**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 :-**
- Frank Webb, Composition; ISBN – 715303376

### 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, Ecoeffectiveness, Ecoefficiency, Ecodesign strategy wheel, Case studies; Methodology for problem solving in engineering design: Recognition, Definition, Analysis, Synthesis, Communication and Presentation.

**Reference Books :-**
- Cross, N Engineering Design Methods, John Wiley.1984
- 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 :-**
- Ashby, M.F. Materials selection in Mechanical Design; Pergamon press, 1992
- 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. 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 :-**
- Zeid, I., CAD/CAM; McGraw Hill
### 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 specific functions.

**Reference Books:**

### MPD – 15 Elements of Engineering Design  
**Elective – II**

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:**
- Shigley, J.E., Mechanical Engineering Design; McGraw Hill
- White, Fluid mechanics; Tata McGraw Hill
- Gupta, V.Sage, Elements of Heat and Mass Transfer

### MPD – 15 Mechatronics  
**Elective – II**


**Reference Books:**
- Kuo. B.C. D.C. Motors and Control systems; S.R.I., Publishing Co., 1979
- Kuo. B.C. Step Motors and Control systems; S.R.I., Publishing Co., 1979

### MPD – 21 Product Design

**Reference Books :-**

**MPD – 22 Product Planning and Marketing**

**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**

**Reference Books :-**
- Ernest Burden, Design presentation; McGraw Hill.ISBN 00/00A9310

**MPD – 24 Design of Automotive Systems**
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 :-**
**MPD – 24 CAE in Product Design**

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 :-**
- K.J. Bathe Finite Element Procedures; Prentice Hall, 1995

**MPD – 24 Design Management**

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 :-**
- Mark Oakley (ED) : Design Management – A Handbook of Issues and Methods; Blackwell Publication.

**MPD – 25 Design and Society**

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**

Project in reengineering a product using computer tools for reverse engineering geometry and intent design evaluation, modification and prototyping.

**Reference Books :-**
- Current Literature

**MPD – 25 Advanced Materials and Manufacturing**

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 :-**
Barkatullah University Institute of Technology, B.U., Bhopal

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Elective V</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPD – 31</td>
<td>Applied Ergonomics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Books :-</td>
<td></td>
</tr>
<tr>
<td>MPD – 32</td>
<td>Design Creativity</td>
<td>Elective V</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Books :-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nigel Cross, Design Methods, Butterworths, 1994</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roozenburg and Eekels, Product design fundamentals and methods John Wiley, 1994</td>
<td></td>
</tr>
<tr>
<td>MPD – 32</td>
<td>Methodology for Design Research</td>
<td>Elective V</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Books :-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current Literature, including various papers in the Proceeding of the International Conference in Engineering Design, Prague, 1995.</td>
<td></td>
</tr>
<tr>
<td>MPD – 33</td>
<td>Mini Design Project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>
MPD – 41 Project (Dessertation)

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