, factors affecting layout tools, techniques and procedure used in workstation and plant layout, quantitative technique 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 pateern, flow patterns for production lines and assembly lines methods.

UNIT–IV

Material Handling- scope and functions of material handling, manual mechanical handling ratio, principles of material handling, analysis of material handling problem, classification of material handling system, 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 cranes , lifts.

Text Books:

1 Practical plant layout by Muther
2 Plant layout and design by James More
3 Manufacturing Management- a Quantitative approach by Robert Aolsem.
4 Productions and Operation Management by Lockyer

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 dependant failure models: Exponential, webull, normal and lognormal Distributions, discreat distribution, bionomial distribution, poission 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 dependant 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 tasks.estimation of maintainance cost.

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

UNIT-V

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

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

Text Books:

1. Clifton R H, "*Principles of Planned Maintenance*", McGraw Hill, New York, 2001.
2. Ebling 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. Maintainace and spare parts management by P. Gopal krishnan PHI.

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IP6TPE51 - Automobile Engineering

UNIT-I

Introduction of an automobile, component and basis 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 dimension, desirable tyres properties, types of tyres, tyre material, tyre dimension, factor 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-actualizing brakes, brake drum, brake liners, brake shoe, trouble shooting.

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 connectors, 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 Shrinivasan T.M.H.

IP6TPE52 - Power Plant Engineering

UNIT-I

Introduction:

Sources of energy, present power position in India, non-conventional energy and their application, steam power plant. High-pressure boilers and their classification and working. Boiler accessories and mountings, condenser and their types.

UNIT-II

Solar Energy: Solar Insulation Calculation, Flat plates and concentrating collectors for liquid and gases, construction.

Collector Area Calculation: heat removal Factor, Efficiency.

Solar System: Power plants, low temperature and high temperature plants, solar dryers, solar cookers, solar refrigeration systems, solar panel.

UNIT-III

Nuclear Energy: Introduction to Nuclear Engineering, Release of Energy by Nuclear Reaction, chain reaction, moderation, components of nuclear reactor, types of reactor, Pressured water reactor, CANDU reactor, Gas cooled reactor, Liquid metal cooled reactor, breeder reactor, Nuclear Materials.

UNIT-IV

Geothermal power plant.Wind energy: Type of Rotors, horizontal axis and vertical axis systems, system design and site selection blade material. Wind power scenario in India. Bio Gas Plant: Types, parameters affecting plant performance, plant design.

UNIT-V

Direct Energy Conversions: fuel Cells, Thermo-electric, Thermo ionic and MHD Systems (Magneto Hydrodynamic system), Economic analysis of Power plant tariffs.

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 Enginering by Wakil, TMH

IP6TPE53 - 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 transfer, thermal diffusivity, overall heat transfer coefficient.

Conduction

The thermal conductivity off solids, liquids and gases, factors in influencing conductivity measurement. The general differential equation of conduction, one dimensional study state conduction, linear heat flow through a plane and composite wall, tube and sphere critical thickness of insulation, effect of variable thermals conductibility, 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 uniforms and non-uniform cross section area. Heat dissipated by a fin. Effectiveness and efficiency of fin. Approximate solution. Design a fins for maximum heat transfer. Solution for different boundary condition. Use of fins 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, convention boundary conditions. Solution through Heisler's chart.

UNIT-III

Forced Convection: Physical mechanics of forced convention. Dimensional analysis for forced convention, 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 convention, Dimensional analysis of natural convention, empirical relationship for natural convention.

UNIT-IV

Boiling and Condensation: Boiling heat transfer, pool boiling, boiling regimes and boiling curve, next 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.

Heat Exchangers: Different type of heat exchanger. Determination of heat exchanger performance, 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, emission, radiosity and irradiation, black and non black bodies, Kirchhoff's law; intensity of radiation, radiation exchange between black surface, geometric configuration factors. Grey body relation exchange between surface of unit configuration factors.

Introduction to mass Transfer

Mass and mole concentrations, molecular diffusion, eddy diffusion, molecular diffusion from an 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

IP6TOE21 - 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 tree node structure, Design of, Role/Activity Diagrams, Benchmarking, Types of Benchmarking, Process of Benchmarking.

UNIT–II

Introduction to Business Process Re-engineering, Procedure of BPR, Principle of BPR, 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 ERP: Introduction Opportunities and problems in ERP selection, Approach to ERP selection of ERP.

UNIT-V

Origins of SAP, SAP's Markets, 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

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

Organisation & 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 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, 4GL, data administration.

UNIT-III

Business application of information technology: electronic commerce Internet, Intranet, 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.

IP6TOE22 - Management Information System

UNIT-I

Organisation & 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.

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UNIT-III

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UNIT-IV

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

UNIT-V

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

Text Books:

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

IP6TOE23 Six Sigma and DOE

UNIT-I

Quality Perception : Quality in Manufacturing, Quality in Service Sector, Differences 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, Attackson X'S, Customer focus, Six Sigma for manufacturing, Six Sigma for service, Z 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, DFSS, 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 inference 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 Book:

1. Issa Bass, Barbara Lawton, Lean Six Sigma Using Sigma XL and Minitab,

1/e, Tata McGraw-Hill, 2010.
2. DOE by Phillip Ross PHI.
3. P. Pande and L. Holpp, 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 Mc-graw hill.
7. D.C. Montgomery, Design and Analysis of Experiments, 8th Edition, John Wiley.

INSTITUTE OF TECHNOLOGY (SCHOOL OF ENGINEERIRNG & TECHNOLOGY)
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DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
C.B.C.S. STUDY & EVALUATION SCHEME
W.E.F. SESSION 2018-2019
Year: B. Tech. IV year

SEMESTER-VII

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	**IP7TPC51**	Principles of Management	4	0	0	40	60	100	4
2	**IP7TPC52**	Production Planning and Control	3	1	0	40	60	100	4
3	**IP7TPC53**	CAD /CAM	3	1	0	40	60	100	4
4	**IP7TOE3..**	**Elective-OE3**	3	0	0	40	60	100	3
5	**IP7TPE6..**	**Elective-PE6**	3	0	0	40	60	100	3
Total			**16**	**2**	**0**	**200**	**300**	**500**	**18**
PRACTICALS									
6.	**IP7LPC53**	CAD/CAM lab	-	-	3	30	20	50	2
7.	**IP7LPC54**	Seminar on Summer Training (About 30 Days)**	-	-	3	50	-	50	2
8.	**IP7LPC55**	Minor Project	-	-	4	50	-	50	2
Total			**-**		**10**	**130**	**20**	**150**	**6**
Grand Total			**16**	**2**	**10**	**330**	**320**	**650**	**24**

Elective- Open Elective (OE)-3		**Elective- Professional Elective (PE)-6**	
S.N.	**IP7-TOE3..**	**S.N.**	**IP7-TPE6..**
31	Product Design & Development	61	Machine Tool Design
32	Entrepreneurship Development	62	Refrigeration And Air Conditioning
33	Strategic Management	63	Composites Materials & Technology

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7TPC51	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Principles of Management	4	0	0	10	20	05	05	40			

Course Learning Objectives: The objective of this Course is to:

- To understand the concepts of different principles of management
- To receive knowledge of working management practices
- To enhance knowledge about the various management skills.
- To help the students gain understanding of the functions and responsibilities of managers.
- To provide them tools and techniques to be used in the performance of the managerial job.
- To enable them to analyze and understand the environment of the organization.
- To help the students to develop cognizance of the importance of management principles.

Course Content:

UNIT-I

Definition of management, science or art, manager vs entrepreneur; Types of managers managerial roles and skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management.

UNIT-II

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes.

UNIT-III

Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.

UNIT-IV

Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT-V

Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Text Books:

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009.
2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.
3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999.
4. Essential of management, Koontz & O'Donnel, McGraw-Hill.
5. Organizational Behavior, Stephen P. Robbins, PHI.
6. Organization and Management, Agrawal R.D, TMH.Principles of Management, Terry & Francklin, Richard – Frwin

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

- Understand the concepts related to Business.
- Demonstrate the roles, skills and functions of management.
- Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
- Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.
- The students will be able to work under team management.

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7-TPC52	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks- Duration-3Hrs	100	4
Subject:	Production Planning And Control	3	1	0	10	20	05	05	40			

Course Learning Objectives: The objective of this Course is to:

- To develop and apply mathematics & Engineering skills to identify, formulate, and solve industrial process problems
- To introduce the concept of Organization, Production systems and Cost analysis
- To understand the problems and opportunities faced by the operations manager 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
- To understand the PPC function in both manufacturing and service organizations.
- To examine several classic Operations Management planning topics including production planning and inventory control.
- To learn several important contemporary topics relevant to business managers of all functional disciplines, including quality management, lean concepts, and sustainability.

Course Content:

UNIT – I

Introduction: Introduction to various Types of Production System viz. Mass Production, Job Shop, Batch Production System, Continuous Production System, Concept of Production and Operation Management, Objective & functions of PPC.

Forecasting: Time Series 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 chart.

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 westner method.

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

UNIT – IV

Types of layout- layouts design procedure such as CORELAP, CRAFT etc., Material handling system & their classification, principles. JIT & KANBAN. Depreciation & methods of depreciation.

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 Decision, concept of original equipment effectiveness.

Text Books:

1. Production and operation management, O.Paneerselvem, TMH.
2. Production and operation management, Adem Ebert

3. Production and operation management, Charry 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, Ellis Horwood limited
7. Operations Management: Design Planning and control for the manufacturing and services
8. Lawrence.P.Atkin, James B. Dilworth Tata Mc Graw Hill
9. Production and Operations management, R.B Khanna, PHI.
10. Production operations management S.N.Buffa, PHI.

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

- Recognize the objectives, functions, applications of PPC and forecasting techniques.
- Explain different Inventory control techniques.
- Solve routing and scheduling problems
- Summarize various aggregate production planning techniques.
- Describe way of integrating different departments to execute PPC functions
- The students will know about the Organization, Production systems and Cost analysis
- The students will know about the methods of making sales forecasting

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7-TPC53	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks- Duration-3Hrs	100	4
Subject:	Computer Aided Design And Manufacturing (CAD/CAM)	3	1	0	10	20	05	05	40			

Course Learning Objectives: The objective of this Course is to:

- To impart fundamental knowledge to students in the latest technological topics on Computer Aided Design, Computer Aided Manufacturing and Computer Aided Engineering Analysis and to prepare them for taking up further research in the areas.
- To create congenial environment that promotes learning, growth and imparts ability to work with inter-disciplinary groups in professional, industry and research organizations
- To broaden and deepen their capabilities in analytical and experimental research methods, analysis of data, and drawing relevant conclusions for scholarly writing and presentation.
- To provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research.

Course Content:

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 documentations, CAD standards GKS, OpenGL, Data exchange standards- IGES, STEP, CALS etc, Communication standards. Standards for vexchange 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, Bezier curves, B-spline curves and rational curves.

Basic 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 technique, 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, interferences of positions and orientation, tolerance analysis, mass property calculations, Visual realism- hidden line-surface-solid removal algorithms, shading, colouring, 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

Advance 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 (AS/RS), Automated guided vehicle(AGV).

Text Books:

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

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

- Apply/develop solutions or to do research in the areas of Design and simulation in Mechanical Engineering.
- Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
- Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
- Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical / scientific methods and use of software tools.
- Design and validate technological solutions to defined problems and communicate clearly and effectively for the practical application of their work.

Syllabus	**(Semester-VII)**	**Periods/ Week**			**Internal Assessment (IA)**					**End Sem Exam (ESE)**	**Grand Total**	**Credits**
Subject Code:	IP7-TOE..31	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL			
Subject:	Product Design & Development	3	0	0	10	20	05	05	40	60 Max Marks-60 Min Marks- Duration-3Hrs	100	3

Course Learning Objectives: The objective of this Course is to:

- To introduce design concepts and techniques to develop design ability in a product design.
- To provide knowledge about estimating and evaluating the feasible manufacturing design.

- To make aware of legal issue pertaining to product design.
- To provide knowledge of management of product development projects

Course Content:

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, three **S's**, standardization, renard 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 Idea generation: modification. Product variants: adding, dropping. Formal testing: new products, concept, product testing, market tests, evaluation, adoption, expansion and forecasting.

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.

UNIT - IV

Developing product strategy: Benefits of strategy, elements of a product strategy, setting objectives, selection of strategic alternatives, increasing sales/market share, increasing profitability. Design for manufacturing and Design for assembly, Ergonomics in 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 Garratt, Design and technology (1996) Published by Cambridge University Press
4. Donald R .Lehman, Rusell S. Wines 3rd Edition, Product Management TMH.
5. Product Life Cycle Engineering and Management, CEP Lecture notes, Prof B Ravi, IIT Bombay
6. Karl. T. Ulrich and Steven D. Eppinger "Product Design & Development" – TMH – 3rd addition.

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

- The course enhance students understanding of new product development processes as well as useful tools, techniques and organizational structures that support new product development practice.
- Understands the legal issue pertaining to patent of product design.
- Understand professional, ethical and social responsibilities resulting in a commitment to quality, timeliness, and continuous improvement

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7TOE…32	L	T	P	CT-1	MIDSEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL			
Subject:	Entrepreneurship Development	3	0	0	10	20	05	05	40	60 Max Marks-60 Min Marks- Duration-3Hrs	100	3

Course Learning Objectives: The objective of this Course is to:

- The course will provide a thorough coverage of conceptual framework on Entrepreneurship development.
- Enhances student's innovation skill.
- Helps to provide a quick understanding of essential concepts and issues.
- Enhance the students to have an understanding about international entrepreneurship.
- Understand the problems and prospects related to setting up of any type of business.
- understanding the role and importance of entrepreneurship for economic development
- Developing personal creativity and entrepreneurial initiative
- Adopting of the key steps in the elaboration of business idea
- Understanding the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.

Course Content:

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 stock 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 –economic, financial, market analysis, technical feasibility and managerial competency environmental clearance.

UNIT- IV

Financing of Enterprise Source of finance: internal and external sources, capitalization, term loans- short term finance, venture capital, export finance. Institutional finance- commercial banks, other financial institution, 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, direct industry centre, technical consultancy organizations

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

UNIT- V

Start-up Business: Why start a business, key consideration, start-up a process, presentation to investors, company considerations, equity considerations, key factors for success.

Government strategies: Growth of enterprises, Objectives of growth, stages and types of growth- Expansion diversification, joint venture, mergers and acquisitions, sub-contracting and financing.

Sickness in small industries: Meaning of industrial sickness, signals and symptoms of industrial sickness, causes and consequences, corrective measures to 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, Kumar, New- Age.
4. Entrepreneurship Development, Kaulgud, Thomson Learning.
5. Entrepreneurship: Theory & Practices, Saini, Wheeler.
6. Entrepreneurship Development, Dr. S.S. Khanka S. Chand.

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

- Work effectively with engineering and science teams
- Understand professional, ethical and social responsibilities resulting in a commitment to quality, timeliness and continuous improvement
- Analyse the business environment in order to identify business opportunities
- Identify the elements of success of entrepreneurial ventures
- Consider the legal and financial conditions for starting a business venture
- Evaluate the effectiveness of different entrepreneurial strategies
- Specify the basic performance indicators of entrepreneurial activity
- Explain the importance of marketing and management in small businesses venture
- Interpret their own business plan.

Syllabus	**(Semester-VII)**	**Periods/ Week**			**Internal Assessment (IA)**					**End Sem Exam (ESE)**	**Grand Total**	**Credits**
Subject Code:	IP7-TOE…33	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL			

Subject:	Strategic Management	3	0	0	10	20	05	05	40	60 Max Marks-60 Min Marks- Duration-3Hrs	100	3

Course Learning Objectives: The objective of this Course is to:

- To expose students to various perspectives and concepts in the field of Strategic Management
- The course would enable the students to understand the principles of strategy formulation, implementation and control in organizations.
- To help students develop skills for applying these concepts to the solution of business problems
- To help students master the analytical tools of strategic management

Course Content:

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 durability of competitive Advantage- Avoiding failures 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, Alance Score Card-case study.

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. New Business Models and strategies for Internet Economy-case study

Text Books:

1. Thomas L. Wheelen, J.David Hunger and Krish Rangarajan, Strategic Management andBusiness policy, Pearson Education., 11th edition, 2007.
2. Charles W.L.Hill & Gareth R.Jones, Strategic Management Theory, An Integrated approach, Biztantra, Wiley India,6th edition, 2007.
3. Azhar Kazmi, Strategic Management & Business Policy, Tata McGraw Hill, Third Edition,

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

- Understand the basic concepts and principles of strategic management
- Analyse the internal and external environment of business
- Develop and prepare organizational strategies that will be effective for the current business environment
- Devise strategic approaches to managing a business successfully in a global context
- Understand the problems and prospects related to setting up of any type of business and resolve by applying different strategies

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7-TPE…61	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL			
Subject:	Machine Tool Design	3	0	0	10	20	05	05	40	60 Max Marks-60 Min Marks- Duration-3Hrs	100	3

Course Learning Objectives: The objective of this Course is to:

- To develop competency in understanding of machine tools and its working principles.
- To make the student conversant with design of machine tool structures and special features of machine tool design.
- To gain the knowledge of different drives and mechanisms used in machine tools
- To gain the knowledge of design of gear boxes & feed boxes used in machine tools
- To gain the knowledge of design of structures, guideways, spindles of machine tools
- To gain the knowledge of various control systems used in machine tools
- To introduce design concepts and techniques to develop designability in a machine tool.
- To provide knowledge about estimating and evaluating the feasible machine design

Course Content:

UNIT - I

Introduction to machine tool design and mechanism: definitions, classification and general; requirement of machine tool, working and auxiliary motions in machine tools, parameters 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 less regulation of speed and feed rates.

UNIT- II

Design of machine tool structures: function of machine tool structures and their requirement, 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 aerostatic slide ways, design of anti-friction guide ways, design of power screws.

UNIT - IV

Design of spindles and spindle supports: function 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, clearances and cutting forces, shear, center of pressure, method of mounting punches, design of blanking **dies**, drawing die design.

Text Books:

1. Machine Tool Design by NK 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.E., Design of Machine Tools, Mashinostroenie Publishers, Moscow, 1977.
5. Machine Tool Design, vols. I-IV, Mir Publishers, Moscow, 1968.

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

- The course will provide a thorough coverage of conceptual framework on machine tool design
- Helps to provide a quick understanding of essential concepts and issues in machine tool designing.
- Students will be able to understand the design considerations for special features in Machine tools.
- Ability enhancement for the design of various components of structures, guideways, spindles of machine tools
- Ability enhancement to adopt & implement the recent trends required as per the applications

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7-TPE…62	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL			
Subject:	Refrigeration & Air Conditioning	3	0	0	10	20	05	05	40	60 Max Marks-60 Min Marks- Duration-3Hrs	100	3

Course Learning Objectives: The objective of this Course is to:

- Learning the fundamental principles and different methods of refrigeration and air conditioning.
- Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
- Comparative study of different refrigerants with respect to properties, applications and environmental issues.
- Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
- Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

Course Content:

UNIT – I

Carnot Refrigerator & Heat pump: air refrigeration systems, bell Coleman air refrigeration cycle. Air craft system & its performance.

Vapour compression refrigeration: simple cycle, t-s and p-h charts analysis of vapor compression cycle, factors effecting performance of vapor compression cycle, actual vapour compression cycle, multi stage compression system.

UNIT – II

Vapour absorption refrigeration systems: description of system components, aqua ammonia and water lithium bromide systems. Its analysis & advantages over vapour compression system.

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

UNIT – III

Production of low temperature - cascade system, Joule Thomson effect & liquefaction of gases, liquefaction of hydrogen & helium, application of cryogenics.

Nonconventional refrigeration system-thermo-electric refrigeration, vortex tube, steam jet refrigeration system.

Refrigerants: classification, properties & selection of refrigerants.

UNIT – IV

Psychometrics: Psychrometry and psychometric properties, psychometric relations, psychometric chart and its use, psychometrics 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.

Automotive 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.

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

- Estimate the cooling load for air conditioning systems used for various applications.
- Calculate the various properties of moist air by conducting test on Window A.C.
- Estimate refrigeration effect and coefficient of performance by conducting test on vapor compression refrigeration system.
- Able to know the properties, applications and environmental issues of different refrigerants.
- Use of P-h, T-S and Psychrometric charts to solve refrigeration and Air conditioning design
- problems
- Explain the working principle of various components of Vapour Compression refrigeration system.
- Calculate cooling load for air conditioning systems used for various applications

Syllabus	(Semester-VII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP7-TPE…63	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL			
Subject:	Composite Materials and Technology	3	0	0	10	20	05	05	40	60 Max Marks-60 Min Marks- Duration-3Hrs	100	3

Course Learning Objectives: The objective of this Course is to:

- Familiarization with the basic expressions and methods used in the mechanics of composite structures
- Explain the behavior of constituents in the composite materials
- Enlighten the students in different types of reinforcement
- Develop the student's skills in understanding the different manufacturing methods available for composite material.
- Illuminate the knowledge and analysis skills in applying basic laws in mechanics to the composite materials.
- Ability to solve mechanics of composite materials problems using classical methods

Course Content:

UNIT – I

Introduction to Composites Definitions. Typical reinforcements and matrices. Typical properties of fibre composites; mechanical, weight, chemical 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, aramid and other organics, ceramics. Fibre coating to achieve

compatibility with matrix. Use of statistical methods to 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 mould), including: hand and spray lay-up, press moulding, injection moulding, resin injection, RRIM, filament winding, pultrusion, centrifugal casting, autoclave, prepreg and other "starting" materials, etc. Machine methods for manufacture of composites .Cutting, drilling and other finishing operations

UNIT – IV

Engineering properties Stiffness and Strength: Geometrical aspects, volume and weight fraction. Unidirectional continuous fibre systems; stiffness and strength. Discontinuous fibres. Short fibre systems; length and orientation distributions. Woven reinforcements. Hybrids. Failure theories for unidirectional lamina. Micro mechanics theories.

UNIT – V

Mechanical Testing Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear. Typical standard methods. Use of photo elastic, holographic and other methods of strain measurement.

Metal Matrix Systems Metals and alloys; solidification processes, diffusion bonding, mechanical properties. Boron fibre reinforced aluminium and titanium alloys. Alumina fibre reinforced aluminium alloys. Silicon carbide fibre reinforced aluminium alloy. Particulate systems.

Text Books:

1. Introduction to Composite Materials Design: Ever J Barbero Taylor and Francis.
2. Mechanics of Composite Materials: Robert Jones Second Edition 1999 Taylor and Francis.
3. Composites and Processing Methods: Ed. Venkatesan Narosa Publications.

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

- The students will know about the Engineering Materials and the modern methods for the material study.
- Understand the specifics of mechanical behavior of layered composites compared to isotropic materials.
- Apply constitutive equations of composite materials and understand mechanical behavior at micro, macro and meso level.
- Determine stresses and strains in composites.
- Apply failure criteria and critically evaluate the results.

Syllabus	**(Semester-VII)**	**Periods/ Week**			**Internal Assessment (IA)**	**End Sem Exam (ESE)**	**Grand Total**	**Credits**
Subject Code:	IP7-LPC53	L	T	P				
Subject:	Computer Aided Design And Manufacturing (CAD/CAM) Lab	0	0	3	30	20	50	2

Course Learning Objectives: The objective of this Course is to:

- To provide students with the writing and reading principles of "Engineering Drawing", which is a graphical universal language used in technical world for describing the shape and size of an object via supplying orthographic views and/ or solid models associated with all the necessary dimensions, associated tolerances and annotations created in a CADD environment
- To understand 3D drafting and analysis software used for modelling and analysis

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

- Ability to perform both 2D and 3D drafting of component using CAD software
- Create solid models of objects; objects in basic shapes, composite bodies, custom built machine parts, building modules etc.
- Draw the orthographic views of an object in CAD environment (particularly in Autodesk AutoCAD environment).
- Create the orthographic views of an object from the solid model (particularly in Autodesk Inventor environment).
- Dimension the views, show some annotations, provide the size tolerance of functional features, and general tolerances
- Explain and interpret the dimensions and the associated tolerances, some annotations
- Read the given orthographic views; i.e. visualize the 3- Dimensional model of the object shown to its orthographic views and create its CAD model.

- Create auxiliary views, revolved views, sectional views.
- Ability to construct assemblies from the concepts learnt using drafting softwares

Syllabus	**(Semester-VII)**	**Periods/ Week**			**Internal Assessment (IA)**	**End Sem Exam (ESE)**	**Grand Total**	**Credits**
Subject Code:	IP7-LPC54	L	T	P				
Subject:	Seminar on Summer Training (About 30 Days)**	0	0	3	50	-	50	2

Course Learning Objectives: The objective of this Course is to:

- To provide comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.
- To enhance students' knowledge in one particular technology.
- To Increase self-confidence of students and helps in finding their own proficiency
- To cultivate student's leadership ability and responsibility to perform or execute the given task.
- To provide learners hands on practice within a real job situation.
- Enhance and supplement the knowledge and skills of the students.
- Develop the students in terms of ability, competence and interpersonal relationship.

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

- Capability to acquire and apply fundamental principles of engineering.
- Become master in one's specialized technology
- Become updated with all the latest changes in technological world.
- Ability to communicate efficiently.
- Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.

- Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
- Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
- Awareness of the social, cultural, global and environmental responsibility as an engineer.

Syllabus	**(Semester-VII)**	**Periods/ Week**			**Internal Assessment (IA)**	**End Sem Exam (ESE)**	**Grand Total**	**Credits**
Subject Code:	IP7-LPC55	L	T	P				
Subject:	Minor Project	0	0	3	50	-	50	2

Course Learning Objectives: The objective of this Course is to:

- Train students to be independent in finding the placement that will prepare them to join the workforce in the future.
- Ability to conduct research in the chosen fields of engineering.
- Ability to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
- Awareness of the social, cultural, global and environmental responsibility as an engineer.
- Ability to acquire and apply fundamental principles of science and engineering.
- Capability to communicate effectively
- Ability to identify, formulate and model problems and find engineering solution based on a systems approach
- Demonstrate competency in relevant engineering fields through problem identification, formulation and solution.
- Generate a report based on the experiences and projects carried out with the ability to apply knowledge of Mathematics, Science, and Engineering Fundamentals.
- Effectively implement skills in communication, in writing and using multimedia tools.
- Develop the ability to work as an individual and in group with the capacity to be a leader or manager as well as an effective team member.
- Master the professional and ethical responsibilities of an engineer.
- Understanding of the importance of sustainability and cost-effectiveness in design and developments of engineering solution.
- Capability and enthusiasm for self-improvement through continous professional development and life-long learning

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

- Understand the basic concepts & broad principles of Industrial projects
- Understand concepts of Project and Production Management
- Get capable of self education and clearly understand the value of achieving perfection in project implementation & completion.
- Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach
- Enable the students to implement project planning in their Industrial in-Plant training work
- Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context
- Discussion and critical thinking about topics of current intellectual importance
- Improve the interpersonal & communication skills and awareness about the industrial environment.

INSTITUTE OF TECHNOLOGY (SCHOOL OF ENGINEERIRNG & TECHNOLOGY)
GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)

DEPARTMENT OF INDUSTRIAL &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.	**IP8TPC61**	Operation Research	3	1	0	40	60	100	4
2	**IP8TPC62**	Marketing Management	4	0	0	40	60	100	4
3	**IP8TPE7…**	**Elective-PE7**	4	0	0	40	60	100	4
4	**IP8TOE4…**	**Elective-OE4**	4	0	0	40	60	100	4
Total			**15**	**1**	**0**	**160**	**240**	**400**	**16**
PRACTICALS									
6.	**IP8LPS02**	Project	-	-	12	120	80	200	6
7.	**IP8LPC01**	Comprehensive Viva	-	-	-	-	50	50	2
Total			**-**	**-**	**12**	**120**	**130**	**250**	**8**
Grand Total			**15**	**1**	**12**	**280**	**370**	**650**	**24**

Elective- Open Elective (OE)-4		**Elective- Professional Elective (PE)-7**	
S.N.	**IP8-OET…**	**S.N.**	**IP8-PET…**
41	Supply Chain Management	**71**	Fluid Power Control
42	Safety Management And Labour Law.	**72**	Robotics and Robot Applications
43	Finite Element Method	**73**	Powder Metallurgy & Ceramics.

Syllabus	(Semester-VIII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP8-TPC61	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Operation Research	3	1	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To learn about the importance of decision making
- To design and analyze mathematical statement and equations
- To grasp importance of Network analysis, transportation problems

Course Content:

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, sack surplus & 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 ,traveling sales-man 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 2game , 2 X N game , M X 2 game , 3 X 3game (Method of matrix's, method of linear programming etc).

Inventory: Introduction, classification, function, level, control techniques, models, various costs associated, EOQ, 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 problems, requirement policy, replacement of items, machinery various themes, group replacement policy, MAPI methods

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 & crushing of network.

Text Books

1. Sharma & S D Kedarnath - Operation Reasearch, Ramnath & Co Meerut
2. Operation Research, Sasien Yaspan
3. Operation Research – N. D. Vohra – TMH Publication
4. Operation Research– Hira & Gupta – S. Chand & Co.
5. Operation Research – H. Gillette – TMH, New Delhi
6. Operations Research – M. Taha – TMH, New Delhi
7. Operations Research – Phillip Ravindran- Wiley Publications

Course Outcomes

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

- Apply knowledge of optimization for formulating and engineering, decision problems in work culture
- Work effectively with engineering departments
- Reflects towards resource optimization and allocation.

Syllabus	(Semester-VIII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP8-TPC62	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Marketing Management	4	-	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To learn about basic concepts of marketing and selling
- To demonstrate importance of need, wants, demands
- To learn implicating strategies in different phases of product life cycle

Course Content:

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 nature 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 Decisions: Definitions and factors contributing to new production development, new product development process.

UNIT-IV

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

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 e 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 Publication

Course Outcomes:

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

- Apply enriched knowledge towards developing product, production means and philosophies
- Import high performance business ethics and culture in behavior
- Assist in Identifying, analyzing, developing & managing development program, sales promotion, public relation

Syllabus	(Semester-VIII)	Periods/ Week			Internal Assessment (IA)					End Sem Exam (ESE)	Grand Total	Credits
Subject Code:	IP8-OET…41	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Supply Chain Management	4	-	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To define supply chain, its importance and management.
- To define various drivers of Supply Chain for grasping effectual performance
- To understand about uncertainty ,risk management and forecasting

Course Content:

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 to 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 ,AM Tires: Evaluation of Supply, Chain Design Decisions Under Uncertainty ,Risk Management and Network Design 175,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 Forecast1ng ,Time-Series Forecasting Methods, Measures of Forecast Error ,Forecasting Demand at Tahoe Salt ,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

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 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: Janat Shah, Pearson Publications 2010.
2. Supply Chain Management: Sunil Chopra and Mein del, 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 :Ed.B.S.Sahay McMillan Publication 2000
6. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay McMillan Publication 2000.
7. Logistics Management: Bowersox TMH 2004.

Course Outcomes

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

- Demonstrate a basic understanding about Competition and Supply Chain Strategies

- Acquire knowledge about distribution network, E-Business and Time-Series
- Demonstrate technical understanding about demand, inventory, safety, pricing.

Syllabus	(Semester-VIII)	Periods/ Week	Internal Assessment (IA)	End Sem Exam (ESE)	Grand Total	Credits

Subject Code:	IP8-OET…42	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60	100	4
Subject:	Safety Management And Labour Law	4	-	-	10	20	05	05	40	Max Marks-60 Min Marks-21 Duration-3Hrs		

Course Learning Objectives:

The objective of this Course is to:

- To define importance of safety concept, safety policy, safety organization
- To impart knowledge about material handling, air pollution control system, fire prevention and protection
- To learn about safety audit, disaster control, safety principles

Course Content:

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. Techniques Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

Safety in Material Handling: Ergonomic consideration in material handling, design, installation, operation and maintenance of Conveying equipment, hoisting, traveling and slewing 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 fixed blades- 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 cement, paper, petroleum, petroleum products- textile-tanneries-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, Inspections 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, saws, types, hazards.

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 stand pipes – fire station-fire alarms and sirens, maintenance of fire trucks, foam generators, escape from fire rescue operations, fire drills, notice first aid for burns.

UNIT -V

Explosion Protecting Systems Principles of explosion-detonation and blast waves-explosion, parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure-explosion venting-inert gases, plant for generation of inert gas rupture disc 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 Books:

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.S., "Hand Book of Fire Technology" Orient Longman, Bombay 1977.
4. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982.
5. Dinko Tuhtar, "Fire and explosion protection

Course Outcomes:

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

- Apply knowledge of disaster control, Job Safety Analysis in working environment
- Demonstrate inspection standards, codes, design and installation provisions
- Lift the knowledge about Protecting Systems, safety handling and maintaining

Syllabus	(Semester-VIII)	Periods/ Week	Internal Assessment (IA)	End Sem Exam (ESE)	Grand Total	Credits

Subject Code:	IP8-OET…43	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Finite Element Method	3	1	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To define importance of FEM modeling
- To learn plotting governing equations of Linear and higher order
- To define basic concept of matrix formulation

Course Content:

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, discretization, 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 functions, Convergence requirements, Pascal triangle, Shape function for linear and plain elements, Shape functions using Lagrange polynomials. Shape functions for serendipity family elements, Degrading technique for nodes.

UNIT- III

Strain displacement matrix: Strain-displacement matrix for linear and plain element, 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 & trusses. 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 vs mesh refinement.

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, Ritz technique, Isoparametric formulations.

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, torsion of non-circular shafts.

Text Books:

1. K.H Huebner, and E.A., Thorton, "The Finite Element Methods for Engineers" John Wiley & Sons.
2. R.D. Cook, Malkus, D.S. and Plesha, M.E., "Concepts and Applications of Finite Element Analysis", 3 rd Ed., John Wiley & Sons.
3. S.S. Rao, Finite Element Method in Engineering, Butterworth Heinemann.
4. Bathe, K.J., "Finite Element Procedures", Prentice Hall of India, New Delhi.
5. Zienewiccz, 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. Seshu, Text Book of Finite Element Analysis, Prentice Hall, New Delhi.

Course Outcomes:

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

- Apply concept of shape functions for optimizing decision problem.
- Identify boundary conditions to solve dynamic problems under thermal aspects and related to torsion of non-circular shafts
- Easy implicating and formulating finite element to evaluate a cause or dilemma

Syllabus	(Semester-VIII)	Periods/ Week	Internal Assessment (IA)	End Sem Exam (ESE)	Grand Total	Credits

Subject Code:	IP8-PET…71	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Fluid Power Control	3	1	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To learn about fluid power, viscosity, viscosity index and force
- To learn about continuity equation, hydraulic power, Bernoulli's equation
- To define various coefficient related to Energy power and flow rate

Course Content:

UNIT -I

Introduction –what is fluid power, application of fluid power, component of fluid power system. Force pressure and head .Specific weight, density specific gravity, bulk modules, 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 thought mechanical linkage, hydraulic cylinder cushions, and hydraulic shock absorber.

UNIT –III

Hydraulic motors: Introduction, limited rotation 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 valve: Hydraulic components -pressure-flow-direction controls valves –proportional, servo, cartridge (logic) valves. Hydraulic fuses

UNIT –IV

Hydraulic Conductor and Fittings: Introduction, conductor sizing for flow rate requirement, pressure rating of conductors, steel pipes, steel tubing, plastic tubing, flexible hoses, quick disconnect couplings, metric steel 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, motor braking system, analysis of hydraulic system

UNIT –V

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

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

Text books:

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

Course Outcomes:

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

- Assists in demonstrating gear motors, vane motors, Hydraulic motors
- Grasp knowledge about theoretical torque, power and flow rate
- Work effectively with hydraulic cylinder cushions, and hydraulic shock absorber

Syllabus	(Semester-VIII)	Periods/ Week	Internal Assessment (IA)	End Sem Exam (ESE)	Grand Total	Credits

Subject Code:	IP8-PET…72	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Robotics and Robot Applications	3	1	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To define basic concept about robots, robotics and programming
- To learn about Coordinate Frames, Mapping and Transforms plots
- To understand kinematic modeling of the manipulators and their working

Course Content:

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, repeatability, accuracy and precision, human arm characteristics, robot specification and notations, concept of robots programming, the future prospects.

UNIT – II

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

UNIT – III

Symbolic Modeling of Robots, Direct Kinematic Model: Mechanical structure and notations, description of links and joints, kinematic modeling of the manipulator, Denavit, Hartenberg (D-H) representation, kinematic relationship between adjacent links, manipulator, transformation matrix, Arm 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 – V

Robot Controller & Applications: Linear control of robot manipulation, 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 application for sustainable development & social issues.

Text Books:

1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers - Yoram Korean- McGrew 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.Gonzalex, C.S.G.Lee- McGrew Hill Book co.
5. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co
6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall
7. Kinematics and Dynamics of Machinary - J.Hirchhorn - McGrew HillBook Company

Course Outcomes:

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

- Characterize fundamental of translation, rotations and transformations
- Apply laws of robotics, robot anatomy and related attributes
- Implement Artificial Intelligence (AI) in robotics for sustainable development & exploiting social issues

Syllabus	(Semester-VIII)	Periods/ Week	Internal Assessment (IA)	End Sem Exam (ESE)	Grand Total	Credits

Subject Code:	IP8-PET…73	L	T	P	CT-1	MID SEM	ATTENDENCE MRKS	ASSIGNMENT MARKS	TOTAL	60 Max Marks-60 Min Marks-21 Duration-3Hrs	100	4
Subject:	Powder Metallurgy and Ceramics	3	1	-	10	20	05	05	40			

Course Learning Objectives:

The objective of this Course is to:

- To understand importance of powder metallurgy, Metal production methods, coating
- To learn about powder treatment, screening, cleaning, annealing, and lubrication
- To characterize metal powder, powder pressing, compaction method

Course Content:

UNIT -I

Introduction: Steps In powder metallurgy, advantage application limitation and recent trends.

Powder production methods and Properties: Metal production methods: Aromatization, Mechanical (Milling), Electro deposition, Spray drying. Powder Treatment- Screening, cleaning, annealing, and lubrication. Powder treatment and handling , coating and pyrophoracity, 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 method, classification of parts. Cold Iso-static 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, Dispersions strengthened materials ,Cutting tool materials, Cemented carbides and tools, cermet.

UNIT – IV

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

UNIT – V

Advance powder metallurgical process technique- atomization and its types , process parameters and characteristics, mechanical alloying , process types and parameter , metal injection molding , steps, requirement, design application and defect .

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

Text Books:

1. Powder metallurgy by P.C.angelo, R. subramanian by PHI publication
2. Fundamentals of Powder Metallurgy :G.S.Upadhaya Cambridge International Science Publishing 1998
3. Fundamentals Principles of Powder Metallurgy : W.B.Jones Edward Arnold Publishing
4. First Course in Powder Metallurgy: Henry Hauser Chemicals Publishing Company
5. Handbook Of Powder Metallurgy : Hausner H.H and Mal M.K. Second Edition , Chemicals Publishing Company
6. Metals Handbook Vol.7 Powder Metallurgy : ASM 1998

Course Outcomes:

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

- Implement electro deposition, spray drying phenomena during working
- Demonstrate Electrical and magnetic applications of metals, Sintering atmosphere, Sintering furnaces, metallographic of sintering parts

- Assist in using cutting tool materials, cemented carbides, silica, glasses, graphite and diamond

Syllabus	(Semester-VIII)	Periods/ Week			INTERNAL ASSESSMENT	ESE	Grand Total	Credits
Subject Code:	**IP8LPS02**	L	T	P	120	80	200	6
Subject:	Project	-	-	12				

Course Learning Objectives: The objective of this Course is to:

- Demonstrate a sound technical knowledge of their selected project topic
- It provides the students with the opportunity to design undertake or conduct an independent research or study related to their degree course.
- Upon completion of Final year project, student should be able to Identify and describe the problem and scope of project clearly, collect, analyze and present data into meaningful information using relevant tools.
- Select plan and execute a proper methodology in problem solving, work independently and ethically, present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

Course Outcomes:

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

- Acquire basic knowledge about the Production and Industrial Engineering.
- To understand abilities and capabilities in the areas of advanced manufacturing processes, quality and other management skills.
- The student will be able to recommend the appropriate design process, production method, machining process and quality assurance tactics.
- The student should be able to develop easiest production methods keeping objective of reduction of cost and manpower.
- Design and validate solutions of defined problems and effectively handled practical utilization of their work.
- Implement innovative practices and developed means to handle work effectively.
- Each individual develops his/her full potential and share his/her knowledge and thinking.
- Professional ethics are practiced and an ability to conceptualize and solve engineering problems will be exposed.

- Evaluation of a wide range of potential solutions for numerous problems and arrival of feasible, and optimal solution considering public health and safety, cultural, societal and environmental factors can be grasp.

INSTITUTE OF TECHNOLOGY (SCHOOL OF ENGINEERIRNG & TECHNOLOGY)
GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)

DEPARTMENT OF INDUSTRIAL &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.	**IP8TPC61**	Operation Research	3	1	0	40	60	100	4
2	**IP8TPC62**	Marketing Management	4	0	0	40	60	100	4
3	**IP8TPE7…**	**Elective-PE7**	4	0	0	40	60	100	4
4	**IP8TOE4…**	**Elective-OE4**	4	0	0	40	60	100	4
Total			**15**	**1**	**0**	**160**	**240**	**400**	**16**
PRACTICALS									
6.	**IP8LPS02**	Project	-	-	12	120	80	200	6
7.	**IP8LPC01**	Comprehensive Viva	-	-	-	-	50	50	2
Total			**-**	**-**	**12**	**120**	**130**	**250**	**8**
Grand Total			**15**	**1**	**12**	**280**	**370**	**650**	**24**

Elective- Open Elective (OE)-4		Elective- Professional Elective (PE)-7	
S.N.	**IP8-OET…**	**S.N.**	**IP8-PET…**
41	Supply Chain Management	**71**	Fluid Power Control
42	Safety Management And Labour Law.	**72**	Robotics and Robot Applications
43	Finite Element Method	**73**	Powder Metallurgy & Ceramics.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-TPC61	Operation Research	3	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, sack surplus & 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 ,traveling sales-man 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 2game , 2 X N game , M X 2 game , 3 X 3game (Method of matrix's, method of linear programming etc).

Inventory: Introduction, classification, function, level, control techniques, models, various costs associated, EOQ, 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 problems, requirement policy, replacement of items, machinery various themes, group replacement policy, MAPI methods

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 & crushing of network.

Text Books

1. Sharma & S D Kedarnath - Operation Reasearch, Ramnath & Co Meerut
2. Operation Research, Sasien Yaspan
3. Operation Research – N. D. Vohra – TMH Publication
4. Operation Research– Hira & Gupta – S. Chand & Co.
5. Operation Research – H. Gillette – TMH, New Delhi
6. Operations Research – M. Taha – TMH, New Delhi
7. Operations Research – Phillip Ravindran- Wiley Publications

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-TPC62	Marketing Management	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

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 nature 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 Decisions: Definitions and factors contributing to new production development, new product development process.

UNIT-IV

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

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 e 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 Publication

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-OET…41	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 to 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 ,AM Tires: Evaluation of Supply, Chain Design Decisions Under Uncertainty ,Risk Management and Network Design 175,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 Forecast1ng ,Time-Series Forecasting Methods, Measures of Forecast Error ,Forecasting Demand at Tahoe Salt ,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

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 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 Book

1. Supply Chain Management: Janat Shah, Pearson Publications 2010.
2. Supply Chain Management: Sunil Chopra and Mein del, 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 :Ed.B.S.Sahay McMillan Publication 2000
6. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay McMillan Publication 2000.
7. Logistics Management: Bowersox TMH 2004.

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-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. Techniques Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

Safety in Material Handling: Ergonomic consideration in material handling, design, installation, operation and maintenance of Conveying equipment, hoisting, traveling and slewing 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 fixed blades- 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 cement, paper, petroleum, petroleum products- textile-tanneries-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, Inspections 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, saws, types, hazards.

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 stand pipes – fire station-fire alarms and sirens, maintenance of fire trucks, foam generators, escape from fire rescue operations, fire drills, notice first aid for burns.

UNIT -V

Explosion Protecting Systems Principles of explosion-detonation and blast waves-explosion, parameters – Explosion Protection, Containment, Flame Arrestors, isolation, suppression, venting, explosion relief of large enclosure-explosion venting-inert gases, plant for generation of inert gas rupture disc 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.S., "Hand Book of Fire Technology" Orient Longman, Bombay 1977.
4. "Accident Prevention manual for industrial operations" N.S.C., Chicago, 1982.
5. Dinko Tuhtar, "Fire and explosion protection

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-OET…43	Finite Element Method	3	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, discretization, 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 functions, Convergence requirements, Pascal triangle, Shape function for linear and plain elements, Shape functions using Lagrange polynomials. Shape functions for serendipity family elements, Degrading technique for nodes.

UNIT- III

Strain displacement matrix: Strain-displacement matrix for linear and plain element, 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 & trusses. 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 vs mesh refinement.

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, Ritz technique, Isoparametric formulations.

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, torsion of non-circular shafts.

Text Books:

1. K.H Huebner, and E.A., Thorton, "The Finite Element Methods for Engineers" John Wiley & Sons.
2. R.D. Cook, Malkus, D.S. and Plesha, M.E., "Concepts and Applications of Finite Element Analysis", 3 rd Ed., John Wiley & Sons.
3. S.S. Rao, Finite Element Method in Engineering, Butterworth Heinemann.
4. Bathe, K.J., "Finite Element Procedures", Prentice Hall of India, New Delhi.
5. Zienewiccz, 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. Seshu, 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	IP8-PET…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, component of fluid power system. Force pressure and head .Specific weight, density specific gravity, bulk modules, 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 thought mechanical linkage, hydraulic cylinder cushions, and hydraulic shock absorber.

UNIT –III

Hydraulic motors: Introduction, limited rotation 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 valve: Hydraulic components -pressure-flow-direction controls valves –proportional, servo, cartridge (logic) valves. Hydraulic fuses

UNIT –IV

Hydraulic Conductor and Fittings: Introduction, conductor sizing for flow rate requirement, pressure rating of conductors, steel pipes, steel tubing, plastic tubing, flexible hoses, quick disconnect couplings, metric steel 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, motor braking system, analysis of hydraulic system

UNIT –V

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

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

Text books

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

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-PET…72	Robotics and Robot Applications	3	1	-	4	Max Marks-60 Min 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, repeatability, accuracy and precision, human arm characteristics, robot specification and notations, concept of robots programming, the future prospects.

UNIT – II

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

UNIT – III

Symbolic Modeling of Robots, Direct Kinematic Model: Mechanical structure and notations, description of links and joints, kinematic modeling of the manipulator, Denavit, Hartenberg (D-H) representation, kinematic relationship between adjacent links, manipulator, transformation matrix, Arm 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 – V

Robot Controller & Applications: Linear control of robot manipulation, 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 application for sustainable development & social issues.

Text Books

1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers - Yoram Korean- McGrew 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.Gonzalex, C.S.G.Lee- McGrew Hill Book co.
5. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co
6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall
7. Kinematics and Dynamics of Machinary - J.Hirchhorn - McGrew HillBook Company

Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-PET…73	Powder Metallurgy and Ceramics	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

POWDER METALLURGY AND CERAMICS

UNIT – I

Introduction: Steps In powder metallurgy, advantage application limitation and recent trends.

Powder production methods and Properties: Metal production methods: Aromatization, Mechanical (Milling), Electro deposition, Spray drying. Powder Treatment- Screening, cleaning, annealing, and lubrication. Powder treatment and handling , coating and pyrophoracity, 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 method, classification of parts. Cold Iso-static 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, Dispersions strengthened materials ,Cutting tool materials, Cemented carbides and tools, cermet.

UNIT – IV

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

UNIT – V

Advance powder metallurgical process technique- atomization and its types , process parameters and characteristics, mechanical alloying , process types and parameter , metal injection molding , steps, requirement, design application and defect .

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

Text Books:

1. Powder metallurgy by P.C.angelo, R. subramanian by PHI publication
2. Fundamentals of Powder Metallurgy :G.S.Upadhaya Cambridge International Science Publishing 1998
3. Fundamentals Principles of Powder Metallurgy : W.B.Jones Edward Arnold Publishing
4. First Course in Powder Metallurgy: Henry Hauser Chemicals Publishing Company
5. Handbook Of Powder Metallurgy : Hausner H.H and Mal M.K. Second Edition , Chemicals Publishing Company
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