**SYLLABUS FOR M.TECH**
**PRODUCT DESIGN AND ENGINEERING**

| **MPD – 11 Elements of Design** |
|---|
| Visual design grammar – an introduction, Spatial relationships, balance, proportions, size, shape, mass, unity, and diversity, 2D and 3D compositions. Texture, Colour Fundamentals, Graphic compositions and layout, Introduction to typography, studio assignments in all the above topics. |
| **Reference Books :-**<br>Frank Webb, Composition; ISBN – 715303376<br>Manfred Maier, Basic Principles of Design : Van Nostrand, ISBN 0442212062 |

| **MPD – 12 Creative Engineering Design** |
|---|
| Design : Definitions, history and modern practice: Design and society: Design and the product life cycle; Ecodesign: Environmental problems related to product design, Levels of ecodesign, Life cycle assessment, Ecosufficiency, Ecoeffectivness, Ecoefficiency, Ecodesign strategy wheel, Case studies; Methodology for problem solving in engineering design: Recognition, Definition,Analysis, Synthesis, Communication and Presentation. |
| **Reference Books :-**<br>Jones. J.C. Design Methods. John Wiley.1981<br>Cross, N Engineering Design Methods, John Wiley.1984<br>Pahl, G, and Betiz, W, Engineering Design Design Council, 1984<br>Brezer and van Hemmel, ECODESIGN - A promising approach to sustainable production and consumption, UNEP Manual. |

| **MPD – 13 Materials Manufacturing and Design** |
|---|
| Engineering Materials, Metals and their properties, uses processing methods, design data and applications, selection criteria, manufacturing and processing limitations, comparative studies; plastics and composites, types, classification, properties, processing techniques and limitation, selection of plastics for specific applications, finishing and surface coating for different materials. |
| **Reference Books :-**<br>Dieter, G.E. Engineering Design: A Materials and processing approach. McGraw Hill,1991<br>Ashby, M.F. Materials selection in Mechanical Design; Pergamon press, 1992<br>Patton, W.J., Plastics Technology, Theory, Design and Manufacturing; Lenton Publishing Co. |

| **MPD – 14 Computer Aided Design** **Elective – 1** |
|---|
| CAD – Modeling of curves, surfaces and solids manipulation of CAD models, features based modeling, parametric / variational modeling, product data exchange standards.<br>Introduction to CAD; surfaces; Interfacing for production and tool, design; Photo rendering and scanning; 3D animation and morphing; Studio exercise in virtual products and systems. |
| **Reference Books :-**<br>Zeid, I., CAD/CAM; McGraw Hill |

| Current Literature |
|---|

| **MPD – 14 Mechanism Design** | **Elective – 1** |
|---|---|
| Machines and Mechanisms, Links, Pairs, Degrees of freedom, Kinematic chain, Inversions; Kinematic analysis of simple mechanisms by graphical and analytic methods, Static force analysis; Dimensional synthesis of four bar mechanism; Two and three position rigid body guidance; Cans, Displacement curves and profile generation; Gears, Profiles, Cyclodial and Involute, Contact ratio; Spur. Bevel Helical, Worm gearing; Analysis of gear trains; Mechanisms for specifie functions. | |
| **Reference Books :-**<br>George N. Sandor and Arthur G. Eardman, Advanced Mechanism Design, Volumes I & II; Prentice Hall of India Limited, New Delhi.<br>Ivan I. Artobolevsky, Mechanism in Modern Engineering Design, Vol. I to VI; Mir Publishers Moscow.<br>Hamiliton E. Mabie and Fred W. Oevirk. Mechanisms and Dynamics of Machinery; John Wiley and sons, New York. | |

| **MPD – 15 Elements of Engineering Design** | **Elective – 1I** |
|---|---|
| Analysis of Stress and strain, failure criteria, Dynamics and Vibrations: Control of Engineering systems, elements of fluid mechanics; Drag and losses; Thermal analysis; problems in structural and Thermal Design. | |
| **Reference Books :-**<br>Shigley, J.E., Mechanical Engineering Design; McGraw Hill<br>White, Fluid mechanics; Tata McGraw Hill<br>Gupta, V.Sage, Elements of Heat and Mass Transfer | |

| **MPD – 15 Mechatronics** | **Elective – 1I** |
|---|---|
| Introduction to Mechatronics – Overview of mechatronics products and their functioning. Survey of mechatronical components. Selection and assembly for precision- engineering applications. Study of electromechanical actuators and trariducers. Load analysis and actuator selection for typical cases such as computer peripherals. Study of electronic controllers and drives for mechanical products. Interfacing of mechanical and electronic systems. Design assignments and practical case studies. | |
| **Reference Books :-**<br>Kuo. B.C. D.C. Motors and Control systems; S.R.I., Publishing Co., 1979<br>Kuo. B.C. Step Motors and Control systems; S.R.I., Publishing Co., 1979 | |

| **MPD – 21 Product Design** |
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Definitions, factors, influencing product definitions and contexts. Different methodologies and design process. Problem Identification, formulation, definition and structuring. Information's as strategic component. Product Specification, conceptual, development, and planning phases. Design decision making. User and utility factors. Design audit – evaluation of function, performance and costing. Value engineering as applied to product design. Concurrent engineering. Standards BIS, ISO.

**Reference Books :-**

Jones J.C. Design Methods; John Wiley 1981.
Flurschem C.H. Industrial Design and Engineering; Design Council, 1983.
Ullman, D.G., The Mechanical Design process; McGraw Hill 1992.

**MPD – 22 Product Planning and Marketing**

Corporate strategy for product planning, Introduction to Marketing. New strategies, market identifications, segmentation and entry; strategies. Consumer response measurement, perceptual mapping, brand equity, strategies product positioning. Estimationof sales potential, product launching and product life cycle, Advertising basics, services and processes. Fundamentals of consumer behavior.

**Reference Books :-**

Philip Kotler Marketing Management
Merle Crawford, New Product management
Luck, David J. and Rubin, Ronald S., Marketing Research
Schiffman and Kanuk, Consumer Behavior.

**MPD – 23 Product Visualization, Communication and presentation**

Object drawing fundamentals; Theory of perspectives exploded views, sectional views. Fundamentals of lighting. Idea representation and communication methods and pitfalls. Materials, tools and techniques of representation in various media like pencil, ink, colour etc. Rendering techniques, air brush illustration. Idea documentation. Fundamentals of photography, videography and digital media. Dark room techniques. Studio assignments in all the above topics. Mock – up modeling and simulation in various materials.

**Reference Books :-**

Alan Pipes, Concepts, Illustration, Presentation – Drawing for 3D design. Thames and Hudson.
Ernest Burden, Design presentation; McGraw Hill.ISBN 00/00A9310
James H Earle, Engineering Design Graphics, Addison Wesley, ISBN 020111318x

**MPD – 24 Design of Automotive Systems** **Elective III**

Classification of automotive systems; interfacing of marketing, design and manufacturing; converting customers needs into technical targets; vehicle design process milestones with a systems engineering approach; trade – off studies; manufacturing cost and economic feasibility analysis; design tools such as reverse engineering, rapid prototyping, CAD/CAE, Taguchi methods, and FMEA; styling concepts and features, ergonomics, packaging and aerodynamics; review of vehicle attributes (NVH durability, vehicle dynamics, crash safety, etc); overview of automotive technology (body, powertrain, suspension systems, etc.)

**Reference Books :-**

Ulrich K.T. and Eppinger S.D. Product Design and Development, 2nd Edition; Irwin

McGraw Hill Gillespie T.D. Fundamentals of Vehicle Dynamics; SAE Inc.
Sehwaller A.E.Motor Automotive Technology; 3rd Edition, Delman Publishers

| **MPD – 24 CAE in Product Design** | **Elective III** |
|---|---|
| Product development driven by concurrent engineering; role of CAE (Computer Aided Engineering) in product design: mathematical abstractions of products for functionally and durability verification; lumped mass., finite elements, boundary element, and statistical modeling procedures; use of commercial finite element – based packages for design analysis and optimization. | |
| **Reference Books :-**<br>K.J. Bathe Finite Element Procedures; Prentice Hall, 1995<br>Robert Cook, Finite Element Modeling for stress Analysis: 1995<br>P.K. Banerjee, Boundary Element Methods in Engineering Science: McGraw Hill | |

| **MPD – 24 Design Management** | **Elective III** |
|---|---|
| Designers perspective of the market. Designers and psychological issues: perception and errors in perception, designers sources of product features: projective techniques to acquire product feature database designer in a team: human resources issues a designer must know, designer and competition, collaboration and conflict management, designer in an organization, designer as an entrepreneur, designer knowledge on intellectual property. | |
| **Reference Books :-**<br>Mark Oakley (ED) : Design Management – A Handbook of Issues and Methods; Blackwell Publication. | |

| **MPD – 25 Design and Society** | **Elective IV** |
|---|---|
| Independent study /research on a chosen topic by students under the supervision of faculty. Presentation of seminar on work done. The course also includes invited seminars on various aspects of product Design and Marketing issues. Focus is on real life situations from practicing professionals. | |

| **MPD – 25 Computer Aided Product Design** | **Elective IV** |
|---|---|
| Project in reengineering a product using computer tools for reverse engineering geometry and intent design evaluation, modification and prototyping. | |
| **Reference Books :-**<br>Zeid, I CAD/CAM: McGraw Hill<br>Current Literature | |

| **MPD – 25 Advanced Materials and Manufacturing** | **Elective IV** |
|---|---|
| Design for manufacturing influence of materials process and tooling on the design of components manufactured by metal casting, forming and joining, form design of components, recent developments in casting, machining, forming and finishing, processing of polymers and ceramics, surface modification of materials. | |
| **Reference Books :-** | |

Amsted. B.H. Oswald. P.F. and Begeman, M., Manufacturing Processes; John Wiley1987
Bralla, J.C., Handbook of product Design for Manufacturing; McGraw Hill 1988
Levy S, and Dubois, L.H., Plastics Production Design Engineering Handbiook; Methuen ine, New York, 1985

**MPD – 31 Applied Ergonomics**

Introduction to ergonomics; elements of anthropometry, physiology, anatomy, biomechanics and CTDs; workspace, seating, handtool design, manual material handling; man – machine system interface, human information processing, displays and controls, compatibility; environmental factors; cognitive ergonomics, principles of graphic user interface design; human error, product safety, product liability.

**Reference Books :-**

Sanders and McCormic, Human Factors in Engineering and Design:Zed McGrawHill1992.
Eberts R.E. User Interface Design; Prentice Hall, 1994

**MPD – 32 Design Creativity** **Elective V**

Introduction to design creativity; five sources of inspiration: Sources of self inspiration: sources of inspirations from customers; and teams: sources of inspiration from trials; sources of inspiration from artificial world sources of inspirations from nature; associated exercises and tests.

**Reference Books :-**

Pahl and Betiz., Engineering Design, Springer London, 1996
Nigel Cross, Design Methods, Butterworths, 1994
Roozenburg and Eekels, Product design fundamentals and methods John Wiley, 1994
Chakrabarti, Amaresh (ED) Engineering Design Systems: Undrstanding, Broaches and Tools, Springer Verkag, 2002

**MPD – 32 Methodology for Design Research** **Elective V**

Introduction to design research; a methodology for design research and its components: types of design research: Selecting criteria and its research methods; understanding factors influencing design and its research methods; developing design support and its research methods; evaluating design support and its research methods; associated exercises and tests.

**Reference Books :-**

Blessing, L.T.M. Charkrabarti, A., Wallace, K.M., An Overview of Design Studies in Relation to a Design Research Methodology, Designers: the Key to Successful Product Development, Frankengerner and Badke – Schaub (EDS.) Springer Verlag, 1998
Current Literature, including various papers in the Proceeding of the International Conference in Engineering Design, Prague, 1995.

**MPD – 33 Mini Design Project**

A Project involving either redesign of an existing product or conceptualization of a new product considering functional, materials and manufacturing, ergonomic, aesthetic and marketing aspects. Product detailing using CAD/CAM tools. Presentation to mockup level with complete documentation for purposes of fabrication.

**MPD – 41 Project (Dessertation)**

Spread over 15 Months, commencing immediately after second semester. A project involving complete design and prototype fabrication with full documentation.