MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR
DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech. (Mechanical Engineering)
Open Electives

Syllabus
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<th>UG</th>
<th>Department: Mechanical Engineering</th>
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<tbody>
<tr>
<td>Course Code: ME 422</td>
<td>Course Name: Supply Chain Management</td>
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<tr>
<td>Credit: 4</td>
<td>L-T-P:3-1-0</td>
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Syllabus

Supply Chain Management introduction, Strategic Fit & Scope, Supply Chain Drivers and Obstacles, Designing the distribution network, Planning demand and supply in supply chain, Planning and managing inventories in a supply chain, Transportation Sourcing, and pricing products, Coordination and Technology in the Supply Chain

Reference Books:

Syllabus

UNIT-I – Project Management
Introduction to Project Management (PM), Collaborative Working, PM Tutorials and their implementation for the same in their projects in tools such as Microsoft Projects.

UNIT-II – Ideation & conceptual Design
Elements of design; Product development cycle overview; Market demands and trends for products; Product Lifecycle Management (PLM) overview; Ideation and conceptual design phase introduction; Benefits and use cases of ideation and conceptual design, Capturing Voice of the customer (VOC), Use of Trizz in ideation, Intellectual Property Rights (IPRs).

UNIT-III - Product Engineering – Component Design
Product Design Phase–Part 2; Design for manufacturing, introduction; Design styled components.
Product Design Phase – Part 3; Top Down and Bottom Up Design Methods; Manufacturing and Engineering Bill of Materials (BOMs); Team and Collaborative based Design.

UNIT-IV - Product Engineering – Documentation (Drawings)
Design Documentation Requirements; Importance and benefits of design documentation; When do you need documentation and when do you not; Drawings requirements (Detailed drawings & Assembly Drawings), Design changes and Automation & Visualization Extending DesignData.

UNIT – V – Prototyping, Testing & User Trials
Need - Development of RP systems, RPT Technologies, Rapid Tooling & Case Studies.

Books:
3. Mastering Autodesk Inventor by Sybex
4. Autodesk Inventor 2012 for Designers by CADCIM Technologies
8. Engineering Design and Design for Manufacturing by Dixen& Poly, University of Mas. Press
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<tr>
<td>Course Code: Open Electives</td>
<td>Course Name: Smart Materials</td>
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**Syllabus**

**Unit-1 Introduction:** Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc. Types of Reinforcements/Fibers: Role and Selection or reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers, Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential

**Unit-2 Various types of composites:** Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites

**Unit-3 Fabrication methods:** Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films

**Unit-4 Testing of Composites:** Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

**Books:**
2. Mechanical Metallurgy by G. Dieter Mc-Graw Hill
3. Thermal Analysis of Materials by R.F. Speyer, Marcel Decker
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<td>Course Code:</td>
<td>Course Name: Robotics</td>
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**Syllabus**


Control of movements of mechanical joints, control sequence, n-joints manipulator control system, system performance, control system with damping, control strategy, Architecture of control systems.

Robot Programming issues, optimization position definitions, interpolation language command, data object command, motion commands, gripper command, tool commands, sensors command, other command, Writing programs for different tasks.

**Text Book:**

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<tr>
<td>Course Code:</td>
<td>Course Name: Finite Element Methods</td>
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### Syllabus


(iii) Plane Trusses: Local and Global Coordinate System, Element Stiffness Matrix, Stress Calculations, Temperature Effects.


(vi) Two Dimensional Isoparametric Elements and Numerical Integration: Four nodded quadrilateral, Numerical Integration, Higher Order Elements.


### Books


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<tr>
<td>Course Code: ME 418</td>
<td>Course Name: Total Quality Management</td>
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**Syllabus**


**Reference Books**

Introduction to six sigma, Indicators of requirement of Six sigma, Elements of six sigma, Six sigma process – Define phase, Six sigma tools (QFD, SIPOC) – Define phase, Six sigma process – Measure phase, Six sigma tools (CTQ tree, Process capability calculation, Measurement system analysis using gauge R&R) – Measure phase, Six sigma process – analyse phase, Six sigma tools (Histogram, box plot, control chart, scatter chart, fish bone diagram, pareto analysis chart, interrelations diagram) – analyse phase, Six sigma special tools (Regression analysis, Hypothesis testing, ANOVA, Multivariate analysis), Six sigma – process improvement, Six sigma tools (Affinity diagram, FMEA, DOE), Six sigma process – control phase, Six sigma tools (Value stream mapping, control charts, TPM, Poka – yoke), Implementing six sigma

Reference Books

Henderson, G. R. (2007), Six Sigma Quality Improvement with MINITAB, WileY
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Syllabus

**Present Energy Scenario:** World, India, Rajasthan and future prospects.

**Power Plant Economics:** Various Terms and definitions, load curves, cost of electricity generation, performance and operating characteristics, combined operation of power plants, load division.

**Steam Power Plant:** Layout, site selection, coal burning methods, disposal of ash and dust, combined cycle power plants, integrated coal gasification, major plant components: condensers, cooling towers.

**Diesel and Gas Turbine Plant:** General Layout, plant components, comparison with steam plant.

**Nuclear Power Plants:** Location, component of nuclear plants, types of reactors, Uranium enrichment, safety, disposal of nuclear waste, comparison with thermal plants.

**Hydro-electric Power Plant:** Classification, layout, components and auxiliaries of hydro power plant, Selection of turbines, micro hydro plants, pumped storage.

**Other power plants:** Wind resource assessment, types and selection of wind turbines; operation and control of machines; Solar PV power plants: system components, selection criteria; Solar Thermal Power Plants: Types of solar thermal plants, component description, auxiliary heating requirement.

**Books:**
1. Frederick T. Morse “Power Plant Engineering” East West Press.
**Program:** B.Tech. Mechanical Engineering  
**Department:** Mechanical Engineering  
**Course Code:**  
**Course Name:** Automobile Engineering  
**Credit:** 3  
**L-T-P:** 3-0-0

### Syllabus


### Books for Reference:


Syllabus

1. INTRODUCTION: Energy demand growth and supply: Historical Perspectives; Fossil fuels: Consumption and Reserve; Environmental Impacts of Burning of Fossil fuels; Sustainable Development and Role of Renewable Energy


3. SOLAR THERMAL ELECTRICITY GENERATION: Solar concentrators and tracking; Dish and Parabolic trough concentrating generating systems, Central tower solar thermal power plants; Solar Ponds.

4. SOLAR PHOTOVOLTAIC SYSTEMS: Basic principle of power generation in a PV cell; Band gap and efficiency of PV cells; Manufacturing methods of mono- and polycrystalline cells; Amorphous silicon thin film cells, Single and multi junction cells; Application of PV; Brief outline of solar, PV stand-alone system design; Storage and Balance of system.

5. WIND Energy Systems: Types of turbines, Coefficient of Power, Betz limit, Wind electric generators, Power curve; wind characteristics and site selection; Windfarms for bulk power supply to grid; Potential of wind electricity generation in India and its current growth rate.

6. BIOMASS ENERGY: Biomass: Sources and Characteristics; Wet biogas plants; Biomass gasifiers: Classification and Operating characteristics; Updraft and Downdraft gasifiers; Gasifier based electricity generating systems; Maintenance of gasifiers.

7. OCEAN ENERGY: Tidal power plants: single basin and two basis plants, Variation in generation level; Ocean Thermal Electricity Conversion (OTEC); Electricity generation from Waves: Shoreline and Floating wave systems.

8. GEOTHERMAL ENERGY: Geothermal sites in India; High temperature and Low temperature sites; Conversion technologies- Steam and Binary systems; Geothermal power plants.

Books:
2. Godfrey Boyle, Renewable energy, Oxford Press
4. Rai G.D., Non-Conventional Energy Sources, Khanna publication