

# 1<sup>st</sup> Semester

## SEMESTER – I :

### **ID 501 COMPUTATIONAL METHODS**

Introduction to finite element method. Basic equation and formulation of solid mechanics, displacement models, dynamic analysis variational and residual methods, finite element solution of heat transfer problems, finite element applications in fluid mechanics, stress analysis and fracture mechanics. Software packages.

### **ID 502 MECHANISM & SYNTHESIS**

Mechanism, link, linkage and mechanism planar and spatial mechanisms, grubler's criteria for degree of freedom, equivalent mechanisms, inversions of four link chain, slider crank chain and double slider crank chain.

Mechanism analysis : Relative velocity method, instantaneous' center methods of velocity, acceleration analysis including coriolis component of acceleration. Application to slider crank chain four bar chain, stone crusher mechanism sewing machine mechanism, quick return mechanisms wrapping m/c mechanism etc klein's construction, computer aided analysis of synthesis of mechanisms. Pole, relative pole, inversion overlay freudenstein and block methods least square technique. Application to four link mechanism and slider crank mechanism function generation, modification of timing of cam mechanism. Limit & dead center positions transmission angle, cognate linkages, coupler curves, euler's equation .

### **ID 503 RELIABILITY ENGINEERING**

Basic Concepts of Reliability, Design for reliability, Component Reliability & Hazard Models, System Reliability Models, Redundancy technique, System Design, Maintainability and Availability Concepts. Reliability problems & measures of reliability. Reliability of non-maintained & maintained systems with & without redundancy allocation of failure & repair rates. Maintenance policies.

### **ID 504 ADVANCED MACHINE DYNAMICS**

Gear design: Spur, bevel, worm, turbine rotor balancing & vibration analysis.

Gyroscope applications : Motor cycle, four wheel vehicle, aero plane, ship rotor bearing system cam dynamics, analysis of an eccentric cam, jump speed analysis of cam, unbalance, spring surge & windup.

## **ID ELECTIVE - I**

### **ID 511 BEARING DESIGN & SELECTION**

Lubrication, hydrostatic bearings, hydrodynamics lubrication full journal bearing, friction, pressure distribution , load carrying capacity thermal equilibrium ,partial journal bearings influence of end leakage on behaviour of bearings, maximum oil pressure with end leakage, practical considerations in bearing design. Bearing – design, selection of ball & roller bearings

### **ID 512 - APPLIED ERGONOMICS**

Human being in man made world . Gross human anatomy, anthropometrics, static and dynamic, muscles and work physiology, static and dynamic work including maximum capacity. Biomechanics, environmental condition including thermal, illumination noise and vibration, biological transducers and nervous system including their limitations. Controls and displays psycho physiological aspects of design. Research techniques in ergonomic data generation. Interpretation and application as statistical methods. Case analysis. Project work involving ergonomic design research for product systems.

### **ID 513 - DESIGN OF COMPUTER AIDED ENGINEERING SYSTEM (CAE)**

Over view of cad, cae system design and implementation processor requirements analysis, functional specifications, outline systems design, components of cae system, project management.

### **ID 514 - COMPUTER AIDED FACILITY & PROCESS PLANNING**

Element of plan design systematic layout planning, industrial component and its consideration. Objectives types, goal, design process and techniques of facility planning. Schematic technique, travel charting,

sequence analysis systematic layout – planning mathematical models, optimizing heuristics algorithm, branch and board technique, quadramatic assignment techniques, traveling salesman problem, single goal improvement type models, single goal construction type models.

Multiple facility design problem and construction type existing improvement type, multiple goal models and modifications, design problem solving technique.

Estimation of distribution parameters. Empirical models, computer aided models. Estimation of distribution parameters in multi goal facilities design problem, computer aided techniques for finding optimum and sub optimum and sub optimum facilities design problem solution.

## **ID 515 - DESIGN & DEVELOPMENT OF PROTOTYPE PRODUCT**

Marketing: forecasting & market research for a new product. Purchasing and sales procedure. Demand analysis for new product. Intellectual property right :introduction to ipr laws, nature, types of property intellectual property, ip as an economic entity, development of ipr copyright, patents, design, trademarks , forms, global ip structure and iprs in india, infringement and remedies available, patent search, contractual agreements involving patents, case studies.

## **ID 516 PRODUCT DESIGN**

Understanding of the factors that directly or indirectly influence the context and the products. Group assignments on assessing relevance of available products with respect to the context. Understanding of problem areas and the limitations. Familiarization studies and programming for detailed investigation of context. Developing questionnaires, interviewing users and selecting suitable techniques to study use behavior and reactions, interviewing and observing user and photographic studies of products in use.

Understanding of market demands and manufacturing constraints. Documenting and interpreting data and formulating conclusions. Role of creativity in understanding of latent needs. Comparative analytical studies in other creative fields. Product to product design.

### **Texts/Reference:**

1. Asimov Morris, Introduction To Design Prentice Hall.
2. Jones J.C.,Design Methods Interscience.

## **ID 541 DYNAMIC OF MACHINES LAB.**

1. Rotor Balancing On Dynamic Balancing W/C
2. Hydrodynamic Journal Bearing Pressure Distribution.
3. Natural Frequency Of Simple, Compound & Torsional Pendulums