RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Departmental Elective ME- 702(A) Advance Machining Processes

Course Objectives:

- Understand the fundamentals and technologies used in different advance machining processes.
- Apply the characteristics and applications of the product obtained using advanced manufacturing processes.
- Compare different advance machining processes.

Syllabus:

Unit 1: Mechanical processes; Process selection, mechanics of cutting, metal removal rate, cutting tool system design, ultrasonic machining, abrasive jet machining, water jet machining, , effect of parameters and variables, applications and limitations, recent developments in mechanical processes.

Unit 2: Electrochemical and chemical metal removal processes; Electrochemical machining[ECM], elements of ECM, power source and control system, electrolytes, tool work system, chemistry of the process, tool design and metal removal rate, process faults, material removal and surface finish, electrochemical grinding, electrochemical deburring, electrochemical honing, chemical machining,

Unit 3: Thermal metal removal processes; Electric discharge machining[EDM], spark erosion, mechanism of metal removal, spark erosion generator, electrod feed control, vibrating electrode system, dielectric fluid, flushing, accuracy, plasma arc machining[PAM], non thermal generation of plasma, mechanisms and parameters, equipments, electron beam machining[EBM],generation and control of electron beam, theory and process capabilities, neutral particle etching, laser beam machining, hot machining, methods of local heating,tool lie and production rate.

Unit 4: Rapid prototyping fabrication methods; Fundamentals, technologies, applications, principles and working of 3D printing, subtractive v/s additive manufacturing process, VAT photo polymerization, material and binder jetting, continuous liquid inter phase production, direct metal laser sintering.

Unit 5: Technologies of micro fabrication; Types of micro system devices, indusrial applications, micro fabrication processes, LIGA process .Technologies of nano fabrication, importance of size, scanning probe microscope, carbon Buckyballs and nano tubes, nano fabrication processes,

References:

1. Mikell P. Groover, Fundamentals of Modern Manufacturing, Wiley India, ISBN 978 81 265 2301 6
2. Pandey P.C, Shan H.S., Modern Machining Processes, Tata McGraw Hill,ISBN 0 07 096518 8
3. Lal G.K,Gupta V, Reddy N.V., Narosa Publishing House,ISBN 81 7319 709 1
4. CMTI Handbook
5. Jain V.K. Introduction to Micro Machining Process Narosa Publication
6. Jain V.K. ,Micromanufacturing Processes , Crc Press.

Evaluation

Evaluation will be continuous an integral part of the class as well through external assessment.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Departmental Elective ME- 702(B) Internet of Things

Course Objectives :

The explosive growth of the "Internet of Things" is changing our world and the rapid drop in price for typical IoT components is allowing people to innovate new designs and products at home. The Internet of Things (IoT) is a course about the new paradigm of objects interacting with people, with information systems, and with other objects. The course will focus on creative thinking and on hands-on project development.

After learning the course, the student will be able:

1. Understand the vision of IoT from a global context.
2. Understand the application of IoT.
3. Determine the Market perspective of IoT.
4. Use of Devices, Gateways and Data Management in IoT.
5. Building state of the art architecture in IoT.
6. Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

Unit I: Internet of Things (IoT)

Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples . Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability .

Unit II: Hardware for IoT

Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, Raspberry pi, Beagle Bone, Intel Galileo .

Unit III: IoT PROTOCOLS

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks, Zigbee – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT .

Unit IV: Security

Understanding the risks, Modes of attack - Denial of Service Guessing the credentials , Getting access to stored credentials, Man in the middle , Sniffing network communication , Port scanning and web crawling ,Search features and wildcards ,Breaking ciphers , Tools for achieving security - Virtual Private Networks , X.509 certificates and encryption , Authentication of identities , Usernames and passwords , Using message brokers and provisioning servers ,Centralization versus decentralization .

Unit V: IoT Applications

Home Automation- Smart Appliances , Smoke/ Gas Detection, Cities – Smart Parking ,Smart Lighting , Smart Road , Health and Lifestyle- Health and fitness monitoring, Retail- Smart Payments. Case Studies: Smart city streetlights:- control and monitoring

References:

1.Raj Kamal "Internet of Things", McGraw-Hill, 1st Edition, 2016

2.Olivier Hersent,David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", Wiley

3. Peter Waher, "Learning Internet of Things", Packt publishing

4.Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A hands on approach)" University Press (India)

5.Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013

.6. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1

Evaluation Evaluation will be continuous an integral part of the class as well through external assessment

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Departmental Elective ME- 702(C) Power Plant Engineering

Course Objectives:

After studying this course, students will be able to

1. Understand the conversion of renewable energy system into electrical power.
2. Design & enhance the performance of fossil fuel based power plant.
3. Analyze the nuclear power plant and its safety.
4. Design & enhance the performance of hydro based power plant.
5. Determine economics of the power plant of renewable and non renewable / nuclear power system

Syllabus:

Unit I: Introduction:

Introduction to methods of converting various energy sources to electric power, direct conversion methods renewable energy sources, solar, wind, tidal, geothermal, bio-thermal, biogas and hybrid energy systems, fuel cells, thermoelectric modules, MHD-Converter

Unit II: Fossil fuel steam stations:

Basic principles of sitting and station design, effect of climatic factors on station and equipment design, choice of steam cycle and main equipment, recent trends in turbine and boiler sizes and steam conditions, plant design and layout, outdoor and indoor plant, system components, fuel handling, burning systems, element of feed water treatment plant, condensing plant and circulating water systems, cooling towers, turbine room and auxiliary plant equipment., instrumentation, testing and plant heat balance.

Unit III: **Nuclear Power Station**:

Importance of nuclear power development in the world and Indian context, Review of atomic structure and radio activity, binding energy concept, fission and fusion reaction, fissionable and fertile materials, thermal neutron fission, important nuclear fuels, moderators and coolants, their relative merits, thermal and fast breeder reactors, principles of reactor control, safety and reliability features.

Unit IV: Hydro-Power Station:

Elements of Hydrological computations, rainfall run off, flow and power duration curves, mass curves, storage capacity, salient features of various types of hydro stations, component such as dams, spillways, intake systems, head works, pressure tunnels, penstocks, reservoir, balancing reservoirs, Micro and pico hydro machines, selection of hydraulic turbines for power stations, selection of site.

Unit V: Power Station Economics:

Estimation and prediction of load. Maximum demand, load factor, diversity factor, plant factor and their influence on plant design, operation and economics; comparison of hydro and nuclear power plants typical cost structures, simple problems on cost analysis, economic performance and tariffs, interconnected system and their advantages, elements of load dispatch in interconnected systems.

References:

1- Nag PK; Power plant Engg; TMH
2- Al-Wakil MM; Power plant Technology; TMH
3- Sharma PC; Power plant Engg; Kataria and sons, Delhi
4- Domkundwar; Power Plant Engg; Dhanpatrai & sons.
5- Rajput RK; A text book of Power plant Engg.; Laxmi Publications.

Evaluation

Evaluation will be continuous an integral part of the class as well through external assessment.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Departmental Elective ME- 702(D) Advance Machine Design

Course Objective

- Understand the design concepts of belt, rope and chain drives.
- Able to design different types of gears.
- Able to design I.C. Engine components, different types of couplings and power screw
- Inspect miscellaneous components such as flanged coupling, rigid coupling, and pressure vessels.

Course Contents:

Unit- I: Design of Belt, Rope and Chain Drives: Methods of power transmission, designof flat beltdrive and V-belt drive ; Design of chain drives, roller chain and its selection; Design of rope drives.

Unit- II: Spur and Helical Gears: Force analysis of gear tooth, AGMA Bending stress equation and AGMA Contact stress equation, modes of failure, beam strength, Lewisequation, form factor, formative gear and virtual number of teeth; Gear materials; Surface strength and wear of teeth; strength against wear; Design of straight tooth spur and Helical Gears.

Unit- III: Bevel Gears: Application of bevel, formative gear and virtual number of teeth; Force analysis; Lewisequation for bevel gears; Strength against wear; Design of bevel gear.

Unit- IV: Design of I.C. Engine Components: General design considerations in I C engines; design ofcylinder; design of piston and piston-rings; design of connecting rod; design of crankshaft.

Unit -V: Design of Miscellaneous Components: Design of Knuckle joint, Design of Cotter joint, Design of keys, Design of Flanged coupling; Rigid coupling and Flexible coupling ,Design of Pressure vessels subjected to internal pressure, Design of power screw.

References:

1. Shigley J.E.; Machine Design; TMH
2. Bhandari VB; Design of Machine Elments; TMH
3. Abdul Mubeen; Machine Design; Khanna Publishers
4. Sharma & Agrawal; Machine Design; Katson
4. Sharma CS and Purohit K; Design of Machine Elements; PHI Learning.
5. Dwivedi and Pandey; Machine Drawing and Design, Dhanpat Rai & Co.
6. Wentzell TH; Machine Design; Cegage Learning
7. Hall and Somani; Machine Design; Schaum Series; TMH
8. Kulkarni SG; Machine Design; TMH
9. Norton R; Design Of Machinery; TMH

Note: PSG Design data book and/ or Mahadevan and Reddy's Mechanical design data book are to be provided/ permitted in exam hall (duly verified by authority)

Evaluation: Evaluation will be continuous an integral part of the class as well through external assessment