SYLLABUS OF B.E. SEM. VII (MECHANICAL ENGINEERING) [C.B.C.S.]

FIFTH: SEMESTER

5ME01 HEAT TRANSFER

Course Learning Objectives:

1. To study applications of heat transfer in engineering, basic laws, one dimensional conduction, combined conduction - convection, conduction with internal heat generation.
2. To study insulations, critical radius concept, conduction through extended surfaces, fin efficiency and effectiveness, Biot number, Newton's law of cooling, transient heat conduction
3. To study radiation theories, the basic laws, concept of shape factor, radiation heat transfer equations, radiation errors in temperature measurement, radiation shield.
4. To study forced convection in the light of boundary layer theory, hydrodynamic and thermal boundary layers, dimensionless numbers, empirical correlations and forced convective calculations.
5. To study free convection over horizontal and vertical surfaces, velocity and thermal boundary layers, empirical correlations and free convective calculations, condensation and boiling heat transfer.
6. To study various types of heat exchangers, overall heat transfer coefficient, fouling, LMTD and NTU methods, working of heat pipe.

Course Outcomes:

1. Apply the concept of heat transfer, laws of heat transfer and various mathematical equations.
2. Demonstrate the knowledge of determining the thermal conductivity of various materials.
3. Understanding and verifying various laws of radiation.
4. Capable to explain the concept of heat exchanger and demonstrate the calculations of efficiency.

UNIT - I: Introduction, heat transfer in engineering, modes of heat transfer, basic laws of heat transfer and their basic equations. Conduction- thermal conductivity and thermal diffusivity effect of phase & temperature on thermal conductivity, one dimensional steady state heat conduction through slab, cylinder & sphere-simple and composite. Combined conduction- convection, overall heat transfer coefficient. General heat conduction differential equation. One dimensional steady state conduction with internal heat generation for infinite slab, wire & cylinder. **(8 Hrs)**

UNIT II: Insulations, critical radius of insulation, Conduction through extended surfaces, analysis of a uniform C.S. fin, fin efficiency, fin effectiveness, Biot number. Introduction to unsteady state heat conduction, Newton's law of cooling, lumped heat capacity analysis. **(8 Hrs)**

UNIT III: Radiation-general concepts and definitions, black body & grey body concept. Laws of radiation- Kirchoff's, Plank's, Stefan- Boltzman's, Wien's law. Concept of shape factor, emissivity factor and radiation heat transfer equation. (No numericals).Radiation errors in temperature, measurement, radiation shield. **(7 Hrs)**

UNIT IV: Forced convection- heat convection, forced and natural convection, boundary layer theory, hydrodynamic & thermal boundary layers, boundary layer thickness. Laminar & turbulent flow over flat plate and through pipes & tubes (only concept, no derivation & analytical treatment). Dimensionless number and their physical significance Reynold, Prandtl, Nusselt, Grashoff number, empirical correlations for forced convection for flow over flat plate, through pipes & tubes & their applications in problem solving. **(8 Hrs)**

UNIT V: Free convection- velocity and thermal boundary layers for vertical plate, free convection over vertical cylinder and horizontal plate/cylinder (only concept, no derivation & analytical treatment). Use of empirical correlations in problem solving. Condensation & Boiling - introduction to condensation heat transfer, film & drop condensation. Boiling heat transfer, pool boiling curves. **(7 Hrs)**

UNIT VI : Heat exchanger - applications, classification, overall heat transfer coefficient, fouling. L.M.T.D. & E.N.T.U. methods, temperature profiles, selection of heat exchangers. Introduction to working of heat pipe with and without wick. **(7 Hrs)**

Text Books:-

1. Heat and Mass Transfer; R.K Rajput; S. Chand, New Delhi
2. Heat and Mass Transfer; V.M. Domkundwar; Dhanpat Rai & Co. Delhi
3. Heat Transfer; A. F.Mills, V. Ganesan, Pearson Publication

Reference Books:-

1. Heat Transfer; J.P. Holman; McGraw Hill
2. Heat Transfer; P.K. Nag; TMH.
3. Heat and Mass Transfer Data book, V.M. Domkundwar, Dhanpat Rai & Co.
4. Heat and Mass Transfer Data book; C.P. Kothandaraman; New age International

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5ME02 METROLOGY & QUALITY CONTROL

Course Learning Objectives:

1. To study generalized production technology, applications, general configuration and functional elements of inspection instruments.
2. To study about quality in production and services and quality management.
3. To study application of nondestructive test for increasing productivity and efficiency of the work.
4. To study design and applications of various gauges and comparators used in inspection.
5. To study various techniques for the inspection of gears and threads.
6. To study various techniques for angular measurement, surface texture measurement, and geometric features measurement.
7. To study advance inspection techniques CMM, profile projector etc.

Course Outcomes:

1. Create & apply the concept of inspection, quality control and its importance to industry.
2. Demonstrate the skills of controlling various out of control processes using statistical quality Control tools.
3. Understand the importance of improving production and productivity using work study approach.
4. Apply the knowledge of various measurement standards and techniques in the industry to measure various parameters related to metrology.

UNIT I: Concept of quality and quality control, quality of design and quality of conformance, Quality characteristics, Cost of quality & Value of quality, Specification of quality, quality control & inspection.
Concept of TQM & Quality assurance,
Concept of variation, variable and attribute data, Frequency distribution, Measures of Central tendency-
Mean mode & median, Measures of dispersion. -Range, std. deviation & variance. **(8 Hrs)**

UNIT II: Concept of universe and population, Normal distribution curve; Control charts for variables, process capability, Control charts for attributes; comparison between variable charts and attribute charts; precision & accuracy, Sampling plans, Operating Characteristic curve, Quality circle. **(8 Hrs)**

UNIT III: Introduction to Non-Destructive testing, Ultrasonic testing, X-ray or Radiography Testing, Liquid Penetrant testing, Magnetic Particle Testing, Eddy current testing, it's applications, Advantages & Disadvantages. **(7 Hrs)**

UNIT IV: Standards of measurements: line standards, end standard, wave length standard. Limits, fits and gauges: terminology of limits, Fits and gauges, concept of interchangeability, allowance tolerance, Indian Standard Specification for limits, fits and gauges, B.S. System. Limit gauging - design of Go, No Go gauges. **(8 Hrs)**

UNIT V: Linear measurement: various comparators such as mechanical, electrical, optical, pneumatic comparators, their principle, operations and applications.
Angular measurements: vernier, optical, bevel protractor universal bevel protector, Sine bar level clinometers, taper gauges. Thread measurement: screw thread limit and fit limits gauging of screw threads **(8 Hrs)**

UNIT VI: Gear measurement: alignment error, master gear, Parkinson tester. Study and use of optical dividing head, auto collimator, tool maker's microscope. Interferometry, flatness testing, squareness testing. Surface texture testing. Coordinate measuring machine- types, role and application. **(7 Hrs)**

Text Books:

1. Engineering Metrology – R.K.Jain - Khanna Publishers.
2. Statistical Quality Control- M. Mahajan – Dhanpatrai & Co. Pvt.Ltd.
3. Non Destructive Testing techniques by Ravi Prakash, New Age Publications.

Reference Books:

1. Quality Control - By Juran - Mc. Graw Hill Pub. Company.
2. Statistical Quality Control- By Grant E.L. – R.S.L.Leavgen Worth-.Mc. Graw Hill Pub. Company
3. Statistical Quality Control- By Gupta - Dhanpatrai & Com. Pvt. Ltd

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5ME03 KINEMATICS OF MACHINES

Course Learning Objectives:

1. To get the basic Knowledge about the mechanism used in automobiles, industrial machines etc.
2. To study about the synthesis and analysis of the mechanism used in machines.
3. To get the operational knowledge about the power transmitting devices used in automobiles.
4. To study the designing and importance of cams in machines.
5. To study the most effective power transmission device used in automobiles, industrial equipment's, toys etc **.**

Course Outcomes:

Students will be able to-

1. Understand & apply the concept and its applications of link, mechanisms and machines.
2. Demonstrate the ability to analyze the mechanisms and machines on the basis of velocity and acceleration and they will show the ability to solve analytical methods.
3. Show the ability to use graphical and analytical methods for synthesis of mechanisms to develop mini projects in the course duration.
4. Understand the practical for study of brake, clutch, dynamometer, gear train etc.

Unit I: 1.Introduction to study of mechanisms, machines, different types of links, kinematic pairs. Grashof's law- class-I and class –II mechanisms. Grubler's criterion, Kutzbach's criterion for planer mechanism. Inversions of four bar, single slider, double slider mechanisms.
2. Transmission angle, Mechanical Advantage, Transmission angle and Mechanical Advantage of 4-bar mechanism. **(7 Hrs)**

Unit II: 1**. Velocity analysis**: - Relative velocity method, method of equivalent mechanisms, Instantaneous centre of rotation method for 4-bar mechanism, body and space centroids.
2**. Acceleration analysis**: - Relative acceleration method and analytical method. **(8 Hrs)**

Unit III: Synthesis of Mechanisms:- Introduction to type, number and dimensional synthesis, graphical method of two position, three position and four position synthesis for input output coordination, Freudenstien's equation, Blosch's method. **(7 Hrs)**

Unit IV: Frictional torque in pivot and collar bearing. Clutches and Dynamometers: types, constructional details, operation. **(7 Hrs)**

Unit V: Special purpose mechanisms:- Steering mechanisms, Geneva wheel mechanism.

Cams: - Introduction, types of cam & follower, different motions of followers, graphical layout of cam profiles, cam with specified contours. **(8 Hrs)**

Unit VI: 1. **Gear**: Introduction, terminology, gear tooth profiles, law of gearing, involumetry, interference of spur gears, and minimum number of teeth to avoid interference.
2. **Gear Trains**:- Types of gear trains and its speed ratio applications. **(7 Hrs)**

Books Recommended:

Text Books:

1) Theory of Machines, P.L.Ballaney, Published by Dhanpat Rai and sons-N Delhi.
2) Theory of Machines, S.S.Ratan, Published by Tata Mc Graw Hill.
3) Theory of Machine, R.S.Khurmi and Gupta J.K., Published by Eurasia Publishing house-N Delhi.

Reference Books:

1) Theory of Machines and Mechanisms, J.E.Shigley, Uicker and Gordon, Published by Oxford University press-New York.
2) Theory of Machines, V.P.Singh, Published by Dhanpat Rai-N Delhi.
3) Theory of Machines and Mechanisms, Ghosh and Amitabh, Published Affiliated East West Press, N-Delhi.

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5ME04 MEASUREMENT SYSTEMS

Course Learning Objectives:

1. To study the generalized measurement system and the general performance characteristics of measuring instruments, applications, general configuration and functional elements of measuring instruments.
2. To study the strain gauges, their types, strain gauge circuits for strain measurement and to study the pressure measurement methods and devices
3. To study the types, constructional details and working of force, torque and flow measuring devices.
4. To study the different types of temperature measuring devices, standards, construction details and their working and to study the different types of liquid level measuring devices.
5. To study the mechanical and electrical types of speed measuring devices, contact and contactless speed measuring devices and their applications.
6. To study the methods of vibrations measurement and methods of linear and angular displacements.

Course Outcomes:

1. Understand & apply the concept of measurement system and will know its importance related to the industry.
2. Demonstrate the ability to measure various parameters like pressure, flow, speed, vibration etc.
3. Understand to use various measuring instruments.
4. Understand the practical approach of engineering and will be confident in industry.

UNIT I: 1. Generalized Measurement system: Significance of measurement, generalized systems. Application of measuring instruments. Types of measuring instruments.
2. General configuration and functional elements of measuring instruments, types of inputs, various methods of correction for interfering and modifying inputs. **(6 Hrs)**

UNIT II: General performance Characteristics:-

1. Static characteristics, different types of errors, combination of component errors in overall systems.
2. Dynamic characteristics: General mathematical model of zero order, first order and

second order instruments, response of first and second order instruments to following inputs step, ramp, impulse and frequency. **(8 Hrs)**

UNIT III: Strain Measurement:

1. Types of strain gauges, strain gauge circuits, calibration, Temperature compensation, use of strain gauges on rotating shafts, selection and installation of strain gauges.
2. Pressure Measurements:-
   Basic methods of pressure measurement: strain gauge pressure cell, High pressure measurement Bridgeman type, low pressure Measurement - Mcleod, Knudsen, ionisation, Thermal conductivity gauges. **(8 Hrs)**

UNIT IV: Force Measurement: Various mechanical. Hydraulic, pneumatic and electrical methods.
Torque and Power Measurements: Various mechanical, hydraulic & electric methods.
Flow Measurements: Construction- orifice, Rota meter. Pressure probes- Pitot static tube, turbine meter, electro-magnetic flow meter. **(6 Hrs)**

UNIT V: Temperature Measurements: Standards, Various temperature measuring devices, bimetallic strip, pressure thermometers, and thermo couples, electrical resistance thermometers, Thermistors, radiation Thermometers.
Liquid Level Measurements: Various methods such as- single float, displacement or force transducers. Pressure sensitivity, bubbler or Page system, capacitance variation type (for both conducting and non-conducting type liquids) Resistance variation type. **(8 Hrs)**

UNIT VI: Speed Measurements: Various mechanical type tachometers, electrical types tachometers, stroboscope etc.
Vibration Measurements: Seismic, Strain gauge and piezoelectric accelerometers.
Displacement measurements: Linear and angular displacement measurements, LVDT, LDR, Capacitive & inductive pickups. **(8 Hrs)**

Books Recommended Text Books:-

1. Measurement Systems : - By Erenest O. Doebelins - MC Graw Hill.
2. Mechanical Measurement & Control: By D.S.Kumar.

References Books:-

1. Mechanical Measurements :- By T.G.Beckwith & N.L.Bulk - Addison Werllv.
2. Instrumental Measurement & Analysis : By Nakra Choudhari Tata Mc Graw Hill.
3. Mechanical Measurement & Instrumentation :By R.K.Rajput,Katsons Books Publications

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5ME05 OPEN ELECTIVE-I
(1) BASICS OF BUILDING CONSTRUCTION

Course Learning Objectives:

- Student should learn about the term Disaster and definitions associated with it.
- Student should know various types , reasons for happening and preventive measures for Natural Disasters .
- Student should know various types , reasons for happening and preventive measures for Artificial Disasters
- Student should know about Impact and mitigation measures against disasters.
- Student should know about Disaster Risk Reduction and its utility practices.
- Learner should know about various Government and NG organization working for Disaster Management.
- Student should know role and responsibility of individual and group for managing Disaster.

Course Outcomes:

At the end of the subject the students will be able -

- To understand Load bearing and Frame structure with their foundations.
- To recognize various types of construction material and its suitability
- To recognize the various levels in building and its need.
- To know types of openings, doors, windows and other related fixtures.
- To recognize types of rock and minerals and its construction properties.
- To understand the basic concepts of DPC, fireproof, soundproof and expansion joints in structure.

SECTION –A

Unit I: Introduction: Definition of building as per national building code, components of buildings and their function , Types of structure-load bearing structure and frame structures, their relative advantages and disadvantages, load bearing walls and partition walls. Types of foundation- Definition and necessity and types of foundations, precautions to be taken against failure of foundations

Unit II: Stone Masonry- Technical term, general principles to be observed during construction, selection of stone masonry. Brick Masonry Construction- Technical term, general principles to be observed during construction, commonly used types of bonds such as Stretcher, Header, English bond Flemish bond and their suitability.

Unit III: Floors- Types of floors-Basement floor, ground floor and upper floor. Types of upper floors-R.C.C. slab floor, R.C.C. slab and beam floor, R.C.C. grid floor, R.C.C. flat slab floor. Floor Finishes Types of flooring material, Shahabad , Kota, Granite, Ceramic tiles, Plain tiles, mosaic tiles glazed tiles ,different types of floor finishes , their suitability. Method of construction, criteria of selection. Roofs-Flat and pitched roof, steel roof trusses-types and suitability ,fixing details at supports ,types of roof covering, AC and GI sheets, acrylic sheets, fixing details of roof covering.

SECTION –B

Unit IV: Door –Purpose, criteria for location, size of door, door frames and its types, method of fixing Windows- Purpose, criteria for location, size and shapes of windows, types of windows and their suitability. Ventilators – Types and their suitability. Fixtures and Fastening for doors and windows. Glass- Types of glass and their suitability. Arches and Lintels - Types and their suitability. Details of R.C.C. lintels and chajja, precast lintels and arches.

Unit V: Stairs- Function, technical terms, criteria for location, types of staircases and their suitability. Painting and Coloring – Necessity, types, processes of painting and coloring to the wall surface, wooden surfaces, iron and steel surfaces, types of paints and their uses Scaffolding- Purposes, types, suitability.

Unit VI: Special Aspects of Construction, Damp proofing-causes of dampness, its effects, various methods of damp proofing, material used for damp proofing. Fire proof construction- Points to be observed during planning and construction. Fire protection requirement for a multistoried building, Sound proof construction –Sound absorbents and their characteristic. Joints Expansion and construction joints necessity, details of expansion joint at foundation level and roof level of load bearing structure and framed structure, Provision of construction joints in slabs, beams and columns.

Books Recommended:

2. Deshpande R.S... And Vartak C.V.: A Treatise on Building Construction.
3. Sharma S.K. Kaul and B.K.:A.T.B. Building Construction, S Chand and co.
4. Sane L.S.: Construction Engineering, Manak Talas, Mumbai
5. Chudley R.: Construction Technology, Volume I.II.III. And IV, Longmans Group Ltd.
6. Basics of Civil Engineering, Vol. I by Dr A.R.Gupta , Google book publishers ltd.
7. Gurucharan Sing: Building Construction Engineering, Standard Book House, Delhi-06

8. Sushilkumar :Building construction ,Standard publisher distributors.
9. B.C.Punmia ,A.K. Jain,: Building construction. ISE National Building code of India, 1970

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(2) DISASTER MANAGEMENT

COURSE LEARNING OBJECTIVES

- Student should learn about the term Disaster and definitions associated with it.
- Student should know various types , reasons for happening and preventive measures for Natural Disasters .
- Student should know various types , reasons for happening and preventive measures for Artificial Disasters
- Student should know about Impact and mitigation measures against disasters.
- Student should know about Disaster Risk Reduction and its utility practices.
- Learner should know about various Government and NG organization working for Disaster Management.
- Student should know role and responsibility of individual and group for managing Disaster.

COURSE OUTCOMES:

At the end of the subject the students will be able -

- To understand concept and terms related to Disaster.
- To understand various types of Natural and Artificial Disaster .
- To decide and take actions to mitigate impact of disaster.
- To know roles and responsibility of organizations – public and private, individual and group to managedisaster.

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SECTION A

Unit I: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation. Study about natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.);

Unit II: Study about manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit III: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

SECTION B

Unit IV: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures, vulnerability and capacity assessment; early warning systems, Post disaster environmental response.

Unit V: Institutional mechanism for Disaster Management**,** Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, Disaster Management Policy Environment and local Action, Funding for Disaster Management, Capacity Building, Disaster Management Act 2005.

Unit VI:. Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster, plan to counter, threats to water supply.

Text Books:

1. Cuny, Fred C; Disasters and management, oxford Uni. Press.
2. Alexander, David; Principles of emergency planning and management, Terra publishing, ISBN 1-903544-10-
3. National Disaster Management Authority, Govt. of India, Report.
4. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPAPublication New Delhi, 1994

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(3) SOFT SKILLS AND INTERPERSONAL COMMUNICATION

COURSE LEARNING OBJECTIVES

- Student should learn about the methods and measures to develop the interaction skills.
- Student should be able to have strong decision ma king and lateral thinking skills.
- Should know the do's and don'ts for being good leader.
- Should be able to understand about conflict and be able to manage it.
- Should understand need of Negotiation and strategy to handle it wisely.
- Should be able to recognize the type, ways and barriers in Communication so as to develop it.
- Should be able to conduct effective correspondence process and shall have knowledge of documentationand formal writing skills.

COURSE OUTCOMES:

At the end of the subject the students will be able -

- Interact in developed way so as to handle the situations .
- To take analyzed decisions over the problem and will effectively carry out wok in time.
- To handle task with developed leadership skills.
- To determine the reasons and solutions over conflict and will be able to manage it.
- To understand need for negotiation and strategy negotiate things.
- To have strong communication.
- To carry out formal documentation process and will have proper guideline for writing formal basicdocuments.

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SECTION A

Unit I : Individual's Basic Interaction Skills –Within family, Society Personal and interpersonal intrapersonal skills Types of skills; conceptual, supervisory, technical, managerial and decision making skills. Problem Solving, Lateral Thinking. Self Awareness and Self Esteem Group Influence on Interaction Skills Human relations examplesthrough role – play and cases.

Unit II : Leadership Skills Working individually and in a team Leadership skills Leadership Lessons through Literature Team work & Team building . Interpersonal skills – Conversation, Feedback, Feed forward Interpersonal skills – Delegation, Humor, Trust, Expectations, Values, Status, Compatibility and their role in building team – work. Conflict Management – Types of conflicts, how to cope with them Small cases including role – plays will be used as teaching methodology.

Unit III : Negotiation Skills (To be Taught through Role Plays and Cases) Types of Negotiation Negotiation Strategies Selling skills – Selling to customers Selling to Superiors Selling to peer groups, team mates & subordinates Conceptual selling, Strategic selling Selling skills – Body language

SECTION B

Unit IV : Introduction, Need for Communication, Process of Communication - Written and Verbal Communication, Visual communication, Signs, Signals and Symbols, Silence as a Mode of Communication - Inter-cultural, Intra- cultural, Cross-cultural and International communication - Communications skills, Communication through Questionnaires, Business Letter Writing, Electronic Communication.

Unit V : Barriers to Communication Improving Communication Skills -Preparation of Promotional Material -Non- verbal communication -Body language -Postures and gestures -Value of time - Organizational body language - Importance of Listening -Emotional Intelligence.

Unit VI : -Business Cases and Presentations, Letters within the Organizations, Letters from Top Management, Circulars and Memos - Business Presentations to Customers and other stakeholders, Presenting a Positive Image through Verbal and Non-verbal Cues, Preparing and Delivering the Presentations, Use of Audio-visual Aids .

Text Books:

1. Personality Development & Soft Skills by Barun K. Mitra.
2. Soft Skills and Interpersonal Communication by S. Balsubhramanium.

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5ME06 HEATTRANSFER-LAB.

Course learning objective: The lab work should clear the vision about all the modes of heat transfer. The practical knowledge should enhance the approach of student towards real life applications of the subject.

Course Outcome:

Upon successful completion of lab Course, student will be able to: i) Understand various modes of heat transfer and ii) evaluate various parameters of the heat transfer process

List of Practical's (Any six of the following):-

1. Determination of thermal conductivity of a metal bar.
2. Determination of thermal conductivity of insulating powder.
3. Study of heat transfer through composite wall.
4. Study of heat transfer through composite cylinders.
5. Determination of fin efficiency.
6. Verification of Stefan-Boltzman's law.
7. Determination of emissivity of grey body.
8. Determination of heat transfer coefficient for forced convection.
9. Determination of heat transfer coefficient for natural convection.
10. Study of pool & nucleate boiling.
11. Trial on double pipe heat exchanger.
12. Determination of efficiency of cross flow heat exchanger.
13. To write a computer program for conduction heat transfer problem.

Practical Examination: - The practical examination shall consist of oral on the term work and syllabus.

5ME07 METROLOGY & QUALITY CONTROL-LAB.

Course learning objective:

The course aims at understanding the principles of metrology for precision measurement of various mechanical components using various measuring tools. Students shall also learn to use standard practices and standard data, learn to use statistical concept, control chart for variables, control chart for attributes.

Course Outcome: Upon successful completion of lab Course, students will be able to

i) Explain the principles involved in measurement and inspection.
ii) Select and use appropriate measurement instrument for a given application
iii) Apply the basics of sampling in the context of manufacturing

List of Practical's (Any six of the following):-

1. Determination of Linear dimensions of a given specimen/part using Precision/Non-Precision Measuring instruments.
2. Determination of Angular Measurement using Precision/Non-Precision Measuring instruments.

3. Measurement of Gear Tooth Thickness by Gear Tooth VernierCaliper/Constant Chord/Span Micrometer.
4. Measurement of Circularity/Roundness of a given specimen.
5. Measurement of Screw Thread Element by Floating Carriage Micrometer.
6. Testing of Surfaces by using Optical Flat.
7. Measurements of various angles of single point cutting tool by usingProfile Projector and Tool Maker's Microscope.
8. Preparation of Variable Control Charts for the given lot of sample.
9. Preparation of Attribute Control Charts for the given lot of sample.

Practical Examination: - The practical examination shall consist of oral on term work.

5ME08 KINEMNATICS OF MACHINES - LAB.

Course Learning Objectives: Objectives of this lab are to impart practical knowledge on design and analysis of mechanisms for the specified type of motion in a machine. With the study of rigid bodies' motions and forces for the transmission systems, machine kinematics can be well understood.

Course Outcome: On successful completion of the course students will be able to:
Design linkage, cam and gear mechanisms for a given motion or a given input/output motion or force relationship, identify the basic relations between velocity & acceleration and use graphical and analytic methods to study the motions of various mechanisms

List of Practical's (Any six of the following):-

1. To Study, Analyse and drawing of inversions of four bar mechanism to identify the types and number of links, types of motion and its mode of fixing arrangement for the required application.
2. To Study and analyse of inversions of slider crank mechanism using working models and graphical representations to find type & number kinematic pair , type of joint and Degree of freedom.
3. To Study and analyse of inversions of double slider crank mechanism using working models and graphical representations to find type & number kinematic pair , type of joint and Degree of freedom.
4. To determine Velocity and acceleration of links in mechanism by relative velocity method. (2 Problem)
5. To determine Velocity and acceleration of Piston of a reciprocating engine by clein's construction method. (2 Problem)
6. To find braking force, braking toque of internal expanding and external expanding brake.
7. To study, understand and observe the actual working and function of each part of single plate clutch by dismantling and assembling.
8. To study, understand and observe the actual working and function of each part of centrifugal clutch by dismantling and assembling.
9. Study of dynamometers.
10. To draw Cam profile for a given follower type and follower motion. (2 Problem.)
11. To Study and find train value and speed ratio of various types of gear trains
12. To study and drawing of Simple four bar Mechanism using position synthesis.
13. To Study and drawing of four bar mechanism by input-output coordination methods using Bloch's Synthesis and Freudenstein's equation.
14. To study interference and undercutting of spur gear pair using graphical layout.
15. To study and drawing of Generation of Involute and Cycloidal Spur Gear Tooth Profile.

Practical Examination: - The practical examination shall consist of oral on term work.

5ME09 MEASUREMENT SYSTEMS-LAB.

Course Learning Objectives:

i) To study various sensers and measuring instruments required to measure various properties and quantities occurring in a typical engineering system.

ii) To understand general performance characteristics of measuring instruments, applications and general configuration of the measuring instruments.

Course Outcome: Upon completion of this course students will be able to:

i) Choose appropriate measuring device for measurement of various quantities
ii) Analyse the performance of various
iii) Analyse and execute the calibration process for measuring instruments

List of Practical's (Any six of the following):-

1. Measurement of strain using strain gauges.
2. Calibration of pressure gauge with pressure gauge tester.
3. Measurement of linear displacement by LDR and inductive pick-uptransducers.
4. Performance of capacitance transducer as an angular displacementmeasuring device.
5. Performance of inductive Transducers.
6. Measurement of flow using optical flow meter and Rotameter.
7. Speed measurement by a stroboscope.
8. Speed measurement by magnetic pick up or photo electric pick up tachometer.
9. Pressure measurement by strains gauge type transducer.
10. Vibration measurement by using Seismic Transducer.
11. Measurement of Liquid level by using capacitive pickup transducer.
12. Temperature measurement using contact and non-contact type instruments or various types of sensors.

Practical Examination: - The practical examination shall consist of oral on term work.