

MINUTES

The board of studies (BOS) of Mechanical Engineering of Faculty of Engineering & Technology met on 22/10/2011 at 10:00AM. Following members attended it.

1. Dr. J. Ram Kumar	External Expert	Present
2. Dr. O.P.Upadhyay		Present
3. Mr. M.S.Karuna		Present
4. Mr. M.K.Singh	In-charge Head	Present
5. Mr. T.U.Siddiqui		Present
6. Mr. S.K.Chaurasia		Present
7. Mr. Vishal Saxena		Present

In the meeting, following recommendations were made-

1. The course structure and syllabus of Mechanical Engineering (Which is enclosed) was discussed in details and passed it for placing in Faculty Board and Academic Council for approval.
2. Also list of examiners for the session (2011-12) was approved as enclosed with the recommendation of that the list of examiners will be valid till the next BOS meeting of Mechanical Engineering Department.
3. The BOS showed great concern over the non availability of latest equipments in the department particularly. Following items/equipment shall be purchased in the department to strengthen the Lab facilities and academic environment.
4. Engineering graphics course ME-107T was moderated and customized.
5. Syllabus of Basic of Mechanical Engineering was formalized, discussed and approved.
 - 20 more computer systems of latest configuration to be procured in CAD/CAM Lab so that software could run on them without hanging.
 - Oil/Electric furnaces to be purchased for setting up casting lab in workshop of department. Universal Testing Machine may either be repaired/procured in Mechanics of solid lab.
 - Industrial Engg. Lab should be set up in the department; 10 separate computer systems should be procured as soon possible.
 - 'Arena' & 'Delmia' software, latest version for at least 05 user should be procured for simulation and analysis in Industrial Engg. Lab.
 - Conference, Seminar/Special lectures should be organized from time to time to in order to boost the morale and academic/research environment in the department.
6. The position of teaching post which are vacant as per AICTE/University norms must be filled as soon as possible.

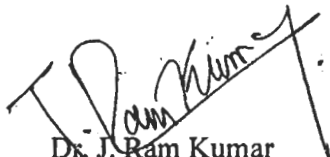
7. The Board members have shown great concern about non availability of Sr. Technician/Lab Technician/Workshop attendants as per AICTE norms. Therefore students of Labs suffer in spite of availability of equipments/items in the Lab. Particular reference was taken of workshop where five shops are being run with only one trained person. University administration is requested to look in to the matter and expedite the process of keeping trained person as Technicians/attendants so that the deficiency of staff is removed. Till that time some alternative arrangement of staff is done immediately. Prior BOS meetings held in the department had recommended above matter, but no action could be taken up, therefore again University is requested to take matter seriously with some suitable outcome.

The meeting ended with a vote of thanks to the Chair.

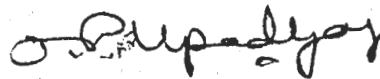
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LIST OF MEMBER OF BOS IN DEPARTMENT OF
MECHANICAL ENGINEERING




Dr. J. Ram Kumar
(External Expert)



Dr. O.P. Upadhyay

Mr. M.S. Karuna


Mr. Vishal Saxena



Dr. T.U. Siddiqui



Mr. S.K. Chaurasia



Mr. M.K. Singh
(Incharge Head)

**Scheme of courses for B.Tech mechanical engineering
IST YEAR**

B.Tech I year, I Semester

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L T P	Total
1.	PH-101T	Engineering Physics-I	4	3 1 0	4
2.	CY-101T	Engineering Chemistry	4	3 1 0	4
3.	MA-101T	Engineering Mathematics-I	4	3 1 0	4
4.	HU-101T	Communicative English	3	3 1 0	4
5.	CS-101T	Computer Programming and Fundamentals	3	2 1 0	3
6.	ME-101T	Manufacturing Techniques	2	2 0 0	2
7.	ME-103T	Engineering Graphics	3	1 2 0	3
		Total	23		24
Laboratory Courses					
8.	PH-101P	Engineering Chemistry Lab	2	0 0 3	3
9.	CS-101P	Computer Programming Lab	2	0 0 3	3
10.	ME-101P	Workshop Practice Lab	2	0 0 3	3
		Total	6		9
		G. Total	29		32

B.Tech I year II Semester

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L T P	Total
1.	EI-102T	Basic Electronics Engineering	4	3 1 0	4
2.	MA-102T	Engineering Mathematics-II	4	3 1 0	4
3.	EE-102T	Basic Electrical Engineering	4	3 1 0	3
4.	PH-102T	Engineering Physics-II	4	3 1 0	4
5.	CY-102T	Environmental Studies: Scientific & Engineering Aspects.	3	3 0 0	3
6.	HU-102T	Fundamental of Economics	3	3 0 0	3
7.	ME-104T	Basic Mechanical Engineering	4	3 1 0	4
		Total	26		27
Laboratory Courses					
8.	CY-102P	Basic Electronics Lab	2	0 0 3	3
9.	EC-102P	Engineering Physics lab	2	0 0 3	3
10.	CS-102P	Basis Electrical Engineering Lab	2	0 0 3	3
		Total	6		9
		G. Total	32		36

B.Tech II year III Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L T P	Total
1.	ME-201T	Kinematics of Machines	4	3 1 0	4
2.	ME-203T	Production Processes-I	4	3 1 0	4
3.	ME-205T	Fluid Mechanics	4	3 1 0	4
4.	MA-201T	Engineering Mathematics - III	4	3 1 0	4
5.	ME-207T	Material Science	4	3 1 0	4
6.	ME-211T	Machines Drawing	4	2 2 0	3
Total			24		23
Laboratory Courses					
7.	ME-201P	Kinematics of Machines Lab	2	0 0 3	3
8.	ME-203P	Production lab	2	0 0 3	3
9.	ME-205P	Fluid Mechanics Lab	2	0 0 3	3
Total			6		9
G. Total			30		32

B.Tech II year IV Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L T P	Total
1.	ME-202T	Dynamics of Machines	4	3 1 0	4
2.	ME-204T	Mechanics of Solids-I	4	3 1 0	4
3.	ME-206T	Internal Combustion Engines	4	3 1 0	4
4.	ME-208T	Production Processes-II	4	3 1 0	4
5.	ME-210T	Principal of Machine Tool Design	4	3 1 0	4
6.	EE-202T	Elements of Electrical Machines	4	3 1 0	4
Total			24		24
Laboratory Courses					
7.	ME-202P	Dynamics of Machines Lab	2	0 0 3	3
8.	ME-204P	I.C. Engines lab	2	0 0 3	3
9.	EE-202P	Electrical Machines Lab	2	0 0 3	3
Total			6		9
G. Total			30		33

B.Tech III year V Semester Mechanical Engineering

Sl. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-301T	Mechanics of Solids-II	4	3 1 0	4
2.	ME-303T	Mechanical Engineering Design-I	4	3 1 0	4
3.	ME-305T	Energy Conversion	4	3 1 0	4
4.	ME-307T	Heat Transfer	4	3 1 0	4
5.	ME-309T	Mechanical Measurement and Metrology	4	3 1 0	4
6.	ME-311T	Production Management	4	3 1 0	4
		Total	24		24
Laboratory Courses					
7.	ME-301P	Mechanics of Solid Lab	2	0 0 3	3
8.	ME-303P	Heat & Mass Transfer lab	2	0 0 3	3
9.	ME-305P	Mechanical Measurement Lab	2	0 0 3	3
		Total	6		9
		G. Total	30		32

B.Tech III year VI Semester Mechanical Engineering

Sl. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-302T	Computer Aided Design	4	3 1 0	4
2.	ME-304T	Mechanical Engineering Design-II	4	3 1 0	4
3.	ME-306T	Production Planning & Control	4	3 1 0	4
4.	ME-308T	Turbo & Fluid Machinery	4	3 1 0	4
5.	ME-310T	Operation Research	4	3 0 0	4
6.	ME-***	Elective-I	3	3 1 0	4
7.	EI-301T	Microprocessor and Applications	3	3 1 0	4
		Total	26		28
Laboratory Courses					
7.	ME-302P	CAD Lab	2	0 0 3	3
8.	ME-301P	Microprocessor lab	2	0 0 3	3
9.	ME-306P	Turbo & Fluid Machinery Lab	2	0 0 3	3
		Total	6		9
		G. Total	32		33

Student has to undergo a summer training of 45 days at the end of VI Sem.

B.Tech IV year VII Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	**	Open Elective (Offered by Science and Humanities Department.)	3	3 0 0	3
2.	***	Pool Elective (Offered by Engineering departments.)	4	3 1 0	4
3.	ME-403T	Computer Aided Manufacturing	4	3 0 0	4
4.	ME-415T	Value Engineering	4	3 1 0	4
5.	ME-405T	Seminar	2	0 0 3	3
6.	ME-***	Elective-II	4	3 1 0	4
7.	ME-401	Industrial Training (viva)	3	-----	-----
		Total	24		22
Laboratory Courses					
8.	ME-402P	Industrial Engg. Lab	2	0 0 3	2
9.	ME-403P	CAM Lab	2	0 0 3	3
10.	ME-405P	Project-I	2	0 0 3	3
		Total	6		8
		G. Total	30		29

B.Tech IV year VIII Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-***	Elective III	4	3 1 0	4
2.	ME-***	Elective-IV	4	3 1 0	4
3.	ME-406T	Refrigeration & Air Conditioning	4	3 1 0	4
4.	ME-***	Elective –V	4	3 1 0	4
		Total	16		16
Laboratory Courses					
5.	ME-406P	Refrigeration & Air Conditioning lab	2	0 0 3	3
6.	ME-404P	Project-II	10	0 1 5	06
		Total	12		09
		G. Total	28		25

LIST OF POOL ELECTIVES

SI. No.	Course No.	Subject
1.	ME-473T	Work Study
2.	EC-475T	Audio Engineering
3.	EC-477T	Integrated Circuit Technology
4.	CS-479T	Artificial Intelligence
5.	CS-481T	Image Processing

The above list is subject to expansion/modification.

LIST OF OPEN ELECTIVES

Sl. No.	Course No.	Subject
1.	HU-491T	Principal of Management
2.	MA-491T	Operations Research
3.	CY-491T	Charge Transfer in Plasma
4.	HU-493T	Introduction to Psychology
5.	CY-401T	Polymeric Materials and their Applications
6.	PH-419T	Futuristic Materials
7.	PH- 429T	Material Imperfection and Applications
8.	HU-402T	Engineering Economics
9.	HU-409T	Quantitative Methods in Economics
10.	HU-407T	Foreign Trade

The above list is subject to expansion/modification.

LIST OF DEPARTMENTAL ELECTIVES

Elective-I		
Sl. No.	Course No.	Subject
1.	ME-316T	Automotive Mechanics
2.	ME-318T	Statistical Quality Control
3.	ME-407T	Power Plant Engineering
4.	ME-409T	Composite Materials
5.	ME-413T	Tribology
6.	ME-417T	Advanced Manufacturing Systems
7.	ME-408T	Advance Precision Machining Processes
8.	ME-414T	Non Conventional Energy Sources
9.	ME-412T	Mechanical Vibration
10.	ME-416T	Gas Dynamics
11.	ME-418T	Maintenance Management
12.	ME-422T	Principles of Robotics

B.Tech. FIRST YEAR (FIRST SEMESTER)

PH-101

Physics-I

Credits-4 LPT(310)

Interference: Coherent sources, Theory of interference, displacement of fringes, Fresnel's biprism experiment, Interference in thin film, wedge shaped film, Newton's rings.

Diffraction: Basic idea of Fresnel & Fraunhofer diffraction, single, double and n slit diffraction, diffraction grating, Rayleigh's criterion of resolution, resolving power of telescope, microscope and grating.

Polarization: Phenomenon of double refraction, Malus law, Nicol prism, quarter wave and half wave plates, production and analysis of plane, circularly and elliptically polarized light, optical activity, specific rotation, Lorentz half shade and biquartz proarimeters.

Wave Mechanics: Elementary idea of quantization, black body radiation, Frank-Hertz experiment, Photoelectric effect. Wave particle duality, De Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's wave equation, physical significance of wave function, applications of Schrodinger's wave equation: (i) Particle in one dimensional box. (ii) Potential Step (iii) Potential barrier-quantum mechanical tunneling (Basic idea).

Solid State Physics: Structure of crystalline solid: Lattice translational vectors, unit cell, Bravais lattice, Miller indices and simple crystal structures.
Free electron model: Free electron gas in one and three dimensions, Fermi energy, Density of states, Heat capacity of the electron gas, failure of free electron model.
Band theory: Kronig Penny model, motion of electrons in one dimension according to the band theory, effective mass of an electron, concept of hole, distinction between metals, insulators and intrinsic semi-conductors.

Books:

- 1) Geometrical & Physical Optics: B.K.Mathur
- 2) Introduction of Solid State Physics: C. Kittel
- 3) Solid State Physics: A.J. Dekkar
- 4) Quantum Mechanics: Singh and Bagdel
- 5) Optics: Ajai Ghatak
- 6) Quantum Mechanics: B.K. Agarwal & Hari Prakash
- 7) Optics: A.H. Flower
- 8) Geometrical & Physical: Zenkin's & White
- 9) Quantum Mechanics: Eisberg

**Chemistry
CY-101**

LPT(310)

Schrödinger equation: origin of quantization; applications of particle in a box problem; hydrogen atom; properties of atomic orbitals; many electron atoms; molecular orbital theory; bonding and intermolecular forces. **Thermodynamics:** Fundamental definition and concepts of thermodynamics; Work, heat and energy; First law: C_p and C_v ; Second law: entropy; Helmholtz and Gibbs Energy; chemical potential; Third law; phase equilibria; chemical equilibrium. **Chemical kinetics:** Rate laws; elementary reaction and chain reaction. **Periodic table and periodic properties:** basis of periodic table, trends in size, electron affinity, ionization potential and electro negativity, Use of Ellingham diagram and thermodynamics in the extraction of elements; Transition metal chemistry: inorganic complexes, isomerism, nomenclature; bonding in transition metal complexes; valence bond and crystal field theory, magnetism, bonding aspects, structural distortion; Bioinorganic chemistry: storage and transport proteins; Catalysis: hydrogenation, hydroformylation and olefin metathesis. **Organic Chemistry:** Hückel treatment of ethylene, butadiene and benzene, concept of aromaticity, configuration, molecular chirality and isomerism, conformation of alkanes and cycloalkanes, reactivity of carbonyl groups (additions, addition-eliminations, reactions due to acidic proton, reactivity of acid halide, ester and amide), functional group inter-conversions involving oxidation and reduction. Introduction to bio-organic chemistry: carbohydrates, amino acids proteins and nucleic acids. Polymer chemistry definition, classification of polymers, orientation of polymers, types of polymerization, Mechanism of addition and condensation polymerization, thermo plastic and thermo setting revious: Important thermosetting and thermoplastic polymers: eg. Bakelite, polyester, cellulose derivatives, PVC, Poly ethylene, Teflon, Polystyrene, Nylon Natural and synthetic rubbers.

Suggested Books

1. P.W. Atkins, **Physical Chemistry** (7th Edition), Oxford University Press, 2006.
2. I. A. Levine, **Physical Chemistry**, McGrawHill, 2009
3. D.A. McQuarrie and J.D. Simon, **Physical Chemistry -a Molecular Approach**, Viva Books Pvt. Ltd., 1998.
4. R.T. Morrison and R.N. Boyd, **Organic Chemistry**, Prentice Hall of India Pvt. Ltd., 5th Ed, 1990
5. G. Solomons and C. Fryhle, **Organic Chemistry**, John Wiley & Sons (Asia) Pte Ltd.
6. J.D. Lee, **Concise Inorganic Chemistry**, (5th Edition), ELBS, 1996.
7. D. F. Shriver and P. W. Atkins, **Inorganic Chemistry**, Oxford University Press, 2006
8. F.W.Bill mayer, **Polymer Science**, Tata McGraw Hill.

B.Tech. First Semester Paper: Mathematics-I Paper Code: MA-101

Note: A setting of eight questions will be there covering all the units proportionally out of which any five are to be attempted.

- UNIT:1 **Differential Calculus:** Limit, continuity and differentiability of functions of single variable. Successive, Differentiations, Leibnitz Theorem, Expansion of functions by Maclaurin's and Taylor's theorems. Functions of several variables: Partial derivatives, Euler's theorem, change of variables, total differential coefficients, maxima and minima, Lagrange's method of multiplier.
- UNIT:2 **Integral Calculus:** Fundamental and mean value theorems of integral calculus. Reduction formulae, Walli's formula, Beta and Gamma functions, Double and Triple integrals, change of orders of integrations. Area enclosed by plane curves, surfaces and volumes of revolutions.
- UNIT:3 **Vectors and Matrices:** Differentiations and integrations of vectors. Gradient, Divergence and Curl. Vector identities, Green's, Gauss's and stoke's theorems with applications.
Types and algebra of matrices, rank, solution of simultaneous linear equations, Eigen values and Eigen vectors, diagonalisation of matrices, Cayley-Hamilton Theorem.

References

1. E.Kreyszig: Advance Engineering mathematics, John Wiley & Sons, 2005.
2. B.V.Ramana: Higher Engineering Mathematics, Tata McGraw Hill Co. Ltd., 2008
3. R.K.Jain & S.R.K. Iyenger: Advance Engineering Mathematics, Narosa Publishing House, 2002.
4. J.C. Sharma: Vector Algebra, Students & Friends Co. Ltd. Agra.
5. J.K.Goel & K.P.Gupta: Matrix algebra, Students & Friends Co. Ltd. Agra.
6. H.K.Dan: Advanced Engineering Mathematics.

English Language and Literature Lab HU 101 LPT 310

This course has a double purpose. It introduces literature and its forms and also helps students learn the English language. The linguistic aspect will be dealt with by concentrating on the dictionary skills and introducing principles of pronunciation, vocabulary development, and syntax. The main topics include:

- (a) **Pronunciation:** basic sounds of English (vowels and consonants) and word-stress
- (b) **Vocabulary:** word-formation (prefixes and suffixes), synonyms and antonyms
- (c) **Syntax:** parts of speech, active and passive voice, direct and indirect speech, tenses, basic sentence patterns, etc. The literary aspect will be dealt with through suitable texts such

as poems, short stories and plays (chosen by the instructors). The main topics for discussion will be:

- (a) What is literature?
- (b) The nature of literary language (mainly “figurative” language)
- (c) The literary forms or genres
- (d) Literature and socio-cultural context

Pre-Requisites of Scientific Writing: Salient features: BOCUST formula. Grammatical pre-requisites: Usage, Sentence fragments, questions tag, Modifiers, connectives Split infinitives, Dangling participle Gereunds, ellipsis coherence & unity: Method.

CS-101 Computer Fundamental & Programming Credits 2(3-0-0)

UNIT 1: Introduction to Computers: Basic definition, Generation, Classification of computers, Introduction to Computer architecture. **Number Systems:** Introduction, Classification- Decimal, Binary, Octal, Hexa Decimal, and their convertibility, Data representation, ASCII, BCD, Gray Code. **Input/Output:** Input System, Input device- Keyboard, Mouse, Joystick, Lighten, MCR MICR, Touch Screen, Graphic Tablet, Voice Input System, Output System, Output Devices-VDU, Printers, Plotters.

UNIT 2: Planning The Computer Program: Purpose of program planning, Algorithms, Flowcharts, Decision Tablets, Pseudo code. **Memory:** Introduction, Characteristic, Main Memory, secondary memory, Back- Up Memory, Cache Memory, Primary Memory, Semiconductor Memory, Memory Management Unit.

UNIT 3: Basic Operating System Concept: MS-DOS, WINDOWS, Introduction to basic commands Of DOS, Evolution of Operating Systems, Batch Processing, Spooling, Multiprogramming, Multiprocessing, Time Sharing, On Line Processing, Real-Time Processing, Introduction to Internet, Basic Terms related with internet.

Computer Software:

Introduction to Software, Relationship between Hardware and Software, Types of Software, Acquiring software, Firmware.

UNIT 4: Programming in C: History, Introduction to C Programming, Language, Structure of C Programs, Compilation and Execution of C Programs, Debugging Techniques, Data Type and sizes, Declaration of Variables, Modifiers, Identifiers and Keywords, Symbolic constants, Storage Classes(Global, Automatic, External, Register, And Static), Enumerations, Command line Parameters, Macros, The C Preprocessors.

UNIT 5: Operators: Unary Operators, Arithmetic and Logical Operators, Bit wise Operators, Assignment Operators, Expressions, Conditional Expressions, Precedence and order of evaluation. **Control Statements:** if-else, switch, break, continue, the comma operator, Goto statement. **Loops:** for, while, do-while.

Functions: Built-in and user-defined, Function declaration, Definition and Function call, parameter passing, call by value, Call by reference, Recursive Functions, Multifile programs. **Arrays:** Linear Arrays, Multidimensional Arrays, Passing array to functions, Arrays of strings.

UNIT 6: Structure And Union: Definition and differences, Self-referential Structure. **Pointers:** Introduction, Accessing the address of a variable, Declaring & Initializing pointers, Accessing a variable through pointer, Pointers and Arrays, Pointers and character strings, Pointers and functions.

References:

- 1) Computers Fundamental by Rajaraman
- 2) Computers Fundamental by B. Ram.
- 3) Computers Fundamental by P.K. Sinha.
- 4) 'Programming in C' by E. Balagurusamy, TMIL.
- 5) 'Let Us C' by Yashwant Kanetkar, Narosa.
- 6) Exploring 'C' by Yashwant Kanetkar

ME-101

MANUFACTURING TECHNIQUES

Credit:02

L T P Total

Max. Marks:

2 0 0 02

Unit:1 Carpentry:-

Wood, timber-exogenous & endogenous, Cross section of an exogenous tree, Seasoning of wood, Seasoning methods, defects (Both natural and that occurs during conversion), Brief description of carpentry tools, various carpentry process. Carpentry joints.

Unit:2 Pattern & Pattern making:-

Pattern, types of pattern (Single piece, split, Match plate, Sweep, Loose piece, Gated patterns), Pattern making allowances, Design considerations in pattern making, pattern making materials, Core prints.

Unit:3 Foundry:-

Moulding materials, types of foundry sands; characteristics of foundry sands; Binders & additives; moulding procedures: Floor moulding, Bench moulding, Pit moulding, Machine moulding, Green sand moulding, Dry sand moulding, CO₂, Core making processes.

Unit:4 Foundry' tools & equipments:-

Tools used in foundry (hand tools); moulding machine- (Jolt machine, Squeezing machine,

Sand Slinger, Push off machine), Furnaces (Pit furnace, cupola furnace).

Unit:5 Welding:-

Welding: Pressure and non-pressure, arc welding (AC and DC arc welding, Introduction to Carbon arc welding, metal arc welding, TIG & MIG welding); Electric resistance welding (Spot, seam, projection, But, thermit welding), welding tools and equipments, Gas welding (oxyacetylene).

Unit:6 Bench work & fitting:-

Tools (holding tools, striking tools, cutting tools), various operations performed in fitting shop (detailed).

Unit:7 Machine tools: Definition, types.

Lathe specifications; Lathe operations in brief (facing, plain turning, step turning, taper turning, threading, drilling and boring). Milling machine (introduction & brief description of operations only).

Unit:8 Jigs & Fixture: Introduction, Location points, Basic Design of Jigs & Fixture, Types of Jigs & Fixture.

Text Book:

A text Book on workshop technology by B. S. Raghuvanshi

Reference Book:

Workshop technology by Hazara & Chaudhry,

Production technology by R.'K.Jain

ME-103	ENGINEERING	GRAPHICS (I year: I Sem)			
Credits: 03		L	T	P	Total
Max. Marks:		1	2	0	03

Unit:1 Importance of Engineering Drawing, Engineering Drawing Instruments and uses, Layout of Drawing sheet, Lettering and Dimensioning, Types of Lines. Scales: What is scale, Representative factor, Types of Scale: Plain, Diagonal and Vernier scales, Metric Measurements and conventions, Plain Scale, diagonal scale& vernier scale(forward & backward both).

Unit:2 Conic Section, Definition, and different methods of construction of ellipse, hyperbola and parabola by Eccentricity method Construction of parabola and ellipse by Concentric circles method, Oblong method, Parallelogram method.

Unit:3 Projections, Principle, types and conventions, Theory of Projections and orthographic projections:- Introduction, Types of projections, Orthographic projections, Planes of Projection, Four quadrants, Types of orthographic projections, (a) Projections of point and straight lines, (b) Projections of lines inclined to both the planes, Projection of planes, (a) Projection of solids (b) Projection of solids inclined to both H.P. & V.P. (of prisms pyramids etc).

Unit:4 Isometric Projections: Theory of isometric projection- Isometric lengths, Isometric scales:- Methods to draw Isometric view or projection, various positions of Isometric axes. Isometric projection with isometric lines, non-isometric lines and with curved & circular surfaces.

Recommended Text Book

1. A Text book of Engineering Drawing (Geometrical Drawing) by R.K. Dhawan
2. Engineering Drawing & Graphics, by K.Venugopal Rao
3. Engineering Drawing by P.S. Gil
4. Engineering Drawing by N. D. Bhatt

Subject: Basic Electronics

Code: EI-101T

Credits: 4

Branches: all branches

Sem: I/II Semester

L P T: 3 1 0

Unit 1:- Introduction of Semiconductor Physics: Band Theory of solids, Insulator, Semiconductor & Metals, Mobility and Conductivity, Electrons and holes in an intrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, n-type material, p-type material, Donor and Acceptor impurities, Charge densities in a semiconductor, Hall-effect, Diffusion, the continuity equation, Fermi level in a semiconductor having impurities.

Unit 2:- Junction Diode Characteristics: p-n junctions, Forward bias, Reverse bias junction, V-I characteristics, Effect of temperature on a p-n junction diode, Maximum temperature operation, Reverse breakdown voltage, Capacitive effects in a p-n junction diode, Space charge capacitance, Diffusion capacitance, Diode Resistance, Static and Dynamic Resistance, Comparison of practical with ideal diode, load line analysis of a diode circuit.

Unit 3:- Rectifying Circuits and DC Power supplies: p-n junctions as an rectifier, form factor, average voltage and current, half wave & full wave rectifier, voltage regulation, Ripple factor, Bridge rectifier, Comparison of rectifier circuits, Filter circuits for power supplies, inductor filter, capacitor filter, Effect of capacitor series resistance, Peak inverse voltage of a half wave rectifier, LC filter, Comparison of filter circuits.

Unit 4:- Diode Applications: Clippers, Series and parallel, Clampers, Zener diodes, Zener diode specification, Voltage regulator circuits, Design of a voltage regulator circuits, Effect of supply voltage variations, Zener diode breakdown mechanism, Voltage multiplier circuits, voltage doublers, voltage Tripler, Quadrupoler.

Unit 5:- Bipolar Junction Transistor: The junction transistor, Transistor current components, transistor as an amplifier, Common base configuration. Early effect, the input and output

characteristics, Common emitter configuration I/O characteristics, Active, Saturation, Cut-off regions for both configurations, common collector configuration, common base current gain, common emitter current gain.

REFERENCES

1. Integrated Electronics: Analog and Digital Circuits and System by Millman, Halkias and Parikh, TMH, Second Edition.
2. Electronic Devices and Circuits, An introduction by Allen Mottershead, TMH.

Electronic Devices and Circuits theory by Robert L. Boylestad, Louis Nashelsky,

B.Tech. Second Semester
Paper: Mathematics-II
Paper Code: MA-102

Note: A setting of eight questions will be there covering all the units proportionally out of which any five are to be attempted.

- UNIT:1 **Numerical Techniques:** Numerical solution of algebraic and transcendental equations by Bisection method, Secant method, Regula-Falsi and Newton-Raphson methods. Numerical integration by Gauss quadrature formula, Trapezoidal rule, Simpson's rule and Weddle's rule. Numerical solution of ordinary differential equations by Euler's method, Milne's method and Runge-Kutta method.
- UNIT:2 **Probability and statistics:** Definitions of probability and simple theorems, conditional probability, Baye's Theorem, random variables, discrete and continuous distributions, Binomial, Poisson and normal distributions, correlation and linear regression.
- UNIT:3 **Complex Analysis:** Analytic functions, C-R equations in Cartesian and polar forms, Harmonic functions, Milne-Thomson method, complex integration, Cauchy's theorem, Cauchy's integral formula. Liouville's and Morera's Theorems, Taylor's and Laurent's theorems. Residues: Cauchy's residue theorem, evaluation of real integrals of the type $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$ and $\int_{-\infty}^{\infty} f(x) dx$.

References

1. E.Balagurusamy: Numerical Methods, Tata McGraw Hill, 2008.
2. Devi Prasad: An introduction to Numerical analysis, Narosa Publishing House, 2006.
3. J.B.Conway: Functions of one complex variable, springer verlag, International Students Edition Narosa Publishing House, 1980.
4. A.M.Goon, M.K.Gupta & B.Das Gupta: Basic Statistics, The world Pren Pvt. Ltd., Calcutta, 1991.
5. L.V.Alhfors: Complex analysis, Tata McGraw Hill, 1979.

UNIT 1: Basic Concept: Definitions & units, Introduction to Basic Laws, Circuit Elements, KVL, KCL, Ideal & Real Sources, Dependent & Independent Sources, Conversion of Voltage Source into Current Source & vice Versa, Controlled and Uncontrolled Sources, Loop and Nodal Method of analysis, Star to Delta Transformation & vice-versa.

UNIT 2: Magnetic Circuit: MMF, Flux, Reluctance, Magnetic Effect of Electrical Current, Hysteresis & Eddy Current Losses.

UNIT 3: Network Theorems: Superposition, Thevenin, Norton, Maximum Power Transfer & Reciprocity Theorems.

UNIT 4: Steady-State Response: Steady-State Response of Circuit to Sinusoidal functions, Phasor Representation of Sinusoids, Concept of Complex Impedance, Series & Parallel AC Circuits, Series & Parallel resonance

UNIT 5: Balanced Three-Phase Circuit: Generation of Three Phase Voltage, Star/Delta Connected Supply, Balanced Load Circuits, Line and Phase Voltage & current Relations. Concept of Three Phase Power.

UNIT 6: Transient: Response of RC, RL & RLC Circuit to DC Excitation only (simple problem).

UNIT 7: Instruments: Introduction to MI,MC Instruments, Extension of range, Dynamometer Type Wattmeter, Simple problems based on these instruments.

Books:

- 1) Basic Circuit Theory by L.P.Huelsman, PHI.
- 2) Hughes Electrical Technology by M.Smith, Addison-Wesley Pub
- 3) Electrical Technology by B.L.Theraja.
- 4) Electrical Engineering Fundamentals by V.Deltoro, PHI

B.Tech. FIRST YEAR (SECOND SEMESTER)

PH-102

Physics-II

Credits-4 LPT(310)

Dielectric Properties of Materials: Polarization of dielectrics, dielectric constant, electric susceptibility, non-uniform polarization, electric displacement vector, Lorentz local field, Polarizability, Clausius-Mosotti relation, frequency dependence of dielectric constant.

Magnetic Properties of Materials : Magnetization, three magnetic vectors (B.M & H), susceptibility and permeability, Dia, Para, and ferromagnetism, Magnetic domains, hysteresis, Ferro electricity & Piezoelectricity.

Maxwell's Equations: Displacement Current, Maxwell's equation in vacuum & medium (Integral and Differential forms), Poynting theorem, Poynting vector.

Electromagnetic Waves: Wave equation, plane waves, Propagation of electromagnetic waves through non-conducting medium, reflection and transmission.

Superconductivity: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, BCS theory (Qualitative), high temperature superconductors. Characteristics of superconductors in superconducting state, applications of superconductors.

Nuclear Physics: Basic properties and constituents of nucleus, mass defect, packing fraction and binding energy, semi empirical mass formula, elementary idea of nuclear forces and their characteristic properties, Nuclear fission, important components and working of nuclear fission reactor, Basic Concept of nuclear fusion reactors.

Books:

- 1) Electricity and Magnetism: Berkley Physics Course-II.
- 2) Electromagnetic waves & Radiating systems: Jordan and Keith.
- 3) Solid State Physics: C.Kittel
- 4) Nuclear Physics: I. Kaplan
- 5) Modern Physics: A.Beiser
- 6) Electrodynamics: d.Griffith.

Environmental Studies: Scientific and Engineering Aspects

ME-102

L P T(3 0 0)

Multidisciplinary nature of environmental studies, Ecosystems, Biodiversity and its conservation, Indicators of environmental pollution, Environment and human health. Consumption of natural resources and environmental degradation of forests, water, coal,

minerals, energy, and land. Sustainable development, Environmental policy and legislation, Environmental impact assessment. Pollution of lakes, rivers, ground water, coasts, and oceans, Science and technology for drinking water and wastewater treatment and issues in management of systems. Solid and hazardous waste management: causes, effects and control measures. Air and noise pollution, science and engineering of pollution control, Global Issues including climate change, global warming, acid rain, ozone layer depletion, nuclear hazards, Disaster management, industrial accidents, floods, earthquakes, cyclones and landslides, Green house effect etc.

Suggested Books

1. W.P. Cunningham and M.A. Cunningham, **Principles of Environmental Science**, Tata McGraw-Hill Publishing Company, New Delhi, 2002.
2. J.A. Nathanson, **Basic Environmental Technology**, Prentice Hall of India, New Delhi, 2002.
3. S.J. Arceivala, and S.R. Asolekar, **Wastewater Treatment for Pollution Control and Reuse** (3rd Edition), Tata McGraw Publishing Co. Ltd., New Delhi, 2006.
4. S.R. Asolekar, and R. Gopichandran, **Preventive Environmental Management: An Indian Perspective**, Foundation Books Pvt. Ltd., New Delhi, 2005. Some selected book-chapters, monographs and journal papers

Fundamentals of Economics

HU-102

LPT(300)

Microeconomics: What is Economics? basic economic problems and nature of economics; demand and supply; consumer choice; individual and market demand; production and cost of production; profit maximization and perfect competition; market structure-monopoly, monopsony, monopolistic competition, and oligopoly; externalities and public goods; factor markets-land, labour and capital market.

Macroeconomics: National income accounting-income, expenditure and components of GDP; consumption and saving; investment spending and demand for money; financial systems-central bank, money, credit, financial markets and asset prices; income and spending; money, interest and income; fiscal and monetary policies; economic growth and accumulation; aggregate supply-wages, prices and unemployment; inflation.

Suggested Books

1. R.S. Pindyck and D.L. Rubinfeld. **Microeconomics** (7th Edition), Pearson Prentice Hall, New Jersey, 2009.
2. R. Dornbusch, S. Fischer, and R. Startz. **Macroeconomics** (9th Edition), McGraw-Hill Inc. New York, 2004.

Credit: 04

L	T	P
3	1	0

A. Thermodynamics:

Unit: 1 **Fundamental Concepts and definitions:** Definition of thermodynamics, system, surrounding and universe, phase, concept of continuum, macroscopic & microscopic point of view. Density, specific volume, pressure, temperature. Thermodynamic equilibrium, property, state, path, process, cyclic process, Energy and its form, work and heat, Enthalpy.

Unit: 2 **Zerth Law:** Concepts of temperature, zeroth law.
First Law: First law of thermodynamics. Concept of processes, flow processes and control volume, flow work, steady flow energy equation, Mechanical work in a steady flow of process.
Second Law: Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator, Statements of second law. Carnot cycle, Clausius inequality, Concept of Entropy.

Unit: 3 **Properties of steam and thermodynamics cycles:** Properties of steam, use of property diagram, Steam-Tables, processes involving steam in closed and open systems. Rankine cycle.
 Introduction to I.C. Engines-two & four stroke S.I. and C.I. engines. Otto cycle, Diesel cycle.

B. Mechanics

Unit: 4 **Force system and Analysis:**
Basic Concept: Laws of motion. Transfer of force to parallel position. Resultant of planer force system. Free Body Diagrams, Equilibrium and its equation, Centre of gravity, Moment of Inertia.
Friction: Introduction, Laws of coulomb friction, Equilibrium of bodies involving dry friction-Belt Friction.

Unit: 5 **Stress and Strain Analysis:**
Simple stress and strain: Introduction, Normal shear stresses, stress-strain diagrams for ductile and brittle materials, elastic constants, one dimensional loading of members of varying cross sections, strain Energy.

Unit: 6 **Newton's Second Law:** D' alemberts Principle-problems (for horizontal & inclined surface). Analysis of lift, motion problem. Motion of several connection bodies, Motion of two bodies connected by as tiring, when one body is lying on horizontal surface and other is hanging free, when one body is lying on inclined plane and other is hanging free case (i) Smooth inclined surface case (ii) Rough inclined surface of co-efficient of friction ' μ' ' (only problems).

Work Power & Energy: work-Units of work-Problems (horizontal &

inclined surface). Power Derivation of the expression for power required to drive a body, problems energy, Types of energy problems. Laws of conservation of energy. Newton's law of conservation of momentum. Plastic impact & Elastic impact. Driving a pile into ground-problems. Motion of connected bodies, work done by spring.

Books:

- 1) Thermodynamics by P.K. Nag.
- 2) Thermodynamic by P.L. Ballaney.
- 3) Engineering Mechanics & Strength of Materials by R.K.Bansal (Chapter 6, 7 & 9) Lakshmi Publications, New Delhi.
- 4) Holman, J.P.: Thermodynamics, MC Graw Hill book Co. NY.
- 5) Yadav R.: Thermodynamics and Heat Engines. Vol I & II (SI Edition) Central Publishing House Allahabad.
- 6) Yadav R.: Steam & Gas Turbines.
- 7) Engineering Mechanics by S.S. Bhavikatti & K.G. Rajashekarappa (Chapter 9 & 10) New Age Publications, New Delhi
- 8) F.L. Singer: Strength of Materials.
- 9) Timoshenko: Strength of Materials.

ME.201T

KINEMATICS OF MACHINES (III Sem)

Credits:04

L	T	P	Total
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Max. Marks:

3	1	0	04
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1. **Basic Concepts:** Kinematic Quantities (Displacement, velocity, Acceleration), structure, machine, degree of freedom, mechanisms, Kinematic link, Kinematics Pairs, Kinematics chain, joints, Types of joints, inversion of Mechanism, four bar mechanism, Inversion of four bar mechanism, slider crank mechanism, Inversion of slider-crank mechanism, Inversion of double slider crank Mechanism, Grublers Equation, Kutzbach Criterion (Numerical problems).
2. **Kinematic Synthesis of linkages:** Type, Number and Dimensional Synthesis, Synthesis of dwell mechanisms Intermittent Rotary Motion problems Movability of four bar mechanism (Grashoffs Criterion), function generation, path generation, approximate & exact synthesis of function & path generation, chebyshev's spacing of accuracy points, function generation of four bar linkages (Freudenstein's Equation), function-generation of Slider-Crank mechanism using three accuracy points only, Three position synthesis, Bloch's Method of synthesis.
3. **Velocity in Mechanism:** Instantaneous Center Method-Analysis of reciprocating engine mechanism, Analysis of four bar mechanism, Number and types of instantaneous centres in mechanism, Method for locating an instantaneous Center, Kennedy Theorem, Procedure for locating instantaneous Centres, (Numerical problems).

- Relative velocity method- Velocities in four bar chain, velocities in slider-crank mechanism, rubbing velocity, Mechanical advantage. (Numerical problems)
4. Acceleration in Mechanism: Acceleration of a body moving along a circular path, Acceleration diagram for a link, Acceleration diagram for slider-Crank mechanism, Acceleration of intermediate and affect points. Coriolis acceleration Component. (Numerical problems)
 5. Analysis & Synthesis of cam follower mechanism, cam profile, pressure angle, cam size, Motions of followers, cycloidal motion, Cam profile construction with different followers.
 6. Gear: Introduction, Classification of gears, Basic terminology, Law of gearing, velocity of sliding Cycloidal profile teeth, In volute profile teeth, length of path of contact, length of arc Contact, interference, minimum no of teeth to required to avoid interference wheel and pinion helical gears, Spiral gears. (Numerical problems).
 7. Gear Train: Introduction, Types of gear trains-Simple, Compound, reverted, Epicyclic, velocity ratio of simple gear train, compound gear train, Epicyclic gear train, Sun and planet gear train, Compound epicyclic gear train. (Numerical problems)

Text Book:

- (i) Theory of Machines by Jagdish Lal
- (ii) Theory of Machines by P.L.Baloney
- (iii) Theory of Machines by S.S. Rattan

Unit:1 Static Force Analysis- Applied and Constraint forces, Free Body diagrams, Conditions for equilibrium, Friction-force models, Static force analysis with friction, gear force analysis.

Dynamic force Analysis- Inertia forces and D' Alembert's principle, Euler's Equations of motion, the principle of Superposition.

Unit:2 Dynamical System- Force on reciprocating parts of an engine. Considering friction and inertia of moving parts, Turning moment on Crank-shaft, Turning moment diagrams for different types of engines, Fluctuation of energy, Fluctuation of speed of Crank-shaft, Fly wheels, calculation of fly wheel size operation of a fly wheel in a punching press (Numerical problems).

Unit:3 Governors-Functions, type and analysis of following types of governors: Watt, Porter, Provel, Hartnell, Willson Harnell, Pickering. Hunting, Isochronisms, Stability, Efforts and Power of governors. Sensitiveness, controlling forces (Numerical problems).

Unit:4 Definitions, Types of friction, friction in screw jack, Limiting friction, friction in pivot and collar bearing, Disc and collars. Friction clutches-Disc clutch, Multi plate clutch, Centrifugal Clutch, Cone clutch.

Unit:5 Brakes- Types of brakes, shoe brake, Band brake, Band and block brake, Internal expanding shoe brake. (Numerical problems).

Dynamometer- Absorption dynamometer, Transmission dynamometer, Torsion dynamometer. (Numerical problems).

Unit:6 Power transmission in belt drives and gear trains, Condition of maximum power. Open flat belt drive, Cross belt drive, length of belt, ratio of belt tensions, Power transmitted by belt, V-belt drive, Rope drive, Chain drive, Centrifugal tension. (Numerical problems).

Unit:7 Balancing of rotating masses-in one plane, in different planes, Balancing of Reciprocating masses. Balancing of radial, In-line, V-engines. (Numerical problem)

Unit:8 Gyroscope-Principle and application of gyroscope. Gyroscopic Couple, Effect of Gyroscopic couple on the stability of automotive vehicles, Gyroscopic Power on the ships and aero-planes. (Numerical problem).

Unit:9 Vibrations- Free and Forced vibrations, Types of vibrations, whirling speeds, Damped vibrations, Forced- Damped vibrations, Logarithmic decrement, Torsional vibrations. (Numerical problems)

Reference Books:

1. Theory of Machines and Mechanisms by Joseph Shigley,
2. Theory of Machine by P.L. Balianey
3. Theory of Machine and Mechanisms by J. Lal
4. Theory of Machine by Dr. R.K. Bansal

Unit:1 Casting processes:-

Introduction, pattern and mould, melting pouring cooling and solidification mechanism of solidification, continuous casting process, Riser design and placement, generation of residual stresses, defects in castings, miscellaneous casting processes, inspection and testing of castings, Micro-welding.

Unit:2 Joining Processes:-

Introduction principles of solid phase welding, principles of fusion welding (Heat source, modes of metal transfer in arc welding, heat flow characteristics, gas metal reaction, cooling of fusion weld, principles of solid/liquid state joining, various joining processes, weld defects and inspection).

Unit:3 Mechanics of forming processes:-

Forming processes: Introduction, plastic deformation and field criteria , relationship b/w tensile and shear field stresses.

Unit:4 Powder Metallurgy:-

Definition, Principle & uses, Methods of Powder production, Mechanical pulverization, Electrolysis. Nano fabrication, nano materials, nano powders.

Unit:5 Non Destructive Testing:-

Principles, Types & Applications, Liquid penetrant test, Magnetic particle test, Radiographic & Ultrasonic testing.

Unit:6 Numerical controlled machine tools:- Introduction Definition, procedure for manufacturing through N-C machine tool sys. Classification of NC sys. Advantages and disadvantages of using NC machines, types of numerical controls.

Unit:7 Rapid prototyping operations:- Introduction, subtractive process, additive process, virtual prototyping, applications.

Reference Book:

1. Production Engineering by R.K.Jain
2. Manufacturing Engineering & Technology by S.Kalpakajian, S.R. Schmid
3. Manufacturing Engg. & Technology by Degarmo
4. Manufacturing Science by Amitabha Ghosh, A.K. Mallik

Unit:1 Simple Stress & Strains:-

Stress-Strain & types-Elastic limit, Hooke's Law, Young Modulus of Elasticity (E), Poisson's ratio ($1/m$)-Bars of Varying C_s , with derivation, compound bars (Composite section). Relationship between volumetric stress and linear strains along any 3 mutually perpendicular directions. Temperature stresses in compound bars. Yield stress, working stress, Factor of safety, Ductile & brittle materials, Stress-Strain Curve for a ductile material, Saint Venant's principle and numerical problems.

Unit:2 Bending Moment and Shear force diagram:

Introduction's and B.M. diagrams. Sign conventions for SF and B.M. Determinate structures & indeterminate structures. SF and B.M. diagrams for simply supported beams with a point load at mid point, Eccentric point, Beam carrying UDL, Beam carrying UVI, Overhanging beams, Beams carrying inclined loads, Beams subjected to couple-problems relations between loads-shear force and bending moment.

Unit:3 Principle Stresses and Strains:-

Simple stress & compound stress, General two dimensional or biaxial stress system expression for Normal & tangential stress for a general 2D stress system-Principle stress & principle planes- expressions for principle stress & directions of principle planes. To show that shear stress on principle planes is zero. To show that sum of the normal stresses on any two mutually plane is a constant in a general 2D stress system. Derivation of the expression for max. shear stress & directions of planes carrying max. shear Stress Graphical method-Mohr' circle

Unit:4 Thin cylinders:-

Hoop or Circumferential stresses. Longitudinal stresses. Max shear stress. Design of thin cylindrical shells, spherical shells.

Unit:5 Column & Struts:-

Types of column. Slenderness ratio. Effective length (l) (Derivation). Long and Short columns. Formulae, assumption made in deriving Euler's formula, limitation for Euler's formula. Rankine's formula, tutorials. Problem.

Unit:6 Deflections:-

Slope, deflection & Elastic Curve. Derivation of the differential equation for slope deflection. Macaulay's method. Tutorials for various types of beam carrying various types of loads

Unit:7 **Bending Theory:-**

Homogenous & isotropic materials. Pure bending. Neutral axis. Derivation of the Bending Equation $M/I = F/Y = E/R$ Variation of bending stress across given section. Moment of resistance. Section modulus. Moment of inertia for various sections with tutorials.

Unit:8 **Torsion of Shafts:-**

Derivation of the torque equation $T = \tau = G\theta$ -Assumptions in theory of JRL Pure torsion. Derivation of the expression for power transmitted by a shaft with tutorials. Derivation of the expression for principal stress & max shear stress developed in a shaft subjected to BM and torque tutorials.

Text Books:

(I) Strength of Materials by Sadhu Singh
Ramamuthum

(ii) Strength of Materials by S.

Reference Books:

(i) Strength of Materials
(ii) Strength of Materials

R.K. Raiput
Tumoshinko & Gere

Unit:1

1. Fluid and Their Properties: Phases of matter-Definition of fluid, continuum. Density mass density-weight density-specific volume. Specific gravity, vapour pressure, compressibility. Relationship between bulk modulus (k) and pressure (p) for a Gas; for isothermal condition (constant temperature), for adiabatic condition, importance of compressibility. Viscosity, Kinematic viscosity-Newton's law of Viscosity. Cohesion & Adhesion. Surface tension; Effect of surface tension on forming a droplet of liquid; pressure inside a liquid droplet (Raindrop); pressure inside a soap bubble; pressure inside a liquid jet. Capillarity. Types of fluid-Ideal and real fluid, Newtonian and non Newtonian fluids. Numerical problems on properties of fluid.
2. Fluid Pressure & its Measurement: Fluid pressure at a point. Pascal's law. Hydrostatic law (Pressure variation in a fluid at rest). Effect of shape and size of the container on the intensity of pressure-Numerical Problems. Absolute, gauge, atmospheric and vacuum pressure-Problems. Measurement of pressure; Barometer; Manometers; simple manometer, single piezometer, u-tube simple manometer, sensitive inclined tube simple manometer; Differential manometer, two piezometer, inverted U-tube differential manometer, U-tube differential manometer-Problems; Micro manometer; Mechanical Gauges, Bourdon tube pressure gauge, diaphragm pressure gauge, deadweight-pressure gauge.

Unit:2

1. Fluid Statics: Total pressure force on a horizontal lamina; Total pressure force on a vertical lamina; Centre of pressure-to locate the position of center of pressure; Total pressure on an inclined lamina; To locate the center of pressure for inclined lamina; Force on curved surface, Pressure Diagram. Numerical problems on total pressure for horizontal lamina, total pressure force and center of pressure for vertical Lamina and inclined lamina, force on curved surface, pressure diagram. Buoyancy, Buoyant forces & center of buoyancy, meta centre and metacenteric height, determination of met centric heights, equilibrium bodies Numerical Problems.
2. Fluid Kinematics (fundamental of fluid flow): Description of fluid motion-lagrangian method & Eulerian methods of study of fluid flow (theory). Basic scientific laws used in the analysis of fluid flow (basic principles of fluid flow)-Law of conservation of mass. Newton's law of motion, law of conservation of energy, thermodynamic laws (theory). Types of fluid flow; Steady and unsteady flow, uniform flow and non uniform flow, one dimensional flow, two dimensional flow and three dimensional flow, rotational flow and Irrotational flow, laminar and turbulent flow, Description of the flow pattern-stream line stream tube-path

line, streak line. Continuity Equation; Equation of continuity for one dimensional steady flow, equation of continuity for three, dimensional unsteady compressible flow. Velocity Potential and Stream function; relation between stream function and velocity potential (Cauchy Riemann Equation). Flow nets; method of drawing flow nets, uses and limitation. Circulation and Vorticity. Vortex flow; Forced vortex flow, free vortex flow, numerical problems finding rate of flow. examine whether the given velocity fluid represents possible incompressible fluid flow and the possible cases whether irrotational or not, steady or unsteady.

Unit:3

1. Fluid Dynamics: Eulers equation of motion along a stream line (Derivation). Bernoulli's equation (derivation from Euler's equation), assumptions in deriving Bernoulli's equation; Modified form of Bernoulli's equation (real fluid); Bernoulli's Equation from energy principles (Derivation); Limitations of Bernoulli's equation; Total Energy line.

Hydraulic gradient line; Practical applications of Bernoulli equation; Venturi meter, inclined venturi meter, orifice meter, pitot tube, pitot static tube (Prandtl pitot tube), flow nozzle. Numerical problem on Bernoulli equation and its application.

2. Flow Measurement: Orifice and mouth piece; Venturi meter, orifice meter, flow nozzle meter, pitot tube, notches & weirs, Flumes-Problems.

Unit:4

Flow Through Pipes: Reynolds experiment to demonstrate type of flow; Equation for head loss in pipe due to friction. Darcy-Weisback Equation (derivation); Other formulae for head loss due to friction in pipe, Chezy's formula, Manning formula, Hazen Williams formula. Other energy losses in pipes; major losses; minor losses; head loss due to sudden enlargement of pipe (Carnot or Borda's equation), head loss due to sudden contractions, head loss at entry, head loss due to pipe fittings. Energy line & Gradient line. Pipe in series, equivalent pipes, pipes in parallel, objects of laying pipes in parallel, elements of pipe networks. Siphon. Moody's diagram. Power transmission through pipes; Condition for maximum transmission of power, maximum efficiency of transmission of power, problems. Water hammer in pipes (only theory).

Text books:

1. Hydraulics & Fluid mechanics-By P.N. Modi & S.N.Seth (Standard Book house, Delhi.)
2. Fluid mechanics & Hydraulic machines-by RK. Rajput (S.Chand & Company Ltd. New Delhi.)
3. Fluid mechanics & Hydraulic Machines-By RK. Bansal (Laxmi Publications (P) Ltd, New Delhi.)

References:

1. Fluid mechanics-By VL Streeter (Mc Graw Hill-SI Edition)
2. Fluid Mechanics-by Douglas (ELBS Edition)
3. Fluid Mechanics through problems-by Garde (New Age Publication)
4. Theory & Application of fluid mechanics-K. Subramanya (TMH outer Series)
5. Fluid Mechanics-Schaum series.

B.Tech. Third Semester

Paper: Mathematics-III Credit -4

Paper Code: MA-201T

- UNIT:1 **Ordinary Differential Equations:** First order equations (linear and non-linear). Linear equations of second and higher orders with constant and variable coefficients. Solution of second order equations by removing first derivative, changing of dependent and independent variables and method of variation of parameters.
- UNIT:2 **Special Functions & Partial Diff. Eqns:** Power Series solutions of second order equations by Frobenius method. Legendre polynomials and Bessel's functions of first kind and their properties method of separation of variable for heat, wave and Laplace equations: Their solutions and related application.
- UNIT:3 **Integral Transforms:** Laplace transform, existence theorem, Laplace transform of derivatives and integrals, Laplace transform of special functions. Inverse Laplace transform, convolution theorem. Applications of Laplace transform and its inverse to solve ordinary and partial differential equation.
Introduction to Fourier transforms. Fourier series, half range sine and cosine series, related applications.

References

1. J.N.Sharma: Differential Equations, Krishna Prakashan Media (P) Ltd., Meerut.
2. B.V.Raman: higher Engineering Mathematics, Tata McGraw Hill Co., Ltd., 2008.
3. R.K.Jain & S.R.K. Iyenger: Advance Engineering Mathematics, Narosa Publishing House, 2002.
4. A.R.Vashista: Integral Transforms Krishna Prakashan Media (P) Ltd., Meerut.
5. G.G.Simmons: Differential Equations, Tata McGraw Hill Co. Ltd., 1981.

- Unit:1 Introduction to I. C. Engine, Classification of I.C. Engine, Difference between two stroke and four stroke engines, difference between SI & CI engines.
- Unit:2 I. C. Engine: cycles-Otto, diesel and dual; calculation of air standard efficiency, work ratio, mean effective pressure, volumetric efficiency IHP, BHP etc.
- Unit:3 Combustion in SI Engines-Introduction; ignition limits, stages of combustion; ignition lag, factors affecting detonation, effects of detonation, control of detonation, knock, rating of volatile fuels, octane number, firing order; salient feature of different combustion chamber.
- Unit:4 Combustion in CI engine-Introduction, combustion process and stages, air fuel ratio in CI Engines; Delay period or ignition lag, factors affecting ignition lag or delay period; Diesel knock, factors affecting diesel knock; Salient features of different combustion chambers. Firing order.
- Unit:5 Carburetion-Introduction, different mixture requirement in SI engine, Elementary carburetor, complete carburetor, additional systems required, carburetor types; calculation of air fuel ratio for simple carburetor; petrol injection- Introduction, continuous and timed injection system. Fuel injection- Introduction, requirements of a fuel injection system; Types of injection system-Air and solid injection system; type of fuel injectors.
- Unit:6 Ignition system-Introduction, Magneto and Battery ignition systems. Advantages and disadvantages of both the systems.
- Unit:7 Supercharging-Introduction, object of supercharging of SI and CI engines, Turbo charging its effect on engine.
- Unit:8 Cooling-Introduction, Necessity of cooling, disadvantages of overcooling, cooling systems- Air and water or liquid cooling, types of liquid cooling; Advantages and disadvantage of air and water cooling; Radiator. Lubrication- Introduction, function of a lubricating system, Different lubrication systems, mist and wet sump lubrication systems. Properties of lubricants
- Unit:9 Testing & Performance-Introduction, Rating and testing methods; Measurement of fuel and air consumption, brake horse power, frictional horse power, Mechanical and thermal efficiency, engine losses and heat balance.

Books:

- (I) I. C. Engine by Sharma & Mathur
- (ii) I. C. Engine by V. Ganeshan
- (iii) I. C. Engine by V. Domkundvar

Unit:1 Introduction to materials science, Introduction & types of advanced materials, some mechanical properties. Atomic structure and bonding, types of atomic and molecular bonds, primary and secondary bonds, ionic bonding mechanism and examples, inter atomic forces for ion pair, covalent bonding, mechanism and examples, covalent bonding in carbon, energy and separation distance relationships, metallic bonding, secondary bonding mechanism and example.

Unit:2 Crystal structures and crystal geometry, space lattice and unit cells, crystal systems and Bravais lattices, classification of space lattices by crystal system, principal metallic crystal structures, BCC, FCC and SC crystal systems, relationship between lattice constant 'a' and atomic radius in SC, BCC & FCC system, atomic packing factor, miller indices for crystallographic planes in cubic unit cells, determination of miller Indices in cubic system. An introduction to crystal system, determination by X-ray diffraction method.

Unit:3 Crystalline imperfections, types of imperfections, zero dimension, one dimension and two dimension defects, point defects, line defects, edge & screw dislocations, their formation and Burger vectors, grain boundaries, rate process in solids, Numerical determination of number of vacancies.

Unit:4 Atomic diffusion in solids, diffusion in solids in general, Diffusion mechanisms, vacancy mechanism, substitutional mechanism, types of diffusion, steady state diffusion and non-steady state diffusion, Fick's Laws of diffusion, factors affecting diffusivity, Numerical problem on Non-steady diffusion (Industrial applications).

Unit:5 Phase diagrams, definition, explanation of phases, phase diagram of pure substances (water and Iron), Gibbs phase rule, Binary isomorphous alloy systems, Lever rule, numerical examples on lever rule for binary alloys, binary eutectic alloy systems, Invariant reactions, their representations and examples, Iron-Iron carbide phase diagram, phases of Fe-Fe₃C phase diagram, invariant reactions, slow cooling of plain carbon steels, numerical problems using lever rule, rapid cooling of plain-carbon steels, isothermal transformation of Austenite in eutectoid plain carbon steel, continuous cooling of eutectoid plain carbon steel T.T.T. diagram.

Unit:6 Heat Treatment, purpose, application, types of heat treatment processes, Annealing, Normalizing, tempering, surface hardening, case hardening techniques.

Text Book:

1. Materials Science by F.W.Smith

Reference Book:

1. Material Science by Van Vlack
2. Material Science by V. Raghwan

ME-208 T

Production Process II (IV Sem)

Credit:04

L T P Total

Max. Marks:

3 1 0 04

Unit:1 Introduction to machine processes :- Mechanics of basic machining operation. Orthogonal & Oblique cutting, principle angles of a single point cutting tool, Tool reference system. Machine reference System, orthogonal reference system, and normal reference system. Tool geometry and signature in MRS, ORS & NRS systems, their interrelationship, numerical examples, chip formation mechanism, chip thickness ratio, dynamic shearing strain, velocity relationship, force relationship in orthogonal cutting Merchant's circle diagram.

Unit:2 Turning and boring:- Lathe machines, Its principle of working, types, parts of lathe, operation on lathe in brief. Work holding devices & accessories, turning parameters, design consideration for turning operations, high-speed machine on lathe, ultra precision machine on lathe.

Unit:3 Drilling & Reaming:- Introduction, tools for drilling, classification of drills, twist drills, its parts, angles and terminology, type of drilling machines, Design consideration for drilling, reaming and tapping.

Unit:4 Shaping and planing:- Introduction to shapers and planers, Working principle of shaper, principle parts, size, specification and classification of shaper, quick return crank & slotted arm, hydraulic mechanism, working principle of a planer, main parts types of planers, difference between planer & shaper.

Unit:5 Milling:- Working principle, types of milling machines, column & knee type milling machines, horizontal, vertical & universal milling machines milling methods, milling cutters, milling operations, milling parameters.

Unit:6 Gear Manufacturing :- Types materials, methods of gear manufacturing brief introduction to gear cutting and gear shaping, design consideration for gear machining, Gear finishing methods.

Unit:7 Abrasive machining and finishing operations:- Grinding, finishing operations, surface finish in machining, surface finish in grinding.

Unit:8 Economics of machining operations:- Introduction, optimizing cutting parameters. (a) For minimum cost. (b) For minimum production. (c) Optimum cutting speed for maximum efficiency.

Books: -

1. Manufacturing Engineering & Technology by S. Kalpakjian, S.R. Schmid
2. Production Process by P.C. Sharma
3. Manufacturing Engineering & Technology by S. Kalpakjian & Steven R. Schmid

B-TECH. SEMESTER-IV
ELEMENTS OF ELECTRICAL ENGINEERING
EE-202T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

TRANSFORMER:

Principle & construction of single phase transformer, EMF equation, phasor diagram, equivalent circuit diagram, SC test, OC test, efficiency.

UNIT-II:

DC MACHINES:

Principle & construction of DC generator, types of windings, types of DC generator, OCC, load characteristics, principle & construction of DC motor, back EMF, torque equation, load characteristics.

UNIT-III:

INDUCTION MOTORS:

Principle and construction of 3-phase induction motor, concept of slip, phasor diagram. Equivalent circuit diagram, T-S characteristics.

UNIT-IV:

SYNCHRONOUS MACHINES:

Principle and construction of synchronous machines, EMF equation, OCC & SCC, synchronous impedance, principle of synchronous motor, V-curve, synchronous condenser.

Text Books:

Electrical Technology by B.L. Theraja

P.S. Bimbhra, "Electrical Machinery", Khanna Publisher

Unit-I

Introduction: Developments in machine tools, types of machine tools, surfaces, profiles and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling machines and planers, grinding machine etc. General requirements of machine tool design. Machine tool design process. Tool wear, force analysis.

Unit-II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, Selection of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

Unit-III

Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

Unit-IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design.

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power screws. Design of spindle & spindle supports. Layout of bearings, selection of bearings machine tools

Unit-V

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools.

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls. Basics of numerical controls. Machine tool testing.

Books :

1. Machine Tools Design & Numerical Controls -N.K. Mehta, T.M.H. New Delhi.
2. Design of Machine Tools - S.K. Basu Allied Publishers.
3. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.

ME-211T

MACHINE DRAWING (III Sem)

Credit-03

L T P Total

Max. Marks:

1 2 0 03

Unit:1

Introduction: Definition, Assembly drawing, types of Assembly drawing, accepted Norms to be observed for Assembly drawing, process of Making Assembly drawing from details.

Screw threads: V-form threads, B.S.W. (Seller, Metric and Unified) Square form threads, Knuckle, Acme and Buttress threads, thread designation and conventional representation of screw thread, locking devices.

Fastening devices Hexagonal, Square, flanged, Cap and dome Nut, Wing Nut, Hexagonal headed Bolt, Square headed bolt, Cylindrical headed and Cap headed bolt, Hook and Eye bolt, Cylindrical headed and Cup headed bolt, Foundation bolt, Rag, Lewis, Square headed, curved hoop and T-headed.

Welding Joints Types and representation of welding joints, butt, Lap, corner, T - joints, welding symbols according to B.I.S.

Unit:2

(a) Keys and Cotter joints:

Gibs, Cotter, spline-shaft, assembly and detailed drawing of following; Sleeve and Cotter, spigot and socket, cotter and knuckle joint.

(b) Coupling:

Flanged coupling- Protected type and un-protected type, flexible coupling, Oldham's coupling, Assembly and detail drawing of Universal coupling, claw and cone clutch.

(c) Brackets, Pulleys and Gears:

Wall bracket and insulator bracket, fast and loose pulley, rope pulley and V-belt pulley, Conventional Representation of gears.

Unit:3

Assembly and detailed drawing

(a) Bearing-Plumber block, footstep Bearing, Swivel bearing.

(b) Engine Parts-Box type piston, Piston Ring, Stuffing box, crosshead, Eccentrics, connecting rod of I. C. Engine.

(c) Valves-Stop valves, feed check valve, spring loaded valve, dead weight safety valve And lever safety valve.

(d) Machine tool component: tail stock of lathe, tool post, shapers tool head, machine device, Screw jack.

Text Book:

(i) Machine Drawing by N.D. Bhatt

Reference Books:

(i) Machine Drawing by R. K. Dhawan

(ii) Machine Drawing by Parkinson,

(iii) Machine Drawing by Sadhu Singh & P.L.Shah

Unit:1 **Analysis of stress:-** Introduction, Body force surface force and stress vector, state of stress at a point normal and shear stress components, rectangular stress component, stress component in an arbitrary plane (Numerical on above), Equality of cross shears. Principal stress, Stress invariants. (Numerical). Octahedral stresses, state of pure shear, decomposition into hydrostatic and pure shear stress. Equations of equilibrium in cylindrical coordinates. St. venant's principle. Arrays stress function, compatibility condition.

Unit:2 **Analysis of Strain:-** Introduction, deformation, deformation in the neighborhood of a point change in the length of a linear element. The state of strain at a point, Interpretation of V_{xy} , V_{yz} , V_{xz} as shear strain components, Cubical dilation.

Unit:3 **Curved beams:-** Winkler back theory, Bending stresses in curved beam with circular, rectangular. Trapezoidal, I and T sections, stresses in a ring. Stresses in a chain links (Numerical on curved beams)

Unit:4 **Unsymmetrical Bending:-** Introduction, product of Inertia, Deflection of beam due to unsymmetrical bending, shear centre. (Numerical on above)

Unit:5 **Spring:-** Stress and deflection in leaf, spiral and conical springs (Numerical), Helical Springs, Elementary idea, Calculation of Shear Stress.

Unit:6 **Thick Cylinder and Rotating Disc:-** Stresses in thick cylinders, Compounding of cylinders, stresses in rotating disc. (Numerical)

Unit:7 **Indeterminate Beams:-** Degree of indeterminacy, indeterminate beams, stresses and deflection in statically indeterminate beams, shear force and bending moment diagram for indeterminate beams (Numerical)

Unit:8 **Fatigue and Creep:-** Fatigue of material, endurance limit, Soderberg triangle, notch sensitivity and sensitivity factor. Factor influencing the endurance limit introduction to creep.

Text Book:

1. Mechanics of Solids by LS. Srinath
2. Mechanics of Solids by Abdul Mubeen
3. Mechanics of Solids by Ryder

Reference Book:

1. Timosherko & Gere
2. E.J. Hearn Vol I & II

CREDIT:04	L	T	P	Total
Max. Marks:	3	1	0	04

1. Introduction to CAD, definition of CAD and its role in product cycle, -significance and importance of CAD.
2. CAD Hardware, types of systems, CAD systems evaluation criteria, input devices, output devices, hardware integration & networking, hardware trends, IBM PC compatible CAD hardware.
3. CAD software:- Introduction, graphic standard, basic definitions, data structure, database, database management system (DBMS), user interface, software modules, operating system graphic, applications, programming, communication, modeling & viewing, software documentation & development.
4. Microcomputer based CAD system, general features, hardware components and configuration, **IBM** PC compatible CAD system, microcomputer based CAD software, operating system, mechanical application 2D drafting, symbol libraries, report generation, parametric design, 3D functions, finite element analysis, kinematics & functions analysis.
5. Geometric Modeling: types of curves: Introduction, wire frame models, wire frame entities, curve representation, analytic & synthetic curves, hermit cubic spline, bezier curves, B-spline curves, Types of surfaces:- introduction, surface models, surface entities, surfaces like plane surface, ruled surfaces, surface of revolution, tabulated cylinder, hermit bicubic surface, B-spline surface, coons surface, blending surface, offset surface, triangular patches, sculptured surfaces, rotational parametric surface, design & engineering application. (Only theory no numerical)
6. Types of solids:- Introduction, solid models, solid entities, solid representation, fundamentals of solid modeling, boundary representation (B-rep, constructive solid geometry (CSG), sweep representation, other representations, organization of solid modeler's, solid modeling based applications, design engineering applications. (Only theory no numerical)
7. Two & three dimensional graphic concept, geometric transformation, introduction, transformation-translation, scaling, reflection, rotation, mapping of geometric models, projection of geometric models, orthographic projections, perspective projection.
Virtual Realism: - Introduction, model clean up hidden line removal, hidden surface removal, z-buffer algorithm, hidden solid removal, ray tracing algorithm, shading, shading models, coloring, coloring models.
8. Graphic Aids: - Intro, geometric modifiers, names layers, colors, grids groups, dragging & rubber banding, clipping, Graphic manipulation editing:- intro, entity selection methods, manipulation operations, editing operators, design & engineering application.

References: 1.CAD I CAM by Ibrahim Zied 2. CAD I CAM by Zimmer & Groover

Unit:1 (a) Introduction to Mech. Engg, Design, Design synthesis, Design procedure for a machine part. Design considerations based on strength, rigidity, fatigue, corrosion, wear and thermal consideration, Allowable stresses, stress concentration, factor of safety.

(b) Design under static load, modes of failures, stress strain relationship, shear stresses and shear strain, stresses due to Bending moment, stresses due to torsional moment, principal stresses. Theories of failures, maximum normal stress theory, maximum shear stress theory, distortion energy theory, maximum strain theory, maximum strain energy theory.

Unit:2 (a) Design under variable loading, stress concentration, stress concentration factors, reduction of stress concentration effects, fluctuating stresses, fatigue failures, Endurance limit and its approx. estimation.

(b) Design of shaft under different kinds of loading such as twisting moment only and combination of twisting, bending moment. Design of keys. Design of different types of couplings such as muff, compression, flexible coupling. Types of coupling, flexible and rigid coupling.

Unit:3 Riveting: strength of riveted joint, efficiency, design of riveted joint, riveted joint of uniform, strength, Design of riveted joint for Boilers etc. Welded joint, strength of transverse and parallel fillet welded joints, axial loaded unsymmetrical, welded sections, Eccentrically loaded welded sections

Unit:4 Power transmission, types of pulleys for flat belts, design of C! pulleys, design of belts.

Unit:5 Spring, types, terms used, design of helical springs. Design of leaf springs.

Unit:6 Bearing, bearing loads. Design of Journal bearing (selection parameters) types of lubrication, hydrostatic bearings.

Text Book:

(I) Machine Design by P.C Sharma & D.K. Agarwal

Reference Reference Books:

(I) Machine Design by Shigley

(i) Machine Design by Muben Ahmed

ME-304 T

MECHANICAL ENGINEERING DESIGN-II (VI Sem)

Credits:04

L T P Total

Max. Marks:

3 1 0 04

Unit:1 Design consideration of Gear, Lewis formula, dynamic effect, Design for spur, helical and bevel gears.

Unit:2 Design procedure of I.C. Engine Cylinder.

Unit:3 Design procedure of I.C. Engine Cylinder head.

Unit:4 Design procedure of I.C. Engine piston.

Unit:5 Design procedure of I.C. Engine connecting rod.

Unit:6 Design procedure of I.C. Engine crankshaft.

Unit:7 Design procedure of I.C. Engine valves.

Text Book:

1. Machine Design by Sharma & Agarwal
2. Machine Design by Pandey & Shah.

Unit:1 Steam Nozzles: Introduction, Definition, principle uses, types of nozzles, flow of steam through nozzle, condition for maximum discharge. Expansion of steam considering friction, nozzle efficiency, velocity coefficient, Relation between nozzle efficiency and velocity coefficient. Supersaturated or Metastable flow through nozzle. General relationship between area, velocity & pressure in nozzle flow, aspect ratio (numerical.)

Unit:2 Steam Turbine: Introduction, definition, working principles, uses, types of steam turbine, advantages of steam turbine over Reciprocating steam engine, Working of Impulse & Reaction turbine. Compounding of steam Turbine, velocity diagram, blade efficiency, stage efficiency or gross efficiency, nozzle efficiency, influence of blade tip speed ratio or blade efficiency Difference between impulse and reaction turbine, degree of reaction, carry over factor, (numerical), reheat factor and its numerical problems. Methods of governing (throttle, nozzle control; by pass governing etc.)

Unit:3 A. Gas Turbine Introduction, application, advantage of gas turbine, classification of gas Turbine, Bray ton or Joule cycle & its related formulae derivation. Thermal efficiency of Bray ton cycle, work ratio, advantages & disadvantages of closed cycle over open cycle units. Ideal & practical gas turbine cycle. Methods for improvement of thermal efficiency of simple open cycle constant pressure gas turbine. Advantage of gas turbine over I-C engine & steam engines, numerical problems.

B. Jet Propulsion Basic, definition, types of jet propulsion, screw propeller, turbo jet, turbo prop, ram jet, specific thrust, thermal efficiency, propulsive efficiency, ram efficiency, overall efficiency. Introduction to rocketing engine. Comparison between turbo machine & positive displacement machines.

Unit:4 Condensers and Steam Generators

- A. Introduction, definition, uses, types of steam condensers, Air leakage, It's effect on the performance of condenser & methods of It's removal from condensers.
- B. Steam Generators: Definition, uses, classification of boiler, brief description of the boiler (lancashire, Cornish, Cochran) Typical high pressure boiler-Benson, La-Mont, Loeffler, Velox) brief description. Boiler mounting & accessories- only names & their function. Performance of boilers, evaporation, boiler thermal efficiency, heat losses in a boiler plant.

Text Book:

1. Thermal Engineering by P.C. Ballaney

Reference Book:

1. Thermal Engineering by R.K. Rajput

ME-306T	PRODUCTION PLANNING AND CONTROL (VI Sem)			
Credit:04	L	T	P	Total
Max. Marks:	3	1	0	04

Unit:1 Introduction: Objective and functions of PPC, scope of PPC, role of PPC in the organization manufacturing systems- intermittent and continuous; plant location Difference between production planning and production control

Unit:2 Production Forecasting: Objectives of forecasting, types of forecasting- short term and long term forecasting Techniques- consumer opinion survey, market research, past record analysis graphical Method, least square method, moving average method etc, seasonal demand and its Forecasting verifying and controlling the forecasting.

Unit:3 Production Planning: Objectives and functions, its importance in the organization; technical scheduling- sequencing assignment model, route chart, operation ratio loading-load chart.

Unit:4 Production Control: Objective, functions and importance; Dispatching-job order and issue system dispatching of cards, reports etc; expediting progress reports, corrective actions; Evaluations and Analysis value analysis and Assembly line balancing.

Unit:5 Material Planning Material requirement planning (MRP) and material resource planning(mrp2) scope and objectives of material planning; Material handling; Classification of inventories inventory control- ABC analysis, V-E-D, X- Y -Z, F-S-N-D etc, economic order quantity - reorder point, buffer stock, levels of inventories, lead time-fixed and variable.

Unit:6 Purchasing Store Keeping and Replacement Analysis: Objectives and functions; purchasing procedure, purchase cycle method of purchasing tender buying, hand to mouth buying contract purchasing ,make or buy decisions, market purchasing etc; terms and conditions of standard purchase order

Unit:7 Significance of stores Management: Replacement need and objectives; replacement of items that denote with time Value of money remains same during the time, (ii) value of money change with time Probabilistic model of replacement; control of waste & scrap, waste management and waste recycling.

Unit:8 Co-ordination: Co-ordination of manufacturing planning, facility planning, sales planning, production planning, quality planning, inventory planning, manpower and material planning and financial planning activities. Use of computer in PPC.

Books:

- | | |
|--|----------------------------|
| 1. Industrial Engineering Handbook | H.B. Maynard (McGraw Hill) |
| 2. Modern production Management | E.S. Buffa (Wiley Eastern) |
| 3. Theory & Problems in Production and Operation | S.N. Chary (THH) |
| 4. Purchasing and inventory control | K.S. Meno |
| 5. Production Planning and control | Samuel elison |

Unit:1 (A) Introduction to Basic modes of heat transfer:

Conduction, Convection, Radiation, Overall heat transfer co-efficient.

(B) Steady state one dimension heat conduction, General heat conduction equation, in Rectangular, cylindrical, and spherical co-ordinates. Steady state one dimension-heat conduction without internal heat generation (with uniform thermal conductivity and non-uniform thermal conductivity)- for flat plate, hollow cylinder, spherical shell. Electrical Analogy, log mean area. One dimension heat conduction with heat generation or system with internal heat source. - for plane wall, for hollow cylinder, for sphere. Insulation, purpose of insulation, critical radius of insulation for cylinders and spheres.

Unit:2 Heat transfer through extended surface- fins, Types of fins, heat transfer through Rectangular fin, pin type fin (Spine), fin effectiveness and efficiency. Heat transfer through a Rod connected to two vessels at different temperature.

Unit:3 Unsteady state heat conduction; Introduction to Unsteady state heat conduction. System with negligible internal resistance (Lumped heat analysis), system with negligible- surface resistance. Heat flow in an infinitely thick plate (semi infinite body).

Unit:4 Heat transfer by convection; Introduction, convective heat transfer co-efficient, basic equations- Continuity equations, momentum equations, Energy equations. Boundary layer- concept-Velocity boundary layer, thermal boundary layer. Dimensional analysis, Buckingham's theorem, dimensional analysis applied to force convection. Dimensionless numbers and their physical significance.

Unit:5 Forced Convection

Laminar flow over a flat plate- introduction to boundary layer, boundary layer definitions and characteristics. Momentum equation for hydrodynamic boundary layer over a flat plate, Blasius solution for laminar boundary layer flows. Von Karman integral momentum equation (Approximate hydrodynamic boundary layer analysis). Thermal boundary layer. Energy equation of thermal boundary layer over a flat plate. Integral Energy equation (Approximate solution of energy equation). Laminar tube flow. Development of boundary layer, velocity distribution, temperature distribution Turbulent flow over a flat plate, turbulent boundary layer, Reynolds Analogy, Colburn Analogy. Heat transfer parameters for combination of laminar and turbulent flow.

Turbulent tube flow, Turbulent Flow over cylinders and spheres.

Unit:6 Free Convection

Characteristic parameters in free convection. Momentum and energy equations for laminar free convection. Heat transfer on a vertical flat plate, integral equations for momentum and energy on a flat plate, velocity and temperature profiles on a vertical flat plate, and solution of the integral equation for a vertical flat plate. Transition and turbulence in free convection. Empirical Correlations for free convection.

Unit:7 Heat Exchanges

Type of heat exchangers, heat exchanger analysis. Logarithmic mean temperature difference, overall heat transfer co-efficient, fouling factor, heat exchanger effectiveness and Number of Transfer Unit (NTU).

Unit:8 Radiation

Surface emission properties, absorptivity, reflectivity, transmittivity. Concept of black body, Stefan Boltzman law, Kirchoffs law, Plank's Law, Wein's displacement law, Intensity of radiation and Lamberts Cosine Law. Radiation exchange between black bodies separated by a non-absorbing medium, shape factor Algebra and salient features of the shape factor, shape factor calculation for simple configuration such as: a black body inside a black enclosure, A tube with a cross section of a equilateral triangle, hemispherical surface and a plane surface. Heat Exchange between two non black parallel surfaces. Heat Exchange between infinite long concentric cylinders. Electrical network analogy for thermal radiation system. Radiation Exchange between three grey surfaces. Radiation shield.

Text books:

1. Heat & Mass Transfer by Dr. D.S. Kumar
2. Introduction to Heat & Mass Transfer by J.P. Holeman
3. Heat & Mass Transfer by Domkundwan

ME-308 T
CREDIT:04
Max. Marks:

TURBO AND FLUID MACHINERY (VI Sem)

L	T	P	Total
3	1	0	04

Part (A) Turbo Machines:-

Unit:1 Introduction, turbo machines, turbines, pumps, compressors fans, blower, type of incompressible and compressible flow machines, application of turbo machines.

Unit:2 Basic definitions and law of thermodynamics, general steady flow energy equation, poly tropic (small stage efficiency) for turbines and compressors, energy and momentum equation, Euler's work for turbo machines.

Unit:3 Flow through turbo machines cascade, one dimensional, two dimensional and three dimensional, axial turbine and compressor cascade, radial cascade, cascade tunnel, different type of tunnels (straight cascade tunnel, annular cascade tunnel), different cascade variables.

Unit:4 Axial turbine stage: introduction, stage velocity triangle, work done, enthalpy, entropy diagram, single stage impulse, multistage velocity compounded impulse, multi stage pressure compounded impulse, reaction stages, degree of reaction, losses and efficiency.

Unit:5 Axial flow compressor: introduction, stage velocity triangle, work done, enthalpy entropy diagram, degree of reaction, definition and types, performance characteristics curve, surging and stalling phenomenon, work done factor.

Unit:6 Centrifugal compressor: Introduction, constructional details, static Pressure rise, velocity triangle, work done by impeller, enthalpy entropy diagram, slip factor.

Part (B) Hydraulic Machine:-

Unit:1 Turbines:- Classification of hydraulic turbines, impulse and reaction turbines, pelton wheel, work done and efficiency of pelton wheel, velocity diagram, Francis turbine, work done and efficiency of Francis turbine, axial flow reaction turbine Kaplan turbine. (theory and numerical), performance, characteristics curve, draft tube, unit quantities, specific speed .

Unit:2 Pumps:-

A. Centrifugal pump: - Introduction, main parts of centrifugal pump, work done by centrifugal pump on water, different heads and efficiency, minimum speed for starting the centrifugal pump, multi stage centrifugal pump (both for high heads, and for high discharge), specific speed of centrifugal pump, priming of centrifugal pump, cavitations phenomenon, NPSH.

B. Reciprocating pump:- Introduction, main parts, working of reciprocating pump, classification of Reciprocating. Pump, single acting and double acting reciprocating pump, slip of reciprocating pump, percentage slip, air vessel, effect of acceleration on piston.

Books:

1. Fluid mechanics and hydraulic machinery- R. K. Bansal
2. Fluid mechanics and hydraulic machinery- Modi and Seth
3. Hydraulic machines- Jagdish Lal
4. Turbines, compressors and fans- S.M. Yahya
5. Gas Turbines and propulsive systems- P.R. Khajuria, SP Dubey

Note:- For Turbo Machinery Book of S.M. Yahya is followed and for hydraulic machinery R.K. Bansal and Jagdish Lal

- Unit:1 Principle of Measurement: Classification of measurement, precision, accuracy & sensitivity, standards of measurements-primary, secondary, tertiary & working standards; length standards-line standards, wave length standards; characteristics of various standards of measurement. Linear Measurement: Linear Measuring instruments, Vernier height gauge, Vernier depth gauge, inside micrometer, depth micrometer, etc; surface plate; spirit level; surface gauge; radius & feeler gauges; pitch screen gauges; slip gauges-requirement of slips; wringing of slips; use of slip gauges, measurement with slip gauges. Classification of instruments, null and deflection type, contacting and non contacting type, analog and digital type.
- Unit:2 Motion Measurement: Linear motion measurement, angular motion measurement, measurement of displacement, velocity and acceleration, seismic.
- Unit:3 Pressure measurement: Manometers; U tube single columns, inclined type, double reservoir type, manometer, differential manometer, centrifugal type air micrometer, Elastic transducers, bourdon gauge, diaphragm gauge, bellows type; vacuum pressure measurement, Kudsengauge, Piranigauge & Numerical problem based on manometers.
- Unit:4 Force, Torque and Power Measurement: Analytical balance, Elastic force measuring devices; spring axially loaded member, cantilever type, proving ring; load cell; pneumatic load cell, hydraulic load cell. Dynamometers; types of dynamometers; pony brake, fluid friction type, Electrical dynamometer, D.C. dynamometer, eddy current dynamometer. Numerical Problem base on prony brake.
- Unit:5 Temperature Measurement: Classification, Expansion type thermometer; bimetallic type; liquid in glass thermometer. Electrical thermometer; resistance thermometer, thermostat, thermo couple, thermopiles, laws of thermocouple, Pyrometers; Radiation pyrometer, optical pyrometer.
- Unit:6 Flow Measurement: Classification of flow measuring instruments, Quantity meter, positive displacement type, weight and volumetric tank, Flow meter, obstruction type; Venturi meter, Orifice meter, Nozzles, variable area type flow meter-rotameter. Velocity probe-prandtl pittot static tube. Special method- turbine flow meter, magnetic flow meter, sonic flow meter, hot wire anemometer. Flow visualization method interferometer, Numerical Problem Numerical Problem based on venturi meter, pittot tubes, officemates.
- Unit:7 Stress Strain Measurement: Mechanical devices, optomechanical devices, inductive device, capacitive devices, resistive devices- resistance strain gauge construction of strain gauge, wheat stone bridge, mounting of gauges, method of measurement, Numerical Problems based on measurement of strain with the help of resistance strain gauge, Introduction to nano measurements.

Unit:8 Limits, Fits and Tolerances: Terminology of limits & fits, types of fits clearance, interference transition, hole basis & shaft based system of fits. Interchangeability & selective assembly; limits of tolerance allowance; designation of hole & shaft; ISO system of limits & fits; Design of limits, Tolerances & deviation on the shaft and hole system.

Unit:9 Gauge & Gauge design: Type of gauges, plain & limit gauge; plug & ring gauge; 'Go' and 'No Go' Gauges; Design of 'Go' & 'NoGo' gauges for holes & shafts. Manufacturing tolerance, wear allowance, Taylor's principle, advantages & its limitations.

Unit:10 Surface Roughness: elements of surface roughness, types of lays & their representation; evaluation of surface value, Ra value, CLA value RZ value, surface finish measuring instruments-profilometer, profile graph light cross section method, visual inspection methods.

Unit:11 Screw Thread and Gear Measurement: Terminology of screw threads & gears tooth, effect of pitch errors on threads, thread micrometer, effective diameter measurements two wire & three wire methods; best wire size; use of tool maker's microscope in measuring various elements of thread; sources of errors in gear manufacturing, measurement of individual elements of gear, gear tooth caliper base tangential gear tooth caliper, Parkinson gear tester ,tooth thickness measurement constant chord method, base method, test plug method for pitch diameter measurement, two wire method for helical gears, run out, lead& backlash

Book: 1. Engineering Metrology (Khanna) by Jain, R.K.

2. Hand book of Industrial metrology (prentice Hall)-ASTME

3. Engineering metrology (Macdonald) Hume. K.J.

4. Engineering Inspection (Pitman)-Parkinsan, A.C.

5. Fundamentals of Mechanical Inspection, (Graw Hill) Jenkins, R.

References: -

1. Mechanical Measurement by Sirohi and Radha Krishan (Unit 1, 6, 7, 8, 10)

2. Mechanical Measurement by Thomas G. Beckwith and N. Lewis Buck (Unit 3, 5)

3. Electrical and Electronics Measurement and Instrumentation (Unit 4) by AK Sawhney

ME-310 T

OPERATION RESEARCH (VI Sem)

Credit-04

L T P Total

Max. Marks:

3 0 0 04

Unit:1 Introduction: The Historical development, the nature and Meaning of 'OR', Management application of 'OR' scope of 'OR', Development of 'OR' in India.

Unit:2

(A) Assignment Models- Introduction, mathematical formulation of Assignment prob.

Fundamental theorems, Hungarian Method for assignment problem, Traveling salesman problem by Branch & Bound techniques.

(B) Transportation Model- Initial Basic Feasible Solution by North-West corner rule, Least cost Method or VAM, optimization by MODI Method, Test of optimality, Degeneracy in transportation problems.

Unit:3 Linear Programming Problem: Introduction, General formulation of LPP, slack & surplus variables, Simplex Method, Degeneracy prob.

Unit:4 Replacement Model:-

Introduction, replacement Model for deteriorative items, Replacement Model for Nondeteratives Items, cash flow diagram, Group replacement Model.

Unit:5 Simulation-Introduction, Types of Simulation, why to use simulation, limitation of simulation technique, Generation of random Numbers, Monte-Carlo simulation, Scope of simulation techniques.

Unit:6 Queuing Theory-Or waiting line Models. Introduction, Queuing system. Arrival rate, service rate, Queue discipline, Derivation of Average waiting time, Mean queue length, minimum cost service rate.

Text Books:

1. Operation Research by Taha
2. Operation Research by D.S. Hira

ME-311T

OPERATION MANAGEMENT (V Sem)

Credits:04

L T P Total

Max. Marks:

3 1 0 04

Chapter 1	The Operation Function: Operations management operation decisions frame work, operation as a process. Operations strategy model, operations, Objectives.
Chapter 2	Product Design: Strategies fro new product, New product development process, cross functional product Design, Value analysis.
Chapter 3	Process & Service Design: (a) Product flow characteristics, process selection decisions, fowsed operations. (b) Service definition, service matrix, customer contact Technology in service.
Chapter 4	Fore Casting: A fore casting frame work qualitative fore casting methods, times services fore casting , moving average, fro cast errors selection of fore casting method.
Chapter 5	Facilities & Aggregate Planning: facilities decisions, facility strategy Aggregate Planning, Planning options Aggregate Planning costs. Examples of costing.
Chapter 6	Project Planning & Scheduling Objectives and Trade off, scheduling methods PERT methods CPM method.
Chapter 7	Inventory Purpose of Inventories, Inventory cost structures, Economic order quantity, continuous review systems periodic review systems, ABC inventory management.
Chapter 8	Material Requirement Planning & ERP. Definition of MRP systems, MRP versus order point systems, MRP elements. <i>Master scheduling</i> <i>Bill of Material (BOM)</i> <i>Inventory Records.</i> <i>Capacity Planning</i> <i>Purchasing</i> <i>Shop floor control</i> Enterprise Resources Planning systems

Reference Books:

1. Operation Management: Contemporary Concepts and Cases by Roger G. Schroeder
2. Production and Industrial management By James Telsang
3. Operations Management: Theory& Practice By D. Mahadevan

ME-316T

AUTOMOTIVE MECHANICS (Elective-I) (VI Sem)

Credit: 04

L	T	P	Total
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Max. Marks:

3	1	0	04
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Unit:1 Power Unit:

Engine Classification, engine performance and characteristics; Description of power unit.

Unit:2 Transmission:

Transmission requirements; standard transmission system; fluid transmission system; Automatic transmission, performance requirements and gear ratios.

Unit:3 Tires:

Pneumatic tires, tube; tubeless tires; importance of maintaining tire pressure. Tyre manufacturing, Tyre rethreading.

Unit:4 Steering:

Steering geometry, function of steering system, steering gear; types, power steering, steering gear ratio, overall steering ratio, turning ratio, types of steering linkages.

Unit:5 Braking systems:

General braking requirement; Simple break classification of brakes; Hydraulic brakes vacuum brakes; power brakes.

Unit:6 Chassis and Suspension, Frames, types of Frames:

Frame, rear end suspension, spring shackles, shock absorbers.

Unit:7 Vehicle Dynamics:

Stability analysis of a linearized model of vehicle; stability on a curve.

Unit:8 Maintenance:

Preventive maintenance; trouble shooting of standard transmission and steering system etc.

Text Book:

1. Automotive Mechanics by Joseph Heitner
2. Automotive Engineering by KM Gupta
3. Automotive Mechanics by Crause & Anglin

ME-318T

STATISTICAL QUALITY CONTROL (Elective-I)

(III Year VI Sem)

Credit: 04

L	T	P	Total
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Max. Marks:

3	1	0	04
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Unit:1 Quality-Definition Basic concepts of quality, quality control of quality, cost of quality, quality control and inspection.

Unit:2 Total quality control, total quality management, Employee involvement Continuous Process Improvement, Supplier partnership Performance Measures, Deming's 14 points.

Unit:3 Basic statistical concept, concept of variance, frequency distribution. Theory of probability and probability distribution: Normal, binomial, Poisson distributions.

Unit:4 Control charts for variables-Variability, Basis of sub grouping, frequency of sub grouping, chance of making an error, drawing preliminary conclusion from control charts, some control chart pattern, control limit on the chart.

Unit:5 Control charts for attribute, choice between P-charts for attribute, choice between P-chart and np-chart, control chart for defects, comparison between attribute chart and variable chart.

Unit:6 Acceptance sampling, the operation characteristic curve (OC-curve), quality indices for sampling plan, sampling plans.

Unit:7 Reliability, quality control and reliability, need for reliable product definition for reliability, basic element of reliability, cost of reliability, mean time between failures, mean time between repair, quality and reliability, system reliability.

Unit:8 History of ISO-9000 series standard, ISO-9000 series of quality system, need for quality system, need for standardization.

Text Books:-

1. Statistical Quality Control By Grant
2. Statistical Quality Control By M.Mahajan

ME-413T

TRIBOLOGY (IV year, VIII Sem)

Credit: 04

L	T	P	Total
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Max. Marks:

3	1	0	04
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Unit:1 Introduction to tribology, definition, scope, surface interactions contact of solids, contact of ideally smooth surfaces, distribution of pressure over elastic contact area of two curvilinear bodies, calculation formula for contact area, maximum pressure and approach in elastic contact of curvilinear bodies. Physico-mechanical properties of surface layers, characteristics of surface geometry, classes of surface roughness. Contact of rough surfaces, introduction of surface peaks, real and contour areas of contact.

Unit:2 Friction, laws of friction, friction theories, surface contaminants, effect of sliding speed on friction.

Unit:3 Wear, wear of metals, types of wear, classification of wear. Wear mechanism, Quantitative Laws of wear, hypothesis of Holm, Burewell and strong, Archard law, Rabinowicz's quantitative law for abrasive wear, Bayer- Ku surface fatigue theory, delamination theory of wear, wear resistant materials, Wear of polymers & ceramics, an introduction to wear reduction by surface improvement.

Unit:4 Lubrication, generalized Reynolds equation, flow and shear stress, energy equation, Hydrodynamic bearing, mechanism of pressure development, plain slider bearing, step (Rayleigh step) bearing, infinitely long journal bearing infinitely short journal bearing. Bearing design, design of journal bearing. Introduction to thin film and boundary Lubrication.

Text book:

1. Tribology of bearings by B.C. Majumdar
2. Tribology Handbook Vol 1 & 2.
3. Basic Lubrication theory by Acastair cameron.

Unit:1 Introduction to CAM and its role in Product cycle and importance of CAM. CAD/CAM computer hardware, types of systems. CAD/CAM system evaluation criteria, input devices, output devices, hardware integration and networking. Hardware trends. IBM PC compatible CAD/CAM soft wares. Operating systems.

Unit:2 Microcomputer based CAD/CAM systems, general features, hardware components and configuration, IBM PC compatible CAD/CAM system, microcomputer based CAD/CAM systems

Unit:3 Numerical Control: Introduction, numerical controls its growth and development, components of NC systems. Digital & analog output, application of NC machine tools, advantages and disadvantages of NC, operation of an NC machine tool system, machine centre, Microprocessor in CNC systems, CNC-DNC and adoptive control. Justification and economics of Numerical control part programming, syntax of part programming, languages, APT.

Unit:4 Part Programming: Introduction, manual part programming. Preparatory functions, feed rate functions, miscellaneous functions, spindle speed functions, tool change function. Data input labeling of programmers and sub programmers fixed cycles. Tool length compensation, Do loop, Macros, Verification. Documentation, Computer aided part programs, computer aided part programming languages, APT language structure.

Unit:5 Group technology: Introduction, concept of group technology, GT loading, how GT works, stages for adopting a plant for GT, benefits of GT, Process planning and GT. Computer aided process planning (CAPP); Process regions for different process planning, integrated process planning systems CAPP implementation.

Unit:6 Flexible manufacturing systems (FMS): Objectives and benefits of FMS, Components of FMS. Problems with FMS, different types of FMS Technology required for FMS.

Unit:7 Computer Integrated manufacturing (CIM): CIM systems, elements of CIM, different modules and information on flow, design aspect of CIM, CIM planning and implementation process.

Unit:8 Robotics: Introduction propose of robotics, law of Robotics, Basic element, degree of freedom, Work envelope, classification of Robots, Economic and social significances of Robots, Robotics applications.

Books Text:

1. Computer Aided Manufacturing-Rao, Tiwari & Kundra
Principles and Applications by P N Rao

Reference:

1. CAD/CAM: CAE- Zimmars/ Groover
2. CAD/CAM: CAE- Jha & Surendra Kumar

ME-404T

INDUSTRIAL MANAGEMENT (VIII SEM)

Credits 04

L T P Total

Max. Marks:

3 1 0 04

1. Work study, method study & work measurement including time study, work sampling, production study, PMTS, MTM, importance of time standards, rating & allowance. Work study, incentive schemes, job description, analysis & evaluation.
2. Plant maintenance, preventive maintenance, maintenance strategy, value engineering. Ergonomics, safety health & environmental protection, work physiology job stress & fatigue, ergonomics of manual material handling.
3. Market research, principle of marketing, customers viewpoint & selective selling, functions & scope of marketing, sales forecasting techniques.
4. Performance measures of a Production system, Production, Productivity, Efficiency, Effectiveness, Quality, Flexibility, Agility etc.
5. Organization, organization structure, department on functional charts for business & industrial organization centralized & decentralized organizations, manpower planning, requirement & forecasting, recruitment training & placement.
6. Role of IT in Systems - MIS, FMS, Japanese intherenes; JIT, Kanban, Decision, Support Systems.

Text Book:

1. Engineering Management by: Fraidoon Mazda

Reference:

2. Marketing Management by: Philip Kotler

ME-406 T	REFRIGERATION AND AIR CONDITIONING (IV year, VIII Sem)			
Credit: 04	L	T	P	Total
Max. Marks:	3	1	0	04

Unit:1 Unit of refrigeration, difference between engine, refrigerator and heat pump. Classification of refrigeration systems.

Unit:2 Air Refrigeration System: Carnot refrigeration cycle or reversed carnot cycle using air as working substance, Bell-coleman cycle, analysis of these cycles, actual Bell-Coleman cycle, advantages and disadvantages of the air refrigeration system. Necessity of cooling the aero plane, application of air refrigeration system in aero planes and different types of air refrigeration systems used in aero planes such as simple cooling and simple evaporative type, boot-strap and boot-strap evaporative type, regenerative cooling system and reduced ambient type cooling system, Coefficient of performance (C.O.P).

Unit:3 Vapor Compression Refrigeration System:

Single stage system: Simple system, Carnet vapor-compression cycle, Difference between air refrigeration system and vapor refrigeration system, diagrammatic layout of the components of this system and a brief description, construction of T-s, P-h, and h-s diagrams and their usefulness in solving the problems, Analysis of simple saturated cycle, actual cycle, use of p-h chart, Dry and wet compression, effect of pressure changes on COP & capacity, Sub cooling & superheating, effects of foreign material, advantages and disadvantages over air refrigeration system. Actual Vapor compression cycle.

Multistage vapor compression systems: - Purpose, Two stage vapor compression, Multi staging, optimum Inter stage pressure, Cascade refrigeration system.

Unit:4 Refrigerants: Desirable properties of refrigerants. Common refrigerants such as Ammonia, Carbon Dioxide, Freon-11, Freon-12, Freon-22 and Freon-502 and their applications. Secondary refrigerants: - Purpose, Theory of brines, Pressure drop and heat transfer.

Unit:5 Refrigeration equipments & its design brief description of reciprocating compressor, centrifugal compressor (Design), capillary tube, thermostatic expansion valve, condenser and evaporator (Design). Duct design: - Introduction, Pressure drops in ducts, Methods of duct design.

Unit:6 Vapor Absorption Refrigeration System.

Diagrammatic layout of the components of this system and a brief description, properties of ideal refrigerant, properties of ideal absorbent, properties for ideal refrigerant absorbtent combination, best combination, Theory of mixtures, Processes: Adiabatic mixing of two Systems, Diabatic mixing, Throttling process, advantages of vapor absorption system over vapor compression refrigeration system

Unit:7 Air conditioning: Definitions of different psychrometric properties such as dry air, moist air, water vapor, dry bulb temperature, wet bulb temperature, dew point temperature, specific humidity or humidity ratio, absolute humidity, degree of saturation, relative humidity, enthalpy of moist air.

Psychrometric chart and psychrometric processes: Sensible cooling or heating, bypass factor, contact factor, cooling and dehumidification, cooling with adiabatic humidification of air or adiabatic saturation or evaporative cooling, heating and humidification, heating and dehumidification, adiabatic mixing of two air stream, numerical problems based on these process only.

Concepts of room sensible heat factor (RSHF), grand sensible heat factor (GSHF) and effective surface temperature.

Requirements of comfort air conditioning: A brief description of comfort chart and its use, diagrammatic layout of year round air- conditioning system providing summer cooling and winter heating and a brief description.

Text Book:

1. Refrigeration and Air-Conditioning by-C.P. Arora

Reference Book:

1. Refrigeration and Air-Conditioning by- R.Yadav
2. Refrigeration and Air-Conditioning by- S. Domkundwan

ME-407T POWER PLANT ENGINEERING (ELECTIVE-II) (IV YEAR, VII SEM)**Credit: 04****L T P Total****Max. Marks:****3 1 0 04****Unit:1 Steam Power Plant**

1. Cycles for steam power plants- Carnot, Rankine, Reheat, Regenerative and Binary vapor cycle and their analysis. Numerical problems.
2. Fuels for steam power plants: Different types of coals, proximate and ultimate analysis of coal, coals suitable for power plant, selection of coal for power plant, Indian coals, Liquid fuels and their advantages and disadvantages over solid fuels, Gaseous fuels and their advantages and disadvantages over solid fuels.
3. Coal handling- Preparation of coal at mine, outplant handling of coal, storage of coal at plant site, inplant handling of coal, A brief description about coal handling equipments such as coal preparation plant, Unloading equipments, Transfer equipments such as Belt conveyor, screw conveyor, bucket elevator, Grab bucket conveyor and Flight conveyor.
4. Coal feeding and burning methods-Overfeed stoker, underfeed stoker, Pulverised fuel system, Different types of pulverised fuel burners and their applications. Advantages and disadvantages of pulverised fuel firing over stoker firing.
5. Ash handling systems:- Mechanical handling system, Hydraulic system, Pneumatic system and steam jet system.
6. Dust collection equipments- Brief description about mechanical dust collectors (Dry type) such as Gravitational separators, cyclone separator, and Electrostatic separator.
7. Draught systems- Natural draught, Forced draught, induced draught and balanced draught. Chimney and its design.

Unit:2 High Pressure Boilers

Unique features of high pressure boilers, advantages of high pressure boilers, La Mont boiler, Benson boiler, Loeffler boiler, Schmidt Hartman boiler and velox boiler. Location of heating surfaces in water tube boiler, Furnace wall construction such as refractory walls, hollow air-cooled refractory walls and water walls, desirable properties of refractory material and different types of refractory materials, desirable properties of insulating materials and different types of insulating materials.

Unit:3

1. Steam Turbines- Classification of steam turbines, Impulse and reaction principles, Compounding of steam turbines. A brief description of Parson's reaction turbine Velocity diagrams and analysis of turbines. Numerical problems based on velocity diagram.
2. Condensers-Purpose, classification and their working principles.
3. Feed Water treatment- Necessity of feed water treatment, Different impurities in

water and their effects, chemicals used for feed water treatment.

Unit:4 Gas Turbine Plant

Carnot and Brayton cycles and their analysis, Regeneration, intercooling and reheating and combined effects of all these on the performance of the cycle, Advantages of Gas turbine plant over steam power plant. Numerical problems based on power plant cycle.

Unit:5 Fluctuating Loads on Power Plants

Definitions of load curve, load duration curve, connected load, maximum demand, Demand factor, Average load, load factor, Diversity factor, Plant capacity factor and plant use factor. Numerical problems.

Reference books:

1. Steam Power station Gaffert
2. Power plant engineering F.T. Morse

Text Book:

1. Power Plant Engg. Mahesh Verma
2. Power Plant Engg. PKNAG
3. Power Plant Engg. Domkundwan

ME-408 T Advanced Precision Machining Processes (APMP) (Elective III)

Credit: 04	L	T	P	Total
Max. Marks:	3	1	0	04

Unit:1 Electric Discharge Machining (EDM):

Introduction, working principle, relaxation circuit & pulse generator, flushing & its types, Dielectric fluid and its essential requirements, EDM electrodes and its manufacturing, EDM tool design, material selection, tool wear, machining operation, metal removal rate, Application, EDG, WEDG.

Unit:2 Electro Chemical Machining (ECM):

Working principle and setup; ECM machine & its structure, electrolytes-flow and storage, applications, Electrochemical drilling, trepanning, turning, sawing, cutting off, honing debarring & Electrochemical Grinding (ECG), ECG, EC debulling (ECD), Anode shop prediction and tool design for ECM process.

Chemical Machining (CHM):

Working principle, chemical blanking, process steps, process characteristics, and applications. Chemical milling its process steps, characteristics and application.

Unit:3 Ultrasonic Machining (USM):

Principle of working and machine setup, tool holder, tool material and size, process characteristics and application.

Unit:4 (a) Abrasive Flow Machining (AFM):

(a) Abrasive finished processes: Abrasive flow finishing (AFF), working principle, Abrasive flow machining system, process variables, Analysis and modeling of abrasive flow machined surfaces, process performance, applications.

(b) Magnetic abrasive finishing (MAF): Introduction, working principle of MAF, Material removal mechanism and surface finish analysis of performance parameters.

Unit:5 Abrasive Jet machining (AJM), Water Jet Machining (WJM), Abrasive water jet Machining (AWJM), Their working principle and machining system; Machine tooling & media, process variables, performances characteristics, process capabilities, limitations & applications.

Unit:6 **Laser Beam Machining (LBM):** Working principle, types of lasers, process variables characteristics, advantages, limitations & applications.

Ion Beam Machining (IBM): Working & setup, equipments, process Performance and characteristics, advantages & limitations, process applications.

Unit:7 **Electron Beam Machining (EBM):** Working principle, process characteristics, variables advantages & limitations.

Plasma Arc Machining (PAM): Principle, setup and machine parts, gases used in PAM, process characteristics, advantages & limitations, applications, plasma turning.

Unit:8 **Micromachining aspects:** Introduction, mechanical advanced micromachining processes, thermal advanced micromachining processes, Electrochemical micro machining, Advanced nano finishing processes, Advanced applications.

Books: 1. Text Book: Production Technology by HMT, Bangalore

2. Ref. Book: Advanced Machining processes by V. K. Jain.

1. Introduction to composite materials, definition, distribution and contiguous classification and characteristics of composite materials, Fibrous Composites, Laminated composites, Particulate composites. Brief description of mechanical behavior of composite materials. Basic terminology of laminated fiber-reinforced composite materials, Laminate, laminates, Brief description of manufacturing methods of laminated fiber-reinforced composite materials. Current and potential advantages of composite materials, strength and stiffness advantage, cost advantage composite modals-Law of mixtures, Interfaces.
2. Macro mechanical behavior of a lamina, stress strain relations for an isotropic materials, engineering constants for orthotropic materials, restrictions on elastic constants for isotropic and orthotropic materials, stress-strain relations for plain stress in an orthotropic material, stress-strain relations for a lamina of arbitrary orientation.
3. Strength of an orthotropic lamina, strength concepts, experimental determination of strength and stiffness. Biaxial strength thesis for an orthotropic lamina, maximum stress theory, maximum strain theory, Tsai-Hill Theory, Effect of variability of fiber strength fracture modes in composites fracture and safety of different composites under static and dynamic loading-mechanism of fracture, fracture mechanics of fiber matrix composite.
4. Micro mechanical behavior of a lamina, basic approaches to micro mechanics, Mechanics of load transfer from matrix to fiber, load transfer in particulate composites. Mechanics of materials approach to stiffness, determination of E_1 , E_2 , ν_{12} , and G_{12} . Elasticity approach to stiffness. Comparison of approaches to stiffness for particulate composite & fiber reinforced composites. Mechanics of materials approach to strength, tensile strength in Fiber direction, and compressive strength in Fiber direction.

Text Book: 1. Mechanics of Composite Materials by R.M. Jones

Reference Book:

1. Principles of Composite material mechanics by R.Gibson.
2. Stress Analysis of Fiber Reinforced composite materials by M.Hyer.

ME-417T: ADVANCED MANUFACTURING SYSTEMS

Credit: 04	L	T	P	Total
Max. Marks:	3	1	0	04

Computer integrated manufacturing (CIM) – scope, segments of CIM. Automated process planning, code structures, generative process planning. Group technology, Cellular manufacturing, Just-in-time in manufacturing, Flexible manufacturing system, Measures of flexibility, Lean manufacturing, Concept of agility, Agile manufacturing. Automated guided vehicles, Application of automated guided vehicle in manufacturing systems. Computer aided quality control in manufacturing, Non-contact inspection methodology, In process and post process metrology, Coordinate measuring machines and their types.

ME-412T
Credit: 04
Max. Marks:

MECHANICAL VIBRATION			
L	T	P	Total
3	1	0	04

1. Introduction- Vector representation and addition of harmonic motion, beats phenomenon, W.O. by harmonic forces Fourier series and harmonic analysis.
2. Single degree of freedom system- undamped vibration. Derivation of differential equation, energy method, equivalent stiffness of spring in series and parallel, positional vibration.
3. Single degree freedom system- Damped Vibration. Force vibration with constant harmonic excitation, force vibration with rotating and reciprocating unbalance force, vibration due to excitation of support vibration isolation and transmissibility vibration, measuring instruments i.e. vibrometer, accelerometer and frequency meter.
4. Two degree freedom system; Principal modes, double pendulum tensional systems combined sub linear and angular mode' damped force system, undamped forced vibration with harmonic excitation system, undamped forced vibration and .harmonic excitation.
5. Multi-Degree vibration:-
Principal modes, torsional systems, combined sublinear and angular mode, damped force system, undamped force vibration with harmonic excitation, critical speed of a light shaft having a single disc with and without damping. Critical speed of a shaft with multiple discs. Electrical analogy. Principle of electrical analogy, truly analogous circuits.

Text Books:

1. Mechanical vibration: G.K.Groover
2. Mechanical Vibration : S. S. Rao

Reference Books:

Mechanical vibration: Francis S.Tse, Ivan E. Morse Rollard T. Hunkle. (Theory and application)

ME-414 T
Credit: 04
Max. Marks:

NON-CONVENTIONAL ENERGY SOURCES (ELECTIVE-III)

L	T	P	Total
3	1	0	04

Unit:1 Introduction to Energy sources Energy consumption as a measure of Prosperity. Energy Sources and their availability, Renewable Energy Resources.

Unit:2 Introduction to solar radiations and instruments for Solar Radiation Measurements, solar Energy collectors principles of conversion of Solar Radiation into Heat, Flat Plate collectors, concentrating collectors. Performance evaluation of flat plate and concentrating collector. Design of flat plate collector. Solar energy storage system, solar ponds, few applications of solar energy.

Unit:3 Introduction to wind Energy, basic principles of Wind Energy Conversion, (WEC) wind data and energy estimation, site selection considerations, basic components of wind energy conversion system, Wind turbine operation and control, Classification of WEC System, horizontal & vertical axis type turbines. Application of wind energy.

Unit:4 Introduction to energy from biomass, biomass conversion technologies, fluidised bed combustion of Bio-mass biogas generation, factors affecting generation of gas, classification of biogas plants, material used for biogas generation.

Unit:5 Introduction to geothermal energy, nature of geothermal fields, geothermal sources, hydrothermal resources, geopressured resources, petrothermal systems, Vapor dominated power plant, Liquid-dominated systems, Hybrid systems, application of geothermal, energy, geothermal energy in India,

Prospects.

Unit:6 Introduction to Energy from ocean, Ocean Thermal Energy Conversion (OTEC), open cycle OTEC system, modifications of open OTEC cycle, closed OTEC system, heat exchangers, Prospects of OTEC in India. energy from tides, basic principles of Tidal power, advantages & limitation of tidal power generation, prospects of tidal energy in India ocean waves, introduction, advantages & disadvantages of wave energy, wave energy conversion devices.

Books: 1. Non-Conventional Energy Sources by G.D. Rai

2. Non-Conventional Energy Sources by Dr. R.K.Singal

(ME-415T)
Credit: 04
Max. Marks:

Value Engineering				
L	T	P	Total	
3	1	0	04	

Introductory concepts in value and cost analysis. Value engineering and value assurance. Product lifecycle and value oriented efforts. Value engineering job plan. Value tests. Techniques of value engineering. Value analysis and decision theory. Decision tree and decision matrix. Purchase price analysis. Evaluation of value alternatives. Fast diagramming. Function cost matrix, matrix evaluation. Brain storming and creativity.

Elements of product cost and cost classification. Investment criteria in value analysis. Case studies in value engineering.

ME-416 T
Credit: 04
Max. Marks:

GAS DYNAMICS (Elective-IV)
L T P Total
3 1 0 04

Introduction and Basic definitions- difference between compressible and incompressible flow, assumptions made for the analysis of compressible flow, continuum, control volume, bulk modulus of elasticity, adiabatic bulk modulus, isothermal bulk modulus, coefficient of compressibility.

1. Fundamental equations of one dimensional steady flow, equation of continuity or law of conservation of mass, momentum equation, steady flow energy equation, adiabatic energy equation, adiabatic energy transformation, stagnation enthalpy, stagnation temperature, stagnation velocity of sound, stagnation pressure, stagnation density, stagnation- state, various regions of flow. Reference velocities such as velocity of sound, maximum fluid velocity, critical velocity of sound, Mach number M^* Crocco number derivation of Bernoulli equation from adiabatic energy equation, equivalent of Bernoulli equation for isentropic compressible flow, effect of Mach No. on compressibility, (Numerical problems).
2. Wave Motion- Wave propagation in gases or compressible media, wave front, a brief description about various types of waves such as infinitesimal pressure wave or sound wave, non-step pressure wave, step pressure wave, expansion wave, equation of acoustic velocity in a compressible fluid, Mach Number, Mach cone, Mach angle.
3. Isentropic flow with variable Area- Comparison of isentropic and adiabatic flows on T-S and P-V diagram, Equation for Mach number variation, Expansions in nozzles, compression in diffusers, stagnation and critical states, Area ratio as a function of Mach number, impulse function, mass flow rate flow through convergent nozzle and convergent-divergent nozzle under varying pressure ratios.
4. Flow with normal shock waves- Formation of a normal shock wave. Governing relations of the normal shock, Prandtl L - Meyer-relation, Mach. No. Downstream of the normal shock wave, Static pressure ratio across the shock, temperature ratio across the shock, density ratio across the shock (The Rankine-Hugoniot equation), stagnation pressure ratio across the shock, moving normal shock wave.

5. Flow through constant area ducts with friction but without heat transfer, governing equations, Fannolines.
6. Flow through constant area ducts with heat transfer but without friction, governing equations, Raleigh lines.

Books:

1. Gas dynamics By S M Yahaha
2. A text book on compressible flow by Rathakrishan
3. Fluid Mechanics and Machines by Modi and Seth

ME-417T: ADVANCED MANUFACTURING SYSTEMS (VII Sem)

Elective

	L	T	P	Total
Max. Marks:	3	1	0	04

Computer integrated manufacturing (CIM) - scope, segments of CIM. Automated process planning, code structures, generative process planning. Group technology, Cellular manufacturing, Just-in-time in manufacturing, Flexible manufacturing system, Measures of flexibility, Lean manufacturing, Concept of agility, Agile manufacturing. Automated guided vehicles, Application of automated guided vehicle in manufacturing systems. Computer aided quality control in manufacturing, Non-contact inspection methodology, In process and post process metrology, Coordinate measuring machines and their types.

Suggested Books:

1. Production technology by HMT Bangalore.
2. Advanced Machining Processes by V.K. Jain
3. Computer Aided Manufacturing Rao & Tiwari

ME-418T

Maintenance Management

Credit: 04

L	T	P	Total
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Max. Marks:

3	1	0	4
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Reliability: Hazard rate, mean time to failure. Hazards models. Constant hazard Weibull model. System Reliability: Series, parallel and mixed configurations. Economics of introducing a stand by or redundancy into a production system, optimum design configuration of a series/parallel system. Maintainability: Maintainability increment Equipment and mission availability. Replacement Decisions: Economic models block replacement policy, age replacement, replacement policies to minimize downtime, economics of preventive maintenance. Inspection Decisions: Optimal inspection frequency to profit maximizing, minimization of downtime and availability maximization.

Overhaul and Repair Decisions: Optimal overhaul/repair/replace maintenance policies for equipment subject to breakdown finite and infinite time horizon. Optimal repair effort of a maintenance work force to meet fluctuating taking into subcontracting opportunities. Spares Maintenance Organization: Computer application in maintenance management, MIS for maintenance.

ME-422 T
Credits: 04
Max. Marks:

Principles of Robotics			
L	T	P	Total
2	1	1	04

Unit-1: Introduction: Definition, configurations, work envelopes, specifications, and other basic parameters of robots.

Unit-2: Kinematics principles: Position and orientation, Co-ordinate systems, Relative frames, Homogenous Co-ordinates, Direct and inverse kinematics, Differential motions and the Jacobians.

Unit-3: Introduction to Dynamics: Types of motions: Slew, joint-interpolated, straight line interpolated motions, planning of manipulator Trajectories and Control, Drive basic Electrical, Hydraulic and Pneumatic drives-basic and relative merits.

Unit-4: Components: Harmonic reduction units, servo valves and grippers.

Unit-5: Sensors and Actuators: Basic types including vision force-torque wrist sensors, Basic types of actuators including intelligent and smart actuators, piezoelectric actuators, shape memory alloy actuators etc., Programming various methods, levels, typical languages like VAL, Industrial applications, Robot cell formation, Case studies.

References Books: 1. Robotics Technology and Flexible automation by Deh, S.R, Tata Mc Graw Hill

2. Robotics: Mechanics and control by Craig, J. J, Addison Wesley

Text Book: 1. Industrial Robots-Technology, Programming and applications by Mikell. P. Groover et al, Mc Graw Hill

ME 473T

Syllabuses of Pool Electives Work Study (Pool Elective)

Credit: 04

L T P Total

Max. Marks:

3 1 0 04

Unit:1 Productivity: Factors affecting productivity, causes of low productivity, remedies to increase productivity. Work study and productivity.

Unit:2 Work Study- definition, purpose & scope, value of work study, human aspects in work study, basic approach. Work study techniques and their comparison.

Unit:3 Method study- definition, purpose and scope, basic approach or procedure, recording techniques, outline process charts, flow process charts, their construction and analysis flow diagrams, string diagram photographic aid, models. Critical examination techniques, primary and secondary questions, development, installation and maintenance methods.

Unit:4 Motion Economy Principle- Micro motion study, Therbligs, motion analysis, simo charts, motion study.

Unit:5 Work Measurement definition, purpose & scope, basic procedure, work measurement techniques, introduction to stop watch time study, work sampling & predetermined motion calculation using rating.

Unit:6 Rating its techniques & scope, application of rating normal time, standard time calculation using rating.

Unit:7 Industrial Relation & Industrial legislation- Introduction, industrial disputes & their causes and their settlement, workers participation management and ways to improve. Industrial harmony, common industrial legislations, India boilers act 1973, payment of wages act 1936, Industrial dispute act 1948, minimum wages act, 1948.

Text Book: 1. Work study by ILO.

LIST OF OPEN ELECTIVES

Material Imperfection and Their Application (PH-429T) L P T (3 1 0) CREDIT-4

Structure of Crystalline Solids: Fundamental concepts, unit cell, crystallographic directions and planes, Crystal systems, Metallic crystal structures.

Imperfections in Solids: Introduction, Point defects: Vacancies and self-interstitials colour centres, in purities is solids, Linear defects dislocations, Interfacial defects, Bulk or volume defects.

Diffusion in Solid: Diffusion, diffusion Mechanisms: vacancy diffusion, interstitial diffusion, steady state diffusion: Fick's first law, non-steady state diffusion: Fick's second law, Factors that influence diffusion, Applications.

Amorphous Materials: Definition, types, structure, methods of preparation of amorphous materials, Applications: optical fibers, amorphous semi-conductor, optical memories, solar cells.

Plastic deformation & Strengthening Mechanisms: Plastic deformation, the tensile stress-strain curve, modes of plastic deformation-slip and twinning, the shear strength of perfect and real crystals, the stress to move a dislocation, mechanisms of strengthening in metals by grain size reduction, solid solution strengthening, strain hardening.

Lasers: Principle, population inversion, Einstein's and B coefficients, types: Ruby laser, he-Ne laser, semi conductor lasers.

Books:	Non Crystalline materials:	by Davis & Mott
	Amorphous Solids:	by S.R. Elliot
	Solid State Physics:	by M.A. Wahab

Polymeric Materials and Their Applications (CY-401T)
L P T (3 1 0) CREDIT-4

1. **Basic Polymer Chemistry:** Definition, Classification, Types of polymerization.
2. **Resins and Plastics:** Thermoplastic and thermosetting resins, constituents of plastics, fabrication of plastic materials, Important resins, Cellulose derivatives, Polyethylene, Teflon, Polystyrene, Polyvinylacetate, PVC, Nylons, Phenolic resins Phenol-Formaldehyde, Urea and Malamine-Urea and melamine-Formaldehyde resins, Epoxy resins, Polyester, Silicones, Ion exchange resins.
3. **Rubbers/Elastomers:** Natural rubber, compounding of rubber, Properties, uses, reclaimed rubber, Synthetic rubber, Buna-S, Nitrile rubbers, Fibre reinforced plastics (FRP).
4. **Biopolymers:** Importance and applications of few important biopolymers eg. Proteins, carbohydrates etc.

Engineering Economics (HU-402T)

L P T (3 1 0) CREDIT-4

- UNIT:1** **Economics Micro and Macro:** Definition, Importance and Uses, Interdependence between Micro and Macro Economics.
- UNIT:2** **Concept in Economics:** Law of Demand, Law of Diminishing Marginal Utility, Law of Equi-marginal Utility, elasticity of Demand, Indifference Curve Analysis-Price effect. In-come effect and substitution effect.
- UNIT:3** **Theory of Production:** Production Function, Laws of Variable proportions, Laws of Returns of to Scale, Cost Function-Meaning of Fixed Cost and Variable Cost, Location of Firms, Wabers theory of Location of the firms.
- UNIT:4** **Theory of the Firm:** Perfect Competition, Monopoly and monopolistic Competition:- Meaning, Assumptions, Equilibrium of the firm in Short run and Long run period of time.
- UNIT:5** **International Trade:** Meaning, Nature and Scope of International Trade, Types and Effects of Tariffs and Quotas, Objective and Functions of International Monetary Fund (I.M.F.).

Open-Elective, (Final Year)

Code: HU-449 T

Subject : Principle of Management

Credits 4(3-1-0)

UNIT 1: Management as a discipline: Definition, nature, scope, functions, managerial Skills, Management. Thought-Historical Prospective, Social Responsibility, of Business.

UNIT2: Planning: Concept and purpose, planning process, Management, By Objectives (MBO), Decision making.

UNIT3: Organization: Concept and purpose of organisation, types of organisation, bases of Departmentation, concept of Authority and Responsibility, Span of Management, Line and Staff Authority, Functional Authority, Delegation of Authority, Centralization and Decentralization of Authority, Coordination Staffing.

UNIT4: Directing: Leadership Concept, Ingredients, Traits, Styles, Roles Communication Concept. Types, Process Barriers, Making Communication effective, Importance.

UNIT5: Controlling: Concept, Provides, Requirements, for adequate control, controlling and earning, Budgeting control Importance, Management Audit, Management in future.

Subject: Operation Research

Code: MA-491T

Credits: 4

Branches: EI

Semester :VII

LPT:310

UNIT 1: Introduction: Definition of O.R. and it's scope, modeling in O.R. General methods for solving O.R. models. The Monte-carlo technique, main characteristic of O.R. main phases of O.R. Linear programming problems. Graphical method for solve L.P.P., Two phase Method, Big-M Method, problems of tie.

UNIT 2: Assignment Model : Mathematical formulation of assignment model, Reduction theorem, problems of maximization & minimization. Hungarian process, travelling salesman problems.

UNIT 3: Transportation Model : Mathematical formulation of transportation problem. Definition of BFS, IBFS, Optimum solution. Algorithms of N-W rule, Least-cost & VAM and their problem

UNIT 4: Sequencing : Introduction, principle assumptions processing of jobs through two, three & m machine's.

UNIT 5: Game Theory : Characteristic of Games. Basic definitions, mini-max criterion and optimal strategy. Equivalence of rectangular Games, Dominance process, Arithmetic method for solving zero-sum-two person Games. Graphical and simplex methods for solving the games.

UNIT 6: Replacement: Replacement of item that fail completely.

UNIT 7: Inventory : Elementary Inventory Models, Inventory models with price breaks.

List of Pool Elective:

1. EI-402 PCB Design & Technology
2. EI-456 Aircraft Instrumentation
3. EC-458 Digital Image Processing
4. EC-460 Microwave Integrated circuit

PH 419 T

Futuristic Materials

Credits 4(3-1-0)

Semiconductors :

Introduction of semiconductors. intrinsic and extrinsic, II-VI and III-V semiconductors and its alloys, Advantages and necessity of the tailoring of semiconductor, Semiconductors and its alloys used of LED and other devices, Utility of semiconducting alloys like GaAs, GaIn, GaP etc.

Superconductors:

Fundamental Phenomena associated with superconductors. Type I & II superconductors, Meissner and London effects, Josephson effects, fundamental of BCS theory. Novel High Temperature Superconductors. High temperature superconductors, TlBa CaCuO single and bilayer. Electron superconductors NdCuO etc. Doping effects in superconductors, Organic superconductors, fullerenes. Application of the superconductors in science, medical and commercial sectors.

Material for Magnetic media:

Material useful for magnetic recording head, magnetic disk, magnetic tape media, Magneto optic recording materials. Holography, data storage materials.

Holography:

Fundamentals of holography, Difference between conventional photography and holography. Techniques to make a hologram. Advantages of holography over other techniques.

Introduction of following with applications :

Fibre optics, Lasers, Ceramics, Dielectric Characterization of Materials

- Books:**
- 1) Superconductivity Today: T.V. Ramakrishnan & C.N.R. Rao Wiley Eastern Pvt. Ltd, New Delhi, 1992
 - 2) Solid State Physics: Ashcroft/Mermin

Quantitative Methods in Economics (HU-409T)
L P T (3 1 0) CREDIT-4

- UNIT:1** **Statistics:** Definition, Importance, Scope and Limitations of statistics, primary and secondary data. Classification of Meaning objectives and types of classification. Frequency Distribution-Discrete, Grouped and continuous frequency distributions. Fundamentals of frequency distribution.
- UNIT:2** **Measures of Central Tendencies:** arithmetic mean, Median, Mode, Geometric Mean and Harmonic Mean, Demerits and Uses of all methods.
- UNIT:3** **Measures of Dispersion:** Mean deviation Method about Mean, Median and Mode, Merits and Demerits of Mean Deviation. Coefficient of M.D. Standard Deviation (S.D.) Method with simple short-cut and step deviation methods. Merits and Demerits of S.D. Coefficient of S.D.
- UNIT:4** **Correlation:** Introduction, Types of Correlation, Karl Pearson's Coefficient of Correlation. Interpretation of 'r'. Probable Error, Uses of Probable Error.
- UNIT:5** **Linear Regression Analysis:** Introduction, Two method of Linear Regression Analysis:- (1) Line of Regression of Y on X and (2) Line of Regression and X on Y. Why two lines of regression Coefficient of Regression. Relation between the coefficient of correlation and Regression.
- UNIT:6** **Index Number:** Definition, Uses and Types of Index Numbers, Methods of Construction Index Numbers-(1) Simple Aggregate Method (2) Weighted Aggregate Method (3) Fisher's Ideal Index Numbers (4) const of living Index Numbers (5) Chain Base Index Numbers. Base Shifting. Limitations of Index Numbers.

Foreign Trade (HU-407T)
L P T (3 1 0) CREDIT-4

- UNIT:1** **Nature of foreign Trade:** Meaning, Nature, Scope and Distinct Features of International Transactions.
- UNIT:2** **Theories of International Trade:** The Classical Theory:-Absolute Advantage Model of Adam Smith, comparative Advantage Model of David Ricardo, the Neo-classical Analysis:-International trade Equilibrium under Constant cost, Increasing Cost and Decreasing cost conditions.
- UNIT:3** **Tariffs and Quota:** types and Effect of tariffs and Quotas, Quota vs. Tariff.
- UNIT:4** **International Monetary fund (I.M.F.):** Nature, Objectives and functions of I.M.F. International Monetary System, since the demise of Bretton Woods System.
- UNIT:5** **International Financial Institutions:** World Bank (IBRD, International Financial Corporation (I.F.C.), International Development Association (I.D.A.).
- UNIT:6** **India's Trade Policy:** Trends of Exports and Imports of India since independence, Composition of India's Foreign Trade.