

SMS Lucknow
Department of Mechanical Engineering
Session: 2020-21

A. NAME OF SUBJECTS FOR ODD SEMESTER

SNO.	NAME OF THE SUBJECT	SUBJECT CODE
1	ENGG SCIENCE COURSE / MATHS IV	KOE 031-38/KAS 302
2	TECHNICAL COMMUNICATIONS /UNIVERSAL HUMAN VALUES	KAS 301/KVE301
3	THERMODYNAMICS	KME 301
4	FLUID MECHANICS AND FLUID MACHINES	KME 302
5	MATERIALS ENGINEERING	KME 303
6	FLUID MECHANICS LAB	KME 351
7	MATERIAL TESTING LAB	KME 352
8	COMPUTER AIDED MACHINE DRAWING I LAB	KME 353
9	MINI PROJECT	KME 354
10	COMPUTER SYSTEM SECURITY/PYTHON PROGRAMMING	KNC 301/KNC 302
11	HEAT AND MASS TRANSFER	KME 501
12	STRENGTH OF MATERIAL	KME 502
13	INDUSTRIAL ENGINEERING	KME 503
14	ADVANCE WELDING	KME 055
15	IC ENGINE AND COMPRESSORS	KME 054
16	CONSTITUTION OF INDIA LAW AND ENGINEERING	KNC 501
17	HEAT AND MASS TRANSFER LAB	KME 551
18	PYTHON LAB	KME 552
19	INTERNET OF THINGS LAB	KME 553
20	MINI PROJECT	KME 554
21	COMPUTER AIDED DESIGN	RME 701
22	AUTOMOBILE ENGINEERING	RME 702
23	POWER PLANT ENGINEERING	RME 071
24	OPERATION RESEARCH	RME 075
25	UNDERSTANDING OF HUMAN BEING	ROE 074
26	CAD/CAM LAB	RME 751
27	AUTOMOBILE LAB	RME 752
28	INDUSTRIAL TRAINING	RME 753
29	PROJECT 1	RME 754

B. NAME OF SUBJECTS FOR EVEN SEMESTER

SNO	NAME OF SUBJECT	SUBJECT CODE
1	MATHS IV/ENGG SCIENCE COURSE	KAS 402/KOE 041-48
2	UNIVERSAL HUMAN VALUES/TECHNICAL COMMUNICATION	KVE 401/KAS 401
3	APPLIED THERMODYNAMICS	KME 401
4	ENGINEERING MECHANICS	KME 402
5	MANUFACTURING PROCESSES	KME 403
6	APPLIED THERMODYNAMICS LAB	KME 451
7	MANUFACTURING PROCESSES LAB	KME 452
8	COMPUTER AIDED MACHINE DRAWING II LAB	KME 453
9	PYTHON PROGRAMMING/COMPUTER SYSTEM SECURITY	KNE 402/KNC 401
10	REFRIGERATION AND AIR CONDITIONING	KME 601
11	MACHINE DESIGN	KME 602
12	THEORY OF MACHINE	KME 603
13	NON DESTRUCTIVE TESTING	KME 061
14	UNIVERSAL HUMAN VALUES	KOE 069
15	REFRIGERATION AND AIR CONDITIONING LAB	KME 651
16	MACHINE DESIGN LAB	KME 653
17	THEORY OF MACHINE LAB	KME 653
18	RENEWABLE ENERGY RESOURCES	ROE 086
19	NON DESTRUCTIVE TESTING	RME 080
20	TOTAL QUALITY MANAGEMENT	RME 085
21	SEMINAR	RME 851
22	PROJECT 2	RME 852

Course Outcomes _Odd Semester Subjects

Session:2020-2021

MATERIALS ENGINEERING ; KME 303	
Course Outcome	
CO1	Student Will Be Able To Identify Crystal Structures For Various Materials And Understand The defects In Such Structures
CO2	Student Will Be Able To Understand Failure Theories And Non Destructive Testing
CO3	Understand How To Tailor Material Properties Of Ferrous And Non-Ferrous Alloys.
CO4	Students Will Be Able To Understand The Concept Of Heat Treatment In Materials
CO5	Students Will Under Stand The Concept Of Alloying And Its Application In Various Materials

FLUID MECHANICS AND HYDRAULIC MACHINES KME ; 302	
Course Outcome	
CO1	Able to explain the effect of fluid properties on a flow system.
CO2	Able to identify type of fluid flow patterns and describe continuity equation
CO3	To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
CO4	Able to demonstrate boundary layer concepts.
CO5	To select and analyze an appropriate turbine with reference to given situation in power plants
CO6	To estimate performance parameters of a given Centrifugal and Reciprocating pump.

THERMODYNAMICS ;KME 301

Course Outcome

CO1	Understand the concept of PN junction and special purpose diodes.
CO2	Study the application of conventional diode and semiconductor diode
CO3	Analyze the I-V characteristics of BJT and FET.
CO4	Analyze the Op-Amp, amplifiers, integrator, and differentiator
CO5	Understand the concept of digital storage oscilloscope and compare of DSO with analog oscilloscope.

Computer System Security; KNC 301

Course Outcome

CO1	To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats.
CO2	To discover cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats
CO3	To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.
CO4	To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios
CO5	To articulate the well known cyber attack incidents, explain the attack scenarios, and explain mitigation techniques.

Technical Communication ;(KAS301/401)

Course Outcome

CO1	1. Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
CO2	Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions
CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
CO4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

ELECTRONICS ENGINEERING; KOE 038

Course Outcome

CO1	Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
CO2	Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions
CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
CO4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

Heat & Mass Transfer

Subject Code: KME 501	Heat and Mass Transfer	L T P : 3 1 0	Credits: 4
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The students will be able to		Blooms Taxonomy
CO-1	Understand the fundamentals of heat and mass transfer	K2
CO-2	Apply the concept of steady and transient heat conduction.	K3
CO-3	Apply the concept of thermal behaviour of fins.	K3
CO-4	Apply the concept of forced and free convection.	K3
CO-5	Apply the concept of radiation for black and non-black bodies	K3
CO-6	Conduct thermal analysis of heat exchangers.	K4

Advance welding; KME 055	
Course Outcome	
CO1	Understand the physics of arc welding process and various operating characteristics of welding power source.
CO2	Analyse various welding processes and their applications.
CO3	Apply the knowledge of welding for repair & maintenance, along with the weld ability of different materials.
CO4	Apply the concept of quality control and testing of weldments in industrial environment.
CO5	Evaluate heat flow in welding and physical metallurgy of weldments.

Industrial Engineering; KME 503

Course Outcome

CO1	1. Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
CO2	Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions
CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
CO4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

Strength of Material ; KME 502

Course Outcome

CO1	Understand the concept of stress and strain under different conditions of loading
CO2	Determine the principal stresses and strains in structural members
CO3	Determine the stresses and strains in the members subjected to axial, bending and torsional loads
CO4	Apply the concepts of stresses and strain in solving problems related to springs, column and pressure vessels
CO5	Calculate the slope, deflection and buckling of loaded members
	Analyze the stresses developed in straight and curved beams of different cross sections

CONSTITUTION OF INDIA, LAW AND ENGINEERING; KNC501**Course Outcome**

CO1	Identify and explore the basic features and modalities about Indian constitution.
CO2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level
CO3	Differentiate different aspects of Indian Legal System and its related bodies.
CO4	Discover and apply different laws and regulations related to engineering practices
CO5	Correlate role of engineers with different organizations and governance models Pedagogy: Lecture, Problem based learning, Group discussions, Visual media, Films, Documentaries, Debate forums.

I C Engine, Fuel and Lubrication ; KME 054**Course Outcome**

CO1	Explain the working principle, performance parameters and testing of IC Engine.
CO2	Understand the combustion phenomena in SI and CI engines and factors influencing combustion chamber design.
CO3	Understand the essential systems of IC engine and latest trends and developments in IC Engines.
CO4	Understand the effect of engine emissions on environment and human health and methods of reducing it.
CO5	Apply the concepts of thermodynamics to air standard cycle in IC Engines
CO6	Analyse the effect of various operating parameters on IC engine performance.

AUTOMOBILE ENGINEERING; RME 702**Course Outcome**

CO1	Be able to understand the application of automobile and frame, Chassis, Tractive force & gearbox Problem with solution.
CO2	Be able to design & application of Transmission system and Assignment problems using appropriate method
CO3	Be able to understand the application of braking system & the use of chassis & suspension system in the automobile using different mechanical & electronic components.
CO4	Be able to solve simple problems of electrical & fuel supply system in practical cases making under different automobile conditions .
CO5	Enables to take best course of action out of several alternative courses for the purpose

	of achieving objectives by using emission standards and pollution control & alternative energy sources.
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Computer Aided Design & manufacturing; RME 701	
Course Outcome	
CO1	Identify proper computer graphics techniques for geometric modelling. Describe and understand the fundamental theory and concepts of the CAD/CAM and to gain knowledge about the benefits of CAD and graphics standards.
CO2	Transform, manipulate objects & store and manage data, Build up the knowledge of the underlying theory of modeling and the usage of models in different engineering applications
CO3	CAM Tool path Creation and NC- G code output., Compare the different types of modeling techniques and create transformations for 2D geometric modeling and also to understand the basics of Finite Element Methods in the context of modelling.
CO4	Use rapid prototyping and tooling concepts in any real life applications, Recognize and analyze Computer Aided Designing systems; Geometric modeling, solid modeling, and feature-based design modeling
CO5	Identify the tools for Analysis of a complex engineering component

ROE 074: Understanding the Human Being Comprehensively – Human Aspirations and its Fulfilment

Course Outcome (CO)	
CO1	To help the students having the clarity about human aspirations, goal, activities and purpose of life.
CO2	To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.
CO3	To help the students to develop the understanding of human tradition and its various components.

OPERATION RESEARCH; RME 075

Course Outcome

CO1	Be able to understand the application of OR and frame a LP Problem with solution – graphical.
CO2	Be able to build and solve Transportation and Assignment problems using appropriate method
CO3	Be able to design and solve simple models of CPM and queuing to improve decision making and develop critical thinking and objective analysis of decision problems
CO4	Be able to solve simple problems of replacement and implement practical cases of decision making under different business environments .
CO5	Enables to take best course of action out of several alternative courses for the purpose of achieving objectives by applying game theory and sequencing models

Power Plant Engineering; KME 076

Course Outcome

CO1	Understand the different sources of power generation and their impact on environment.
CO2	Understand the elements of power generation using fossil fuels.
CO3	Understand the elements of power generation using nuclear and renewable energy sources.
CO4	Understand the concepts of electrical systems used in power plants
CO5	Apply the basic concepts of thermodynamics to measure the performance of different power plants.
CO6	Determine the performance of power plants based on load variations.

Course Outcomes _Even Semester Subjects

Session:2020-2021

APPLIED THERMODYNAMICS ;KME 401	
Course Outcome	
CO1	After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles.
CO2	They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.
CO3	They will be able to understand phenomena occurring in high speed compressible flows.

ENGINEERING MECHANICS ;KME 402	
Course Outcome	
CO1	Student Will Be Able To Identify Different Force Systems And Have An Idea About Friction
CO2	Student Will Be Able To Understand Beams And Trusses And Difference Between Them
CO3	. Student Will Be Able To Understand About Centroid And Moment Of Inertia
CO4	Students Will Be Able To Understand The Concept Of Kinetics And Kinematics Of Rigid Body
CO5	Students Will Under Stand The Concept Of Pure Torsion And Pure Bending And Stresses Strains

Universal Human Values and Professional Ethics; KVE401

Course Outcome

CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Manufacturing Process; KME 403

Course Outcome

CO1	Acquire fundamental knowledge and design widely used and very important primary manufacturing processes such as casting, joining and forming.
CO2	Upon completion of this course, the students will be able to understand and compare the functions and applications of different metal cutting tools, Student will be able to Estimate machining time for milling and drilling process.
CO3	Demonstrate operation such Grinding and super finishing operation.
CO4	Student able to understand all welding process and calculate melting efficiency of joint
CO5	Acquire knowledge about modern manufacturing process and calculate MRR

Mathematics IV; KAS 402

Course Outcome

C01	Remember the concept of partial differential equation and to solve partial differential equations
C02	Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations
C03	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting
C04	Remember the concept of probability to evaluate probability distributions.
C05	Apply the concept of hypothesis testing and statistical quality control to create control charts

PYTHON PROGRAMMING; KNC 402

Course Outcome

C01	To read and write simple Python programs.
C02	To develop Python programs with conditionals and loops.
C03	To define Python functions and to use Python data structures -- lists, tuples, dictionaries
C04	To do input/output with files in Python
C05	To do searching ,sorting and merging in Python

Machine Design ; KME 602	
Course Outcome	
C01	Recall the basic concepts of Solid Mechanics to understand the subject.
C02	Classify various machine elements based on their functions and applications.
C03	Apply the principles of solid mechanics to machine elements subjected to static and fluctuating loads.
C04	Analyze forces, bending moments, twisting moments and failure causes in various machine elements to be designed.
C05	Design the machine elements to meet the required specification

Refrigeration & Air Conditioning; KME 601	
Course Outcome	
C01	Understand the basics concepts of Refrigeration & Air-Conditioning and its future prospects.
C02	Explain the construction and working of various components in Refrigeration & Air-Conditioning systems.
C03	Understand the different types of RAC systems with their respective applications.
C04	Apply the basic laws to the thermodynamic analysis of different processes involved in Refrigeration and Air-Conditioning.
C05	Apply the basic concepts to calculate the COP and other performance parameters for different RAC systems
C06	Analyze the effects of performance parameters on COP.

Universal Human Values and Professional Ethics; KOE 069	
Course Outcome	
CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Theory of Machines ; KME 603	
Course Outcome	
CO1	Understand the principles of kinematics and dynamics of machines.
CO2	Calculate the velocity and acceleration for 4-bar and slider crank mechanism
CO3	Develop cam profile for followers executing various types of motions
CO4	Apply the concept of gear, gear train and flywheel for power transmission
CO5	Apply dynamic force analysis for slider crank mechanism and balance rotating & reciprocating masses in machines.

CO6	Apply the concepts of gyroscope, governors in fluctuation of load and brake & dynamometer in power transmission
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Nondestructive Testing; KME 061	
Course Outcome	
CO1	Understand the concept of destructive and Non-destructive testing methods.
CO2	Explain the working principle and application of die penetrant test and magnetic particle inspection.
CO3	Understand the working principle of eddy current inspection.
CO4	Apply radiographic techniques for testing.
CO5	Apply the principle of Ultrasonic testing and applications in medical and engineering areas.

NON-DESTRUCTIVE TESTING; RME 080	
Course Outcome	
CO1	Be able to understand the application of non destructive testing & common terminology flaws 7 defects advantage & limitation of visual inspection Problem with solution.
CO2	Be able to understand the different technique of non destructive testing like dye penetration test & magnetic particle inspection for determining the defects in different manufacturing process.
CO3	Be able to understand the different technique of non destructive testing like Radiographic methods for determining the defects in different manufacturing process.
CO4	Be able to understand the different technique of non destructive testing like Ultrasonic

	testing methods for determining the defects in different manufacturing process.
C05	Enables to take best course of action out of several alternative courses for the purpose of achieving objectives by some special technique like eddy current inspection.

TOTAL QUALITY MANAGEMENT; RME085	
Course Outcome	
C01	To understand the concept of Quality
C02	To understand the Implication of Quality on Business
C03	To Implement Quality Implementation Programs
C04	To have exposure to challenges in Quality Improvement Programs
C05	Identify requirements of quality improvement programs

RENEWABLE ENERGY RESOURCES; ROE 086	
Course Outcome	
C01	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations
C02	Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation
C03	Explore the concepts involved in wind energy

	conversion system by studying its components, types and performance.
CO4	Illustrate ocean energy and explain the operational methods of their utilization.
CO5	Acquire the knowledge on Geothermal energy.

FLUID MECHANICS AND HYDRAULIC MACHINES

Syllabus:

UNIT – I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT - II

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows- steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows- equation of continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces –Euler’s and Bernoulli’s equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT - III

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

Closed conduit flow: Reynold’s experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT – IV

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vane

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT - V

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

THERMODYNAMICS

Syllabus:

UNIT I

Review of Fundamental Concepts and Definitions:

Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Property of mixture of gases, electrical, magnetic, gravitational, spring and shaft work.
Zeroth law of thermodynamics: Concept of Temperature and its' measurement, Temperature scales.
First law of thermodynamics:
First Law for Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc.

UNIT II

Second law of thermodynamics:
Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and its' corollaries, Thermodynamic Temperature Scale, PMM-II.
Entropy: Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT III

Availability and Irreversibility:
Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.
Thermodynamic relations:
Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient

and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

UNIT IV

Properties of steam and Rankine cycle:

Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Subcooled

liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Moller chart, Dryness factor and its measurement,

processes involving steam in closed and open systems. Simple Rankine cycle.

Air-water vapour mixture and Psychrometry: Psychrometric terms and their definitions, Psychrometric chart, Different Psychrometric processes and their representation on Psychrometric chart.

UNIT V

Refrigeration Cycles:

Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration. Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle.

Analysis

of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on

performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable

properties. Vapour absorption refrigeration system

ELECTRONICS ENGINEERING

Syllabus:

UNIT-I

PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and avalanche).

UNIT-II

Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices : light-emitting diodes, Varactor (Varicap) diodes, tunnel diodes, liquidcrystal displays.

UNIT-III

Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model), Field effect transistor: Construction and characteristic of JFETs. AC analysis of CS amplifier, MOSFET (depletion and enhancement) type, transfer characteristic.

UNIT-IV

Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, differentiator), OpAmp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.

UNIT-V

Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.

COMPUTER SYSTEM SECURITY

Syllabus:

Unit1

Computer System Security Introduction: Introduction, What is computer security and what to learn? , Sample Attacks, The Marketplace for vulnerabilities, Error 404 Hacking digital India part 1 chase. Hijacking & Defense: Control Hijacking ,More Control Hijacking attacks integer overflow ,More Control Hijacking attacks format string vulnerabilities, Defense against Control Hijacking - Platform Defenses, Defense against Control Hijacking - Run-time Defenses, Advanced Control Hijacking attacks..

Unit 2.

Confidentiality Policies: Confinement Principle ,Detour Unix user IDs process IDs and privileges , More on confinement techniques ,System call interposition ,Error 404 digital Hacking in India part 2 chase , VM based isolation ,Confinement principle ,Software fault isolation , Rootkits ,Intrusion Detection Systems

Unit 3

Secure architecture principles isolation and leas: Access Control Concepts , Unix and windows access control summary ,Other issues in access control ,Introduction to browser isolation . Web security landscape : Web security definitions goals and threat models , HTTP content rendering .Browser isolation .Security interface , Cookies frames and frame busting, Major web server threats ,Cross site request forgery ,Cross site scripting ,Defenses and protections against XSS , Finding vulnerabilities ,Secure development

Unit 4.

Basic cryptography: Public key cryptography ,RSA public key crypto ,Digital signature Hash functions ,Public key distribution ,Real world protocols ,Basic terminologies ,Email security certificates ,Transport Layer security TLS ,IP security , DNS security.

Unit 5

Internet Infrastructure: Basic security problems , Routing security ,DNS revisited ,Summary of weaknesses of internet security ,.Link layer connectivity and TCP IP connectivity , Packet filtering firewall ,Intrusion detection.

MATERIALS ENGINEERING

Syllabus:

UNIT-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength.

UNIT-II

Static failure theories: Ductile and brittle failure mechanisms, Tresca, Von-mises, Maximum normal stress, Mohr-Coulomb and Modified Mohr-Coulomb; Fracture mechanics: Introduction to Stress intensity factor approach and Griffith criterion. Fatigue failure: High cycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of mean stress using the Modified Goodman diagram; Fracture with fatigue, Introduction to non-destructive testing (NDT).

UNIT-III

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructural aspects of ledeburite, austenite, ferrite and cementite, cast iron.

UNIT-IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening.

UNIT-V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titanium alloys.

TECHNICAL COMMUNICATION

Syllabus:

Unit -1

Fundamentals of Technical Communication: Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition, types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication.

Unit - II

Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration, C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Unit - III

Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Unit - IV

Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Unit – V

Dimensions of Oral Communication & Voice Dynamics: Code and Content; Stimulus & Response; Encoding process; Decoding process; Pronunciation Etiquette; Syllables; Vowel sounds; Consonant sounds; Tone: Rising tone; Falling Tone; Flow in Speaking; Speaking with a purpose; Speech & personality; Professional Personality Attributes: Empathy; Considerateness; Leadership; Competence.

APPLIED THERMODYNAMICS

Syllabus:

UNIT I

Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy. Introduction and Otto, Diesel and Dual cycles.

UNIT II

Vapour Power cycles: Vapor power cycles Rankine cycle with superheat, reheat and regeneration, exergy analysis. Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration. Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow. Steam Turbines: Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles. Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine. Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of intercooling, minimum work for multistage reciprocating compressors.

ENGINEERING MECHANICS

Syllabus:

UNIT-I:

Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium. Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.

UNIT-II:

Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams. Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.

UNIT-III:

Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.

UNIT-IV:

Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity. Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.

UNIT-V:

Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections. Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque. Course Outcomes: After completing this course, the students should be able to understand the various effect of force and motion on the engineering design structures.

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

Syllabus:

UNIT-1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration– what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-2

Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

UNIT-3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!.

UNIT-4

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5

Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Syllabus:

UNIT-I

Conventional Manufacturing processes:

Casting and moulding, Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses. Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy.

UNIT-II

Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, cutting tool materials, cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining. Additive manufacturing: Rapid prototyping and rapid tooling Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding.

UNIT-III

Grinding & Super finishing:

Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Centreless grinding. Super finishing: Honing, lapping and polishing.

UNIT-IV

Metal Joining (Welding):

Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Weld decay in HAZ.

UNIT-V

Unconventional Machining Processes:

Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining(ECM), etchant & maskant, process parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining.

PYTHON PROGRAMMING

Syllabus:

Unit1.

Introduction: The Programming Cycle for Python , Python IDE, Interacting with Python Programs , Elements of Python, Type Conversion.

Basics: Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.

Unit 2.

Conditionals: Conditional statement in Python (if-else statement, its working and execution), Nested-if statement and Elif statement in Python, Expression Evaluation & Float Representation.

Loops: Purpose and working of loops , While loop including its working, For Loop , Nested Loops , Break and Continue.

Unit 3

Function: Parts of A Function , Execution of A Function , Keyword and Default Arguments ,Scope Rules.

Strings : Length of the string and perform Concatenation and Repeat operations in it. Indexing and Slicing of Strings.

Python Data Structure : Tuples , Unpacking Sequences , Lists , Mutable Sequences , List Comprehension , Sets , Dictionaries

Higher Order Functions: Treat functions as first class Objects , Lambda Expressions

Unit 4.

Sieve of Eratosthenes: generate prime numbers with the help of an algorithm given by the Greek Mathematician named Eratosthenes, whose algorithm is known as Sieve of Eratosthenes.

File I/O : File input and output operations in Python Programming

Exceptions and Assertions

Modules : Introduction , Importing Modules ,

Abstract Data Types : Abstract data types and ADT interface in Python Programming.

Classes : Class definition and other operations in the classes , Special Methods (such as `_init_`, `_str_`, comparison methods and Arithmetic methods etc.) , Class Example , Inheritance , Inheritance and OOP.

Unit 5.

Iterators & Recursion: Recursive Fibonacci , Tower Of Hanoi

Search : Simple Search and Estimating Search Time , Binary Search and Estimating Binary Search Time

Sorting & Merging: Selection Sort , Merge List , Merge Sort , Higher Order Sort

MATHMATICS IV

Syllabus:

Module I : Partial Differential Equations

Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Cauchy's method of Characteristics, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.

Module II: Applications of Partial Differential Equations

Classification of linear partial differential equation of second order, Method of separation of variables, Solution of wave and heat conduction equation up to two dimension, Laplace equation in two dimensions, Equations of Transmission lines.

Module III : Statistical Techniques I

Introduction: Measures of central tendency, Moments, Moment generating function (MGF) , Skewness, Kurtosis, Curve Fitting , Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves ,Correlation and Rank correlation, Regression Analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions coefficients and non linear regression.

Module IV : Statistical Techniques II

Conditional probability, Baye's theorem, Random variables (Discrete and Continuous Random variable) Probability mass function and Probability density function, Expectation and variance, Discrete and Continuous Probability distribution: Binomial, Poission and Normal distributions.

Module V : Statistical Techniques III

Introduction , Sampling Theory (Small and Large) , Hypothesis, Null hypothesis, Alternative hypothesis, Testing a Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, T-test, F-test and Chi-square test, One way Analysis of Variance (ANOVA).Statistical Quality Control (SQC) , Control Charts , Control Charts for variables (X and R Charts), Control Charts for Variables (p, np and C charts).

ADVANCE WELDING

Syllabus:

UNIT-I:

Introduction: Introduction to welding, application, classification and process selection criterion. Health & safety in welding.

Welding Arc: Physics of welding arc, arc initiation, voltage distribution, arc characteristics, arc efficiency, arc temperatures and arc blow. Mechanism and types of metal transfer.

Welding Power Sources: Types of welding power sources, operation characteristics and specifications.

UNIT-II:

Welding Processes: Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) Gas Tungsten Arc Welding (GTAW) Plasma Arc, Submerged Arc Welding, Electro gas and Electroslag, Resistance welding, Friction welding, Brazing, Soldering & Braze welding. Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding.

Advances in Welding Processes: Narrow Gap, Tandem (Twin / Multi Wire) Welding, A-TIG, Hybrid Welding processes, Magnetically impelled arc butt (MIAB) welding, welding automation and robotic applications.

UNIT-III:

Heat Flow Welding: Weld thermal cycle, Temperature distribution, Peak temperature; Heat Affected Zone (HAZ), heating, cooling and solidification rates.

Welding Metallurgy: Fundamentals of physical metallurgy, Principle of solidification of weld metal, Reactions in weld pool - Gas metal reaction, Slag metal reaction, factors affecting changes in microstructure and mechanical properties of HAZ, Micro and macro structures in weld metal and HAZ

UNIT-IV:

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.

STRENGTH OF MATERIAL

Syllabus:

Unit I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclined sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's circle for plane stress, three dimensional states of stress & strain, equilibrium equations, generalized Hook's law, theories of failure. Thermal Stresses.

Unit II

Stresses in Beams: Pure Bending, normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

Deflection of Beams: Differential equation of the elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes.

Unit III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Rankine Gordon formulae, examples of columns in mechanical equipment and machines.

Unit IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or

external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

Unit V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

Unsymmetrical Bending: Properties of beam cross section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I section and channel section

INDUSTRIAL ENGINEERING

Syllabus:

Unit-I:

Overview of Industrial Engineering: Types of production systems, concept of productivity, productivity measurement in manufacturing and service organizations, operations strategies, liability and process design.

Facility location and layout: Factors affecting facility location; principle of plant layout design, types of plant layout; computer aided layout design techniques; assembly line balancing; materials handling principles, types of material handling systems, methods of process planning, steps in process selection, production equipment and tooling selection, group technology, and flexible manufacturing.

Unit II:

Production Planning and control: Forecasting techniques – causal and time series models, moving average, exponential smoothing, trend and seasonality; aggregate production planning; master production scheduling; materials requirement planning (MRP) and MRP-II; routing, scheduling and priority dispatching, concept of JIT manufacturing system

Project Management: Project network analysis, CPM, PERT and Project crashing.

Unit III:

Engineering economy and Inventory control: Methods of depreciation; break-even analysis, techniques for evaluation of capital investments, financial statements, time-cost trade-off, resource levelling; Inventory functions, costs, classifications, deterministic inventory models, perpetual and periodic inventory control systems, ABC analysis, and VED analysis.

Queuing Theory: Basis of Queuing theory, elements of queuing theory, Operating characteristics of a queuing system, Classification of Queuing models.

Unit IV

Work System Design: Taylor's scientific management, Gilbreths's contributions; work study: method study, micro-motion study, principles of motion economy; work measurement –time study, work

sampling, standard data, Predetermined motion time system (PMTS); ergonomics; job evaluation, merit rating, incentive schemes, and wage administration.

Product Design and Development: Principles of product design, tolerance design; quality and cost considerations; product life cycle; standardization, simplification, diversification, value engineering and analysis, and concurrent engineering.

Unit V:

Operational Analysis: Formulation of LPP, Graphical solution of LPP, Simplex Method, Sensitivity Analysis, degeneracy and unbound solutions. transportation and assignment models; Optimality test: the stepping stone method and MODI method, simulation.

CONSTITUTION OF INDIA, LAW AND ENGINEERING

Syllabus:

Module 1

Introduction and Basic Information about Indian Constitution: Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.

Module 2

Union Executive and State Executive: Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Module 3

Introduction and Basic Information about Legal System: The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.

Module 4

Intellectual Property Laws and Regulation to Information: Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

Module 5

Business Organizations and E-Governance: Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.

I C ENGINE FUEL AND LUBRICATION

Syllabus:

Unit-I

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram, Valve mechanism- Push rod type, Overhead type (SOHC, DOHC). Thermodynamic analysis of Air standard cycles: Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles Fuel air cycle, factors affecting the fuel air cycle, Actual cycle. Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines.

Unit-II

Combustion: Stages of Combustion in SI & CI engine, Factors affecting combustion, Flame speed, Ignition Delay, Abnormal combustion and its control. Combustion chamber: Squish, Swirl & tumble, Combustion chamber design for SI & CI engine & factors affecting it.

Unit-III

Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine, MPFI, Scavenging in 2 Stroke engines. Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings. Turbocharging & its types- Variable Geometry Turbocharger, Waste Gate Turbocharger, Effect of turbocharging on power & emission.

Unit-IV

Engine Emission and Control: Pollutant - Sources and types – Effect on environment and human health - formation of NO_x - Hydrocarbon Emission Mechanism - Carbon Monoxide Formation - Particulate emissions - Methods of controlling Emissions - Catalytic converters and Particulate Traps - Selective Catalytic Reduction (SCR) - Diesel Oxidation Catalyst (DOC).

Fuels: Fuels for SI and CI engine, Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

UNIT-V

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation. Ignition System in SI Engine: Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition. Recent trends in IC engine: Lean burn engine, Stratified charge spark ignition engine, Homogeneous charge spark ignition engine, GDI.

REFRIGERATION AND AIR CONDITIONING

Syllabus:

Unit-1

Refrigeration:

Introduction to refrigeration system, Methods of refrigeration, Unit of refrigeration, Refrigeration effect, Carnot refrigeration cycle, Refrigerator and Heat Pump, C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed air Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Need of Aircraft refrigeration, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

Unit-2

Vapour Compression System:

Reversed vapour Carnot cycle, limitation of Reversed vapour Carnot cycle, Simple vapour compression cycle, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle,

Multistage System:

Multistage vapour compression system requirement, Different configuration of multi pressure system, Removal of flash gas, Intercooling, Multi evaporator system, Cascade system.

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison, Three fluid system.

Refrigerants:

Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants, and Environment friendly refrigerants, Anti-freeze solution, Phase changing materials, Ozone layer depletion and global warming considerations of refrigerants, Selection of refrigerants, Future Refrigerants like Hydrofluoro-Olefines

Unit-4

Air Conditioning:

Introduction to air conditioning, Psychrometric properties and their definitions, Psychrometric chart, Different Psychrometric processes, Air Washers, Cooling towers & humidifying efficiency, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP).

Window air Conditioner, Simple air conditioning system, Air conditioning system with ventilation.

Unit-5

Refrigeration System Equipment:

Compressors, Condensers, Expansion Devices and Evaporators, Elementary knowledge of transmission and distribution of air through ducts and fans,

Application:

Food preservation, Transport refrigeration, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Comfort and Industrial air conditioning Refrigeration.

Other systems:

Cryogenic liquefaction and refrigeration systems, Brief introduction of Thermo-electric refrigeration system, Steam jet refrigeration system, Vortex tube refrigeration system, Magnetic refrigeration system.

THEORY OF MACHINE

Syllabus:

Unit I

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

Velocity analysis: Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous centre.

Acceleration analysis: Introduction, acceleration of a point on a link, acceleration diagram, Coriolis's component of acceleration, crank and slotted lever mechanism,

Unit II

Cams: Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration

Gears and gear trains: Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

Unit III

Force analysis: Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

Unit IV

Balancing: Introduction, static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of reciprocating masses, balancing of single cylinder engine.

Governors: Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor

Unit V

Brakes and dynamometers: Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four-wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

Gyroscope: Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two-wheel vehicles moving on curved paths.

MACHINE DESIGN

Syllabus:

Unit I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Standards designation of carbon & alloy steels, Selection of preferred sizes, Selection of materials for static and fatigue loads, Design against Static Load

Design against Fluctuating Loads

Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Design for finite & infinite life, Soderberg, Goodman, Gerber criteria

Unit II

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint

Welded Joints

Stress relieving of welded joints, Butt Joints, Fillet Joints, Strength of Butt Welds, Strength of parallel fillet welds, Strength of transverse fillet welds

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity, Keys, Types of keys, Selection of square and flat keys, Strength of sunk key

Unit III

Spur Gear

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

Helical Gears

Terminology, Proportions for helical gears, Force components on a tooth of helical gear, Virtual number of teeth, Beam strength and wear strength of helical gears, Dynamic load on helical gears, Design of helical gears. Introduction, Classification and Applications of Bevel & Worm Gears

Unit IV

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing.

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing.

Unit V

IC Engine Parts

Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin;

Friction Clutches

Clutches, Difference between coupling and clutch, Single plate friction clutch, Torque transmitting capacity, Multi-Disk Clutches, Friction Material

Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin;

Friction Clutches

Clutches, Difference between coupling and clutch, Single plate friction clutch, Torque transmitting capacity, Multi-Disk Clutches, Friction Material

NON DESTRUCTIVE TESTING

Syllabus:

Unit-I:

Introduction to NDT, DT, advantages & limitations of NDT, classification of NDT methods, Comparison with DT, Terminology, Flaws and Defects. Scope of NDT. Codes, Standards and Certifications in NDT.

Visual Inspection – Equipment used for visual inspection, Borescopes, Application of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection, Visual Inspection in Welding.

Unit-II:

Liquid Penetrant Testing – Principle, Scope, Testing equipment, Advantages, Limitations, types of penetrants and developers, standard testing procedure, Zygo test, Illustrative examples and interpretation of defects.

Magnetic Particle Inspection – Principle, Scope, Testing equipment, Advantages, Limitations, Application of MPI & standard testing procedure, DC & AC magnetization, Skin Effect, different methods to generate magnetic fields, Illustrative examples and interpretation of defects.

Unit-III:

Radiographic Testing – Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photoelectric effect, coherent scattering and Incoherent scattering, Beam geometry.

X-ray Radiography – Principle, equipment & methodology, applications, source, types of radiations and limitations; γ -ray Radiography – Principle, equipment, γ -ray source & technique; Radiography Image Quality Indicators, Film Processing, advantages of γ -ray radiography over X-ray radiography. Precautions against radiation hazards.

Unit-IV:

Ultrasonic Testing – Introduction, Principle, Piezoelectricity and Piezoelectric Transducers, Wave propagation, Ultrasonic probes, selection of angle probes, Acoustic Impedance, Reflection and transmission coefficient, Snell's law, standard testing procedure & calibration, advantages & limitations. Data representation - A-scan, B-scan, C-scan. Applications in inspection of welded joints, castings, forgings and dimensional measurements. Introduction to TOFD & Phased Array Ultrasonic Testing.

Unit-V:

Special NDT Techniques:

Eddy Current Inspection– Introduction, Principle, Methods, scope, Equipment, types of probes, Sensitivity, standard testing procedure, advanced ECT methods, advantages and limitations.

Acoustic Emission Technique– Introduction, Types of AE signal, Principle, Advantages & Limitations, Interpretation of Results, Applications.

Holography, Thermography– Introduction, Principle, advantages, limitations and applications.

UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY-
HUMAN ASPIRATIONS AND ITS FULFILLMENT

Syllabus:

Module 1: Introduction

The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.

Module 2: Understanding Human being and its expansion.

The domain of right understanding starts from understanding the human being (the knower, the experiencer and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).

Module 3: Activities of the Self.

Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.

Module 4: Understanding Co-existence with other orders.

The need and the process of inner evolution (through self-exploration, self-awareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).

Module 5: Expansion of harmony from self to entire existence.

Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence.

AUTOMOBILE ENGINEERING

Syllabus:

UNIT-I:

Introduction: Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

UNIT-II:

Transmission System: Requirements. Clutches. Torque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc... Steering geometry. Ackerman mechanism, Understeer and Oversteer. Hotchkiss drive and Torque tube drive.

UNIT-III:

Braking System: General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects. Antilock braking system (ABS), electronic brake force distribution (EBD) and traction control.

Chassis and Suspension System: Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axis suspension system, Air suspension & shock absorbers.

UNIT-IV:

Electrical System:

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburettor etc. MPFI.

UNIT-V:

Emission standards and pollution control: Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive

vehicles, engine emission control by 3-way catalytic converter system, fuel additives and modern trends in automotive engine efficiency and emission control.

Alternative Energy Sources: Alternative energy sources, natural gas, LPG, biodiesel, bio-ethanol, gasohol and hydrogen fuels in automobiles, modifications needed, performance, combustion & emission characteristics of alternative fuels in SI and CI engines, Electric and Hybrid vehicles, application of Fuel Cells. Prevention maintenance and overhauling.

CAD/CAM

Syllabus:

UNIT-I

Principles of Computer Graphics: Point plotting, drawing of lines, Bresenham's circle algorithm. Transformation in Graphics: Co-ordinate system used in Graphics and windowing, view port, views. 2D transformations – rotation, scaling, translation, mirror, reflection, shear - homogeneous transformations – concatenation. 3D Transformation – Perspective Projection – Technique (Description of techniques only). Geometric Modelling:

Classification of Geometric Modelling – Wire frame, Surface and Solid Modelling, applications – representation of curves and surfaces – Parametric form.

Design of curved shapes- Cubic spline – Bezier curve – B-spline – Design of Surfaces - features of Surface Modelling Package – Solid Primitives, CSG. B-rep and description of other modelling techniques like Pure primitive instancing, cell decomposition,

spatial occupancy enumeration, Boolean Operations (join, cut, intersection), Creating 3D objects from 2D profiles (extrusion, revolving etc).

UNIT-II

Graphics standard & Data storage: Standards for computer graphics GKS, PHIGS. Data exchange standards – IGES, STEP – Manipulation of the model - Model storage.

Finite Element Modelling: Introduction, Mesh Generation – mesh requirements.

Semi-Automatic Methods- Node-based approach, Region based approach, Solid-modelling-based methods. Fully Automatic Methods- Element-based approach, Application, Mesh Refinements using Isoperimetric Finite Elements, Meshing in high gradient areas, Transition Regions. Sub modelling Concept. An overview of modelling software's like PRO-E, CATIA, IDEAS, SOLID EDGE etc.

UNIT-III

CAM: Scope and applications – NC in CAM – Principal types of CNC machine tools and their construction features – tooling for CNC – ISO designation for tooling – CNC operating system –

FANUC, SINUMERIK – LINUMERIK. Programming for CNC machining – coordinate systems – manual part programming – computer assisted part programming – CNC part programming with CAD system. Material handling in CAM environment:

Types – AGVS – AS/RS – Swarf handling and disposal of wastes – single and mixed mode assembly lines – quantitative analysis of assembly systems.

UNIT-IV:

Robotics: Classification and specification – drive and controls – sensors - end effectors - grippers- tool handling and work handling – machine vision – robot programming concepts – case studies in assembly. Quality Function Deployment: Process Planning – CAPP – Variant and Generative systems- Concurrent Engineering and Design for Manufacturing. Advanced manufacturing Planning Computer Aided Production Planning and Control –Aggregateproduction planning and master production schedule – MRP – MRP II – ERP - Capacity planning.

UNIT-V

Rapid prototyping: Need for rapid prototyping, Basic principles and advantages of RP, General features and classifications of different RP techniques with examples.

Introduction to three representative RP techniques: Fusion Deposition Modelling, Laminated Object Manufacturing and Stereo-lithography. Flexible manufacturing cells:

Systems – characteristics – economics and technological justification – planning, installation, operation and evaluation issues – role of group technology and JIT in FMS – typical case studies future prospects

OPERATION RESEARCH

Syllabus:

UNIT-I

Introduction:

Basic of Operation Research, Origin & development of Operation Research, Applications.

Linear Programming:

Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal and dual problem sensitivity analysis.

UNIT-II

Transportation Problem:

Methods of obtaining initial and optimum solution, degeneracy in transportation problems, unbalanced

Transportation Problem.

Assignment Problem:

Methods of obtaining optimum solution, Maximization problem, travelling salesman problem.

UNIT-III

Game Theory:

Two-person Zero sum game, Solution with/without saddle point, dominance rule, Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming. Sequencing:

Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

UNIT-IV

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy.

Simulation: Use, advantages & limitations, Monte-Carlo simulation, Application to queuing, inventory & other problems.

UNIT-V

Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration.

Project management: Basic Concept of network Scheduling, Rules for drawing network diagram,

Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

POWER PLANT ENGINEERING

Syllabus:

UNIT-I: Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units. Power plant economics and selection Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

UNIT-II: Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverisers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating, flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

UNIT-III: Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, Lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

Gas turbine power plant: Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, combined cycle power plants, Site selection of gas turbine power plant, Integrated Gas fire based Combined Cycle (IGCC) systems.

UNIT-IV: Nuclear power plant

Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

Hydroelectric and Non-Conventional Power Plant: Hydroelectric power plants, classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems.

UNIT-V: Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc. Energy Saving and Control: Energy, economic and environmental issues, power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

NON-DESTRUCTIVE TESTING

Unit-I: Introduction

Scope and advantages of NDT, Comparison of NDT with Destructive Testing, some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.

Unit-II:

Tests:

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Test stations, Advantages, types of penetrants and developers, Zygo test, Illustrative examples and interpretation of defects.

Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Nonferromagnetic materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

Unit-III:

Radiographic methods:

Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor.

X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ -ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ -ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.

Unit-IV:

Ultrasonic testing methods:

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.

Unit-V:

Special NDT Techniques:**Eddy Current Inspection:**

Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

TOTAL QUALITY MANAGEMENT (TQM)

Syllabus:

UNIT -I

Quality Concepts: Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

UNIT -II

Quality Management: Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme. TQM Principles: Leadership, strategic quality planning; Quality councils-employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

UNIT –III

Tools and Techniques: Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart). Control Charts: Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts, P-charts and C-charts.

UNIT –IV

Defects Diagnosis and Prevention: Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V

ISO and its concept of Quality Management: Quality systems, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation, Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors, Auditing, Taguchi method, JIT in some details.

RENEWABLE ENERGY RESOURCES

Syllabus:

UNIT-I

Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II

Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geothermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V

Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working performance and limitations. Waste Recycling Plants.

