

S.Y.B.Tech ILOE Even Semester

Sr No	Branch	Course Name	Except
1	Civil	Basic Civil Engineering	Civil Engineering
2	Computer and IT	E-Commerce	Computer Engg. & I.T.
3	Electrical	Electrical Technology	Electrical, Metallurgy and Production
4	Electrical	Industrial Electronics and Electrical Drives	Only for Production. All other branches excluded
5	E&TC	Principles of Electronic Communication	E & TC
6	Instrumentation	Engineering Instrumentation	Civil Engineering, Instrumentation
7	Mechanical	Automobile Engineering	Mechanical Engineering.
8	Mechanical	Computer Aided 3 D Geometric Modeling	Mechanical Engineering.
9	Metallurgy	Device Materials	No Exception
10	Production	Production Processes and Metrology	Mechanical, Production
11	Production	Operations Efficiency	Open to all

(ILOE)- Basic Civil Engineering [For other Departments]

Teaching Scheme

Lectures : 3 hrs/week
Tutorial : ---

Examination Scheme

T1 and T2: 20 Marks each
End-Sem Exam: 60 Marks

Course outcomes:

Students will be able to

- 1) understand basic principles related to various civil engineering systems.
- 2) identify the various areas in his discipline to utilize his knowledge related to civil engineering.

Unit 1

(7 hrs)

Introduction and scope of Civil Engineering. Role of Engineers in the infrastructure development.

Surveying: Principles of surveying and leveling, Various types of maps such as contour map, index map, etc. and their uses; Introduction to digital mapping, Introduction to various survey instruments such as EDM, Total Station, and digital planimeter.

Modern survey methods:-Introduction to GIS, GPS and their applications.

General concepts related to building. Selection of site, basic functions of buildings, types of buildings – Residential, Public, Commercial, and Industrial. Principles of planning, orientation of buildings, introduction to bye-laws regarding building line, Height of building, open space requirement, F.S.I., Carpet area, built up area, setbacks, ventilation.

Unit 2

(7 hrs)

Components of Buildings - Types of loads on buildings. Substructure – Types of soils; rocks and foundation strata, concept of bearing capacity, Types of foundation and their suitability.

Superstructure –Types of construction: Load Bearing, Framed, and Composite.

Building Materials

Introduction to basic construction materials; cement, bricks, stone, aggregates, reinforcing steel, Structural glazing, structural steel; Concrete types: PCC, RCC, Prestressed, Precast and Ready Mix Concrete. Use of various eco- friendly materials in construction.

Unit 3

(6 hrs)

Building Services: Vertical transportation, acoustics, ventilation and air conditioning, plumbing services,

Construction management: Principles, function of various agencies related to construction activities, tenders and contracts

Sustainable Development: Role of Engineers in Sustainable Development. Concept of green buildings and Certification.

Unit 4**(7 hrs)****Transportation Engineering**

Role of transportation in national development; various modes of Transportation. Classification of Highways: - Expressways, NH, SH, MDR, ODR, VR; Types of Pavements, Road maintenance, PPP/BOT Projects; Road safety:-Traffic Signs, signals, Parking system, and Causes of Accidents.

Unit 5**(7 hrs)****Environmental Engineering**

Water supply - Sources, drinking water requirements, impurities in water and their effects; Purification of water, modern purification processes; Standards of purified water. Solid Waste: Classification, Collection, treatment and Disposal methods; Waste water: Classification, Collection, treatment and reuse.

Unit 6**(6 hrs)****Water Resources Engineering**

Introduction to Hydrology, Hydrologic cycle, precipitation, losses, Runoff , Sources of water, Hydraulic structures of storage; Water requirements, water conservation, water conveyance systems. Watershed management: Definition, Necessity and methods; Roof top rain water harvesting and Ground water recharge: relevance and methods.

Text Books:

- B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Basic Civil Engineering, Firewall Media, 2003.
- S.S. Bhavikatti, Elements of Civil Engineering, Vikas Publishing House Pvt. Ltd.,

- Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain., "Soil Mechanics and foundations", Laxmi Publications (P) LTD, March 2005.
- M. S. Shetty, "Concrete Technology", S. CHAND & COMPANY LTD. & Co., 1992, New Delhi.
- T. P. Kanetkar, S. V. Kulkarni, "Surveying and Levelling" Pune Vidyarthi Griha Prakashan, 1988
- Santosh Kumar Garg, "Irrigation Engineering And Hydraulic Structures" Khanna Publications, 23rd Edition, 2009
- G. S. Birdie, J. S. Birdie "Water Supply and Sanitary Engineering: Including Environmental Engineering" Dhanpat Rai and Sons, 5th Edition, 1996.
- Sushil Kumar, "Building Construction" Standard Publishers Distributors, 6th Edition, 2006.
- Khanna&Justo, "Highway Engineering" Nem Chand and Bros, Roorkee(U.A), 8th Edition, 2001
- M. G. Shah, C. M. Kale, S. Y. Pakti, "Building Drawing Design" Tata McGraw Hill Publication, 4th Edition, 2007.
- "Building Construction manual" CBRI, Roorkee

- "Civil Engineering Materials" Tata McGraw Publication, TTTI Chandigarh.
- "National Building Code of India 2005", Bureau of Indian Standard, New Delhi

Institute Elective (ILOE-CE) E- Commerce

Teaching Scheme:

Lectures : 3 Hrs/week

Examination Scheme:

T1/T2 Exam – 20 marks each

End Sem Exam - 60 marks

Course Outcomes:

Students will be able to:

1. Demonstrate an understanding of the foundations and importance of E-commerce
2. Understand the impact of Information and Communication technologies, especially of the Internet in business operations
3. Comprehend risk, legal issues and privacy in E-Commerce and Assess electronic payment systems
4. Analyze the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders.
5. Evaluate the opportunities and potential to apply and synthesize a variety of E-Commerce concepts and solutions to create business value for organizations, customers, and business partners.

Unit I: Introduction: E-Commerce: meaning advantages & disadvantages, incentives for engaging in electronic commerce, impact of e-commerce on business and e business, electronic commerce framework, types of e-commerce, Intellectual Property Rights- copyright, trademark and patent. **[5 Hrs]**

Unit II: Risk and Legal Issues in E-Commerce: risks and barriers in the adoption of e-business environment, the impact of ICT in contemporary business operations, entrepreneurial development in e commerce, cloud computing and e Commerce, e-commerce in India – laws for e-commerce in India, cryptocurrency and e commerce **[6 Hrs]**

Unit III: E-Commerce Business Models: key element of a business model, major B2C business models, major B2B business models, business models in emerging e-commerce areas

E-Government: issues in e-governance applications, benefits and reasons for the introduction of e- governance, e-governance models **[6 Hrs]**

Unit IV: Electronic Payment Systems: types, digital wallet, digital cash, payment through card system, e–cheque, e–cash, e–payment threats & protections, smart cards electronic payment systems, risk in electronic payment Systems, secure electronic transaction protocol, e–marketing: home –shopping, e-marketing, tele-marketing, digital marketing. **[6 Hrs]**

Unit V: Electronic Data Interchange (EDI): meaning, benefits, concepts, e-procurement, future of e commerce and latest technology: Storefront digitizing, chatbot, beacon technology, direct

social media purchase, voice assistants, drone and droid delivery, augmented reality device etc.

[5 Hrs]

Text Books:

- Kenneth C Lauden, Carol G. Traver, "E-Commerce", Perason Education, ISBN 97881317812.
- Doing Business on the Internet E-COMMERCE (Electronic Commerce for Business):S. Jaiswal, Galgotia Publications, ISBN 9788175153059.
- E-Business, Bookseller Code (AG) OXFORD, 1st edition Parag Kulkarni, Sunita Jahirabadkar &Pradip Chande,ISBN 9780198069843.

Reference Books:

- P. T. Josef, "Electronic Commerce- A managerial perspective" Prentice-Hall International, ISBN 8120320891.
- Kamlesh K. Bajaj, Debjani Nag, "Electronic Commerce: The cutting edge of business", Tata McGraw-Hill Publishing Co. Ltd, 2000, ISBN 9780070585560.
- Jeffrey F. Rayport, Bernard J. Jaworski, "e-Commerce", Tata McGraw Hill, 2002, ISBN 9780072510249.
- Pete Loshin, Paul A. Murphy, "Electronic Commerce", Jaico Publishing House, 2000, ISBN 9788172246662.
- Ravi Kalakota, Andrew B. Whinston, "Frontiers of Electronic Commerce", Addison Wesley,2002, ISBN 0201845202.

(ILOE) ELECTRICAL TECHNOLOGY

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Learn different types of power converters; and fundamentals of dc and ac motors.
2. Evaluate different types of dc and ac drives.
3. Acquire the knowledge of different heating and welding techniques used in industries.
4. Acquire the knowledge of industrial electrical systems and understand power quality problems.

Unit 1

Power Converters:

Fundamentals of ac-dc, dc-dc, dc-ac and ac-ac converters, their applications, selection and sizing. Introduction to various PWM strategies and control. [07 Hrs]

Unit 2

Dc Motors and Drives:

Dc motor: Introduction, different types of dc motors, torque production, motional E.M.F, steady-state characteristics and armature reaction. dc motor drives, starting and speed control thyristor dc drive, chopper-fed dc drive and dc servo drive. Introduction to BLDC. [08 Hrs]

Unit 3

A.C. Motors and Drives:

Induction motor: Introduction, Advantages, basic principle of operation, influence of rotor current on flux, stator-current speed characteristics, method of starting, torque speed curves, speed control, equivalent circuit and power balance. Inverter-fed Induction motor drive: comparison with dc drive, torque-speed characteristics, V/f operation, limitation imposed by the Inverter and limitation imposed by the motor [08Hrs]

Unit 4

Industrial Heating and Welding:

Introduction, advantages of electric heating, direct resistance heating, heat treatment by induction heating, dielectric heating and arc furnaces. [07 Hrs]

Unit 5

Industrial Electrical Systems:

11 kV system, LT panel/cables, basic protection, diesel generators, UPS, lift, battery systems, earthing and lightning protection, energy efficiency measures. [06 Hrs]

Unit 6

Power Quality and Energy Economics:

Power quality: definitions, importance, various causes and standards. Power factor improvement: Need and various methods. Energy economics: Industrial tariff and energy conservation. [06 Hrs]

Text Books

- Roger C. Dugan and Mark F. McGranaghan "Electrical Power Systems Quality", Second edition, Tata McGraw-Hill.
- S. C. Tripathy "Electrical Energy Utilization and Conservation", Tata McGraw-Hill.
- Mohan and Undeland "Power Electronics Converters, applications and design", third edition, Wiley India.
- E. Fitzgerald, Charles Kingsley and S.D.Umans "Electric machinery", fifth edition, Mc Graw-Hill Book Company

Industrial Electronics and Electrical Drives

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks,
End - Sem Exam – 60 Marks

Objective :

- To study various electronics devices such as power control devices, integrated circuits and its industrial applications.
- To study various electrical machines and their applications in Production Engineering

Industrial Electronics

Unit 1

(8 hrs)

Study of Power Control Devices

SCR, Triac, Power MOSFET, IGBT, characteristics and simple applications like controlled rectifiers. Triggering circuits using Diac/UJT and digital logic: Power supply protection circuits (over voltage, thermal shutdown and current limiting). Study of UPS (only block diagram), light dimmers, fan regulators.

Unit 2

(10 hrs)

Integrated Circuits and Applications

Amplifiers: Review of Op-amp IC 741, Audio Power Op-Amp ICs like TBA 810, LM 380, Schmidt trigger and its applications, Op-Amp as wave form generator (square and ramp), case study of waveform generator IC such as 8038 or XR 2206.

IC 555 as mono-stable and a stable multi vibrator and its applications in Mechanical Engineering. Cascading of Timers, sequential timers.

Binary and BCD adder, subtractor. Shift registers, counters, applications of digital circuits such as staircase, traffic light, lift controller, sequential controllers, mechanical system, opto isolators and opto couplers.

Unit 3

(10 hrs)

Industrial Applications

Resistance welding, RF heating energy storage welding, ultrasonic method of testing of materials, principles of LASER and applications. DC drives, separately excited and series motors, speed control of AC motors. Use of CR0 as a display device for industrial application.

Smoke, temperature, pressure, vibrations, displacement, flow, level detectors. Controllers using these sensors annunciator circuits, electronic weighing systems, electronic ignition systems, proximity switches.

Analog to Digital and digital to analog converters. Introduction to PLC, concept to distributed control systems, concept of computerised numerical controllers.

Electrical Drive Systems

Unit 4

(8 hrs)

D. C. Machines

Construction, generating action, e.m.f. equations, types - shunt, series, compound generators (elementary treatment)

Motoring action, types - shunt, series, compound motors. Significance of back e.m.f., torque-speed equations, torque-armature current speed-armature current, torque- speed characteristics, different methods of speed control, braking, starters of D.C. motors, applications.

Unit 5

(7 hrs)

Induction Motors

Three Phase Induction Motors: Types, principle of operation slip torque equation, condition for maximum torque, torque slip characteristics, various methods of speed control, breaking.

Relation between slip, mechanical power developed and copper loss. Efficiency of motor. Different types of starters, applications.

Single Phase Motors: Principle of working, construction and applications (descriptive treatment only) of

a) Single phase induction motors: resistance split phase, capacitor split phase and shaded pole motors.

b) Special purpose motors: stepper motors, servomotors, hysteresis motors, and reluctance motors. A.C. series motors. Universal motors.

Unit 6

(13 hrs)

Synchronous Machines & Electrical Drives

Alternators: Constructional features, salient pole and cylindrical type rotors, synchronous speed, frequency of induced e.m.f., e.m.f. equations, winding factors, regulation of an alternator (synchronous impedance method).

Synchronous motors: Concept of rotating magnetic field, principle of working, phasor diagram, effect of variation of load and excitation, hunting, methods of starting, general applications, application as synchronous condensers.

Selection And Applications Of Electrical Drives:

- a) Selection: Factors to be considered, classes of insulation, review of speed/torque characteristics. Selection of power rating for drive motors based on Thermal limits; over load and load variation factors.
- b) Industrial Applications: Selection of motors for rolling mills. Cranes, winches, traction, shear press, mechanical press, power mills, textile industry, coal and mining industry.
- c) Maintenance of electrical equipment.

References :

Industrial Electronics:

- Chute & Chute: Electronics in Industry, Tata McGraw Hill.
- R.P. Jain: Modern Digital Electronics, Tata McGraw Hill.
- Ramamoorthy: Thyristor and Power Electronics Applications, Prentice Hall of India.
- Harish C. Rai: Industrial and Power Electronics (Umesh Publication, Delhi).
- C. S. Rangan, Sharma, Mahi: Instrumentation, devices and system (WIE).
- Curtis Johnson: Process Instrumentation, Prentice Hall of India.

Electrical Drive Systems:

- B.L. Therja: Electrical technology, Vol. II
- Pillai S. K.: First course in Electrical Drives – Wiley Eastern.
- Kuo B. C.: Automation control systems – Prentice Hall of India.
- H. Cotton: Electrical Technology.
- Stefan Chapman: Fundamental of Electrical Machinery.

Outcomes:

- Learn all speed control methods of separately excited and self excited DC motors and AC motor and with solid state control so these can be used as DC drive and AC drives.
- Understand power control devices like, Triac, SCR, IGBT MOSFET and their triggering methods and design fan regulator and light dimmer circuit.
- Study and select proper OPAMP mechanical or production application like wave form generators IC555 as a timer ,cascading of timers and sequential timer.
- Use logic gates and study registers and counters and applications like staircase, traffic light, lift controllers, sequential controllers.
- Learn all types of welding methods like resistance, RF heating energy storage welding, principles of Laser and applications

(ET 16017-A) Principles of Electronic Communication

Teaching Scheme

Lectures : 3 hrs/week

Examination Scheme

Test-1: 20 marks, Test-2: 20 marks

End-Sem Exam: 60 marks.

Course outcomes

At the end of this course students will demonstrate the ability to

1. Understand basics of electronic communication in analog and digital domain
2. Analyze the working of existing wired and wireless communication
3. Understand a basic of electronic communication to its application

Unit 1

Basic Concepts of Electronic Communication

Introduction to Electronic communication system, Electromagnetic spectrum, need for modulation, concept of modulation, types of modulation, basic concepts of signals, noise, SNR, bandwidth, transmitter, receiver, channel etc. [06 Hrs]

Unit 2

Analog Modulation Schemes

Amplitude modulation, AM representation in time domain and frequency domain, modulation index, bandwidth and power relations in AM, Frequency Modulation (FM), FM spectrum, bandwidth, pre-emphasis and de-emphasis, comparison of AM and FM [08 Hrs]

Unit 3

Digital Modulation Schemes

Advantages of digital signals, sampling theorem, pulse code modulation (PCM), PCM generation and reception, quantization noise, bit rate, bandwidth in PCM, companding in PCM, techniques of DPCM, DM and ADM, basic shift keying techniques ASK, FSK and PSK [08 Hrs]

Unit 4

Fiber Optic and Satellite Communication

Basics of optical communication, structure of optical fiber, advantages and applications of optical fiber communication, basic schematic of satellite communication, role of transponder, LEO, MEO and GEO satellites and their applications. [06 Hrs]

Unit 5

PSTN and Mobile communication

Basic telephony, PSTN structure, basics of cellular (mobile) telephony, GSM architecture, Mobile and base identification, mechanisms of originating a call, receiving a call, and handoffs, Introduction to 2G, 3G & 4G [06 Hrs]

Unit 6

Information Theory and Source Coding:

Introduction to Information theory, Information and Entropy, Channel coding theorem, Source coding theorem, Huffman & Shannon Fano coding Techniques **[06 Hrs]**

Text book:

- Blake, "Wireless Communication Technology", Thomson publication.
- Kennedy, "Electronic Communication Systems", McGraw Hill publication.

References Books:

- R G. Gallager, "Information theory and reliable communication" Wiley publication
- Simon Haykin, " Introduction to Analog and Digital Communication Systems", John Wiley
- B.P. Lathi, "Communication Systems", BS publications

(IE 16010) Engineering Instrumentation

Teaching Scheme
Theory: 3 Hrs/week

Examination Scheme :
Assignments/Quiz/T1/ T2-40,
End Sem. Exam.– 60

Course Outcomes:

At the end of the course, students will able to:

1. Describe working principles of various transducers/sensors [PEO1][PO-a]
2. describe working principles of various the measuring instruments [PEO3][PO-b]
3. Describe elements of control system. [PEO1] [PO-a]
4. Describe latest technologies used for automation [PEO3][PO-j]

Unit 1: Basic characteristics of measuring devices: Introduction to measurement process, accuracy, precision, error, linearity, hysteresis, threshold, repeatability, calibration process, static & dynamic characteristics of instruments. Definition: Transducer, Sensor, Calibration, Range and Span. Classification: Active, passive, primary, secondary, mechanical, electronic, analog and digital transducers

[06]

Unit 2: Transducers I: (Working principles, types, signal conditioning, and applications). Selection criteria, sources of errors in transducers and their analysis. Displacement, Velocity, acceleration, Force, and Torque

[06]

Unit 3: Transducers II: Working principles, types, signal conditioning, and applications). Pressure, Level, Flow, Temperature transducers

[06]

Unit 4 Control System: Basics of Control systems, concept of pole, zero, stability, frequency, and time domain, Introduction to design process, Industrial applications of feed forward and feedback control system. Classification of control systems, modeling in frequency domain (mechanical, electrical, electromechanical systems).

[08]

Unit 5: Electronic Test Equipment: Digital meters, DMM (Digital multi-meter), Digital storage oscilloscope (DSO), probes, signal generators, Typical specification & front-panel controls of DMM, DSO, & function generators.

[06]

Unit 6: Automation: Fundamentals of Automation, Overview of tools used in Automation, Programmable Logic controllers (PLC) & their applications, concept of intelligent instruments, future trends in Automation

[08]

Text Books:

- A. K. Sawhney, "Electrical & Electronic Instruments & Measurement", Dhanpat Rai and Sons, Eleventh ed., 2000.

- B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGraw Hill Education, Second ed., 2004.

Reference Books:

- B.G. Liptak, "Process Measurement & Analysis", Chilton Book Company, Fourth ed., 2003.
- E.O. Doebelin, "Measurement Systems", McGraw Hill, Fifth ed., 2003.
- Sabrie Soloman, "Sensors Handbook" ,McGraw Hill Publication, First ed., 1998.
- Nagrath and Gopal, Control System Engineering-, New Age International Publication, fifth edition,2003.

(ILOE) Automobile Engineering

Teaching Scheme:

Lectures : 3hrs / week

Examination Scheme:

T1 and T2: 20 Marks each

End Sem. Exam: 60 marks

Course Outcomes:

Student will be able to

1. Implement the knowledge obtained in theory towards design and analysis of various automobile systems.
2. Comprehend various aspects of automobile system for enhancement of comfort, safety and economics the various automobile
3. Repair and maintain the automobile

Unit I :

Introduction: Vehicle specifications, classifications, Engine cylinder arrangements, Power requirements, motion resistance and power loss; tractive efforts.

Chassis layout, frame, main components of automobile and articulated vehicles. Design considerations, materials and their properties. [6hrs]

Unit II :

Transmission System : Clutches: need, types. Need of gearbox, types of gear transmission, shift mechanisms, over running clutch, fluid coupling, and torque converters. [6hrs]

Unit III :

Transmission universal joint, constant velocity joint, propeller shaft, Hotchkiss drive, torque tube drive, front and rear axles types, stub axles, need of differential and types, four wheel drive. [6hrs]

Unit IV :

Steering and Suspension Systems: Steering system, principle of steering, centre point steering, steering linkages, steering geometry and wheel alignment, power steering.

Suspension system: need, types, independent suspension, coil and leaf springs, suspension systems for multi, axle vehicles, trouble shooting and remedies. [8hrs]

Unit V : Brakes:

Need, types, mechanical, hydraulic and pneumatic brakes, disc and drum types, their relative merits, details of components, brake adjustments and defects, power brakes.

Wheels and Tyres: Types, tyre construction, specification, tyre wear and cause, wheel balancing. [6hrs]

Unit VI : Electrical Systems:

Electrical systems construction, operation and maintenance of lead acid batteries battery charging system principle and operation of cutout and regulators starter motor Bendix drive solenoid drive magneto coil and solid stage ignition systems, ignition timing, lighting, and electrical accessories, automobile air conditioning, panel board instruments. [8hrs]

Text Books:

- Automobile Engineering by Dr. Kirpal Singh (Vol. I & II) Standard Publishers 1999
- Automobile Engineering by G.B.S. Narang.1999

Reference Books:

- Automotive Technology by H.M. Sethi.1990
- Automobile Engineering by Banga & Singh,1990
- Joseph Heitner,, "Automotive Mechanics", 2nd Ed., Affiliated Eastern Law house, 1967.
- Dolan. J.A., „Motor Vehicle Technology and Practical Work", ELBS, 1978
- Motor Vehicles, Newton & Steed
- Motor Manuals (Vol I to VII), A.W. Judge.
- Automobile Mechanics, W.H. Crouse. McGraw Hill publishing Co 2005

(ILOE) Computer Aided 3 D Geometric Modeling

Teaching Scheme:

Lectures : 3hrs / week

Examination Scheme:

T1 and T2: 20 Marks each

End Sem. Exam: 60 marks

Course Outcomes:

Student will be able to

1. think logically & understand the basic concepts of solid modeling
2. to apply knowledge of mathematics, science, and engineering while creating parametric geometric model
3. create 3D model using any professional software
4. create assembly model using any professional software
5. generate 2D part and assembly drawings with BOM details using any professional software
6. interface 3D part model with program to automate design process

Unit I : Geometric Modeling:

Introduction to CAD/CAM, 2D vs 3D Geometric model, Introduction to Wireframe, surface and solid modeling techniques. Geometry vs Topology, Requirements of Geometric Modeling, Geometric Modeling Methods: Constructive Solid Geometry (CSG), Boundary Representation (B-rep), Feature based Modeling, Direct (History less) Modeling, behavior modeling, 3D scan modeling. **[6hrs]**

Unit II : Parametric solid modeling:

Fundamentals, apply/modify constraints and dimensions, transform the parametric 2-D sketch into a 3D solid. Introduction to Graphical User Interface (GUI) of any commercially used solid modeling software. Create 3D model using Sketch features and Placed features. **[8hrs]**

Unit III : Advance Features:

3D modelling using Modifying and copying features. Use of datum features: Datum points, axis, curve, planes etc. Parametric equation of various curves. **[8hrs]**

Unit IV : Assembly modeling

Defining relationship between various parts of machine, creation of constraints, generation of exploded view. **[6hrs]**

Unit V : Production drawing

Generation of 2-D sketches from parts and assembly 3-D model, appropriate dimensioning and tolerancing. Introduction to design automation by interfacing CAD software to Higher level languages. **[8hrs]**

Text books:

- Ibrahim Zeid, Mastering CAD/CAM, McGraw-Hill
- Help manuals and tutorials of professional CAD software

References books:

- N. D. Bhatt and V.M. Panchal, Machine Drawing, Charoter Publications
- ASME Y14.5 – 2009

(ILOE) Device Materials

Teaching Scheme:

Lectures : 3 Hrs/week

Examination Scheme:

T1 and T2: 20 Marks each

End-Sem Exam: 60 Marks

Course Outcomes

Students will be able to

1. Select and design a conducting material for a given application.
2. Understand the difference between intrinsic and extrinsic semiconductors.
3. Distinguish between various types of magnetic materials and select them for proper applications.
4. Understand the difference between piezoelectricity, Ferroelectricity and pyroelectricity.
5. Select various electronic materials for optical applications.
6. Understand the material requirements for solar cells, oxygen sensors and auxiliary applications like fuses, soldering materials, contact materials etc.

Unit I: Functional basis for materials selection, Device design and production, Resistivity range, Free electron theory, Conduction by free electrons, Temperature and Impurity effects, Conductor and resistor materials, Superconductivity and Meissner effect, Type I and Type II superconductors and their applications. [07 Hrs]

Unit II: Energy gap in solids, Mechanism of electrical conduction in intrinsic and extrinsic semiconductors, Effect of temperature on electrical conductivity of intrinsic and extrinsic semiconductors, Effect of doping on carrier concentration in extrinsic semiconductor, Hall effect Semiconductor materials, Materials for circuits, MOS structures Memories and IC fabrication. [07 Hrs]

Unit III: Dielectric constant and polarizability, Polarization mechanism, Frequency and Temperature effects, Electrical breakdown, Ferroelectric materials, Piezoelectricity, Capacitor dielectric materials, Insulating materials and Pyroelectric materials [07 Hrs]

Unit IV: Classification of magnetic materials, Magnetic moments due to electric spin, Ferromagnetism, anti ferromagnetism and ferrimagnetism, Magnetic energy and domain structure, Hysteresis loop, Soft and Hard magnetic materials, Magnetic recording materials, Bubbles, Thin films and Tapes, Discs and Magneto optics, Diluted Magnetic Semiconductor, Multiferroic materials [07 Hrs]

Unit V: Light and electromagnetic spectrum, absorption in semiconductors, Photoconduction, Luminescence, Materials for Displays, Semiconductor Laser and Optical fibers, Electro optic ceramics, Fluorescent and phosphorescent materials **[07 Hrs]**

Unit Vi: Materials for solar cells, Materials for oxygen sensors, Conducting Polymers, Soldering materials, Fuse and Contact materials, Thermocouple materials, Thermoelectric materials. **[07 Hrs]**

Text Books:

- W. F. Smith - Foundation of Materials Science and Engineering, Mc Graw-Hill International, 5th Edition, 2009, New York.
- N. Braithwaite and G. Weaver - Materials in Action Series -Electronic Materials, Butterworths Publication, 2nd Edition, 1990, Oxford.
- S. O. Kasap - Principles of Electronic Materials and Devices, Tata McGraw-Hill Publication, 3rd Edition, 2006, New York.

Reference Books:

5. K. Schroder, Electronic Magnetic and Thermal properties of Solids, Marcel Dekker, 1st Edition, 1978, New York.
6. K.H.J. Buschow (Ed.), Handbook of Magnetic Materials, Elsevier 1st Edition, 1991, Amsterdam.
7. W. D. Kingery, H. K. Bowen and D. R. Uhlman, Introduction to ceramics –2nd Edition, John Wiley and Sons, 1976, New York.
8. R.C. Buchanan – Ceramic materials for Electronics, Marcel Dekker, 3rd Edition, 2004, New York.
9. A.J. Moulson and J.M. Herbert, Electroceramics: Materials, Properties and Applications, John Wiley and Sons, 2nd Edition, 2003, West Sussex.

PE(ILE)-15006 PRODUCTION PROCESSES AND METROLOGY

Faculty-- Prof. S.U.Ghunage

Teaching Scheme Examination Scheme

Lectures: 3 hrs/week

T1 and T2 -20 marks each, End-Sem Exam- 60.

Objective :

- To understand the various basic manufacturing processes and machine tools.
- To learn how to select a particular manufacturing process for the given component from the available conventional as well as non conventional machining processes.
- To understand the concept of principles of measurement, interchangeability, linear and angular and surface finish measurement.

Unit 1

Lathe and Drilling Machines

(07)

Principle, construction, operations, tools, accessories and special features of lathe machine, Capstan and Turret lathe, concept of speed, feed and depth of cut. Principle, construction, operations, tools and accessories of drilling, Reaming and boring machines.

Unit 2

a) Milling, Shaping and Planning

(07)

Principle, construction, operations, tools, accessories of milling, shaping and planning machines, dividing head– construction and working.

b) Grinding

Principle, construction, operations, tools for grinding machines, grinding wheel nomenclature.

Unit 3

a) Joining Processes

(07)

Introduction, weldability, classification of welding, study of Gas welding, Arc Welding, Resistance welding, Ultrasonic welding, Electron beam welding, Laser beam welding, Brazing, Soldering, Tungsten Inert Gas Welding, Metal Inert Gas Welding, Riveting – equipments and applications.

b) Non Conventional Machining Processes.

Introduction, Principle, set-up, operations, accessories, applications and limitations of Ultrasonic Machining, Electrical Discharge Machining, Laser Beam Machining, Chemical Machining, Electrochemical Machining, Abrasive Jet Machining, Water jet machining etc.

Unit 4

a) NC/CNC Machines: Principle, classification, construction and applications.

(07)

b) Robots: Principle, classification, construction, control systems and applications.

Unit 5 (07)

a) Sheet Metal Working

Sheet metal properties, gauge and surface condition, Study of process and equipment used, various cutting and forming operations.

Blanking and Punching: Theory, types of die used, force requirement, theory of shear and method of reduction of forces. Deep drawing: types of dies used, defects and lubricants used.

b) PCB Artwork and Surface Treatment

Etching, anodizing and electroplating etc., Classification, types and applications of adhesives.

Unit 6

(07)

Introduction to Metrology

- a) Definition, interchangeability, selective assembly, standards of measurement, errors, calibration of instruments. limits, fits and tolerances, Indian standards specifications for limit, fits and gauges, relevance of limits, fits and tolerances with machine design.
- b) Linear, Angular and Surface Finish Measurement
Linear measuring instruments, precision measuring instruments, comparators. Angular measurement- Combination protractor, universal bevel protractor, sine bar. Surface finish/texture measurement- methods and equipments of measurement.

Textbooks:

- Hajra Chaudhary S.K.- Elements of Workshop Technology, Vol. I& II, Media Prom & Pub, Mumbai.
- Rao P.N.: Manufacturing Technology, Vol I, II, Tata McGraw Hill.
- Chapman W.A.J.: Workshop Technology, Volume I, II, III; ELBS
- Hajara Chaudhary, Bose S.K.: Elements of workshop Technology; Volume I, II, Asia Publishing House.
- Jain R.K.: Engineering Metrology, Khanna Publisher, Delhi

References:

- HMT: Production Technology, TMH Publishing Co., New Delhi, 1985.
- Roy A. Lindberg: Processes and Materials of Manufacture, fourth Edition, Prentice Hall of India, New Delhi, 1990.
- Campbell J.S. : Principles of manufacturing Materials and Processes, McGraw-Hill, New York
- Begeman - "Manufacturing processes", Asia Publishing house Bombay.
- Degarmo, Black and Kohser: Materials and processes in Manufacturing – 8th Edition, Prentice Hall of India, New Delhi.
- I.C. Gupta: Metrology and Quality control., – 5th Edition, Dhanapat Rai Publications, New Delhi.

Outcomes:

- Students should have understood various basic manufacturing processes and machine tools.
- Students should learn how to select a particular manufacturing process for the given component from the available conventional as well as non conventional machining processes.
- Students should understand the concept of principles of measurement, interchangeability, linear and angular and surface finish measurement.

PE- OPERATIONS EFFICIENCY

Teaching Scheme

Lectures: 3 hrs/week

Examination Scheme

3- Presentations -25 marks each.

End-Sem Exam- 25.

Unit 1

What is Operations Efficiency?

(09hrs)

Operations Efficiency is an end to end system where in-house developed processes and tools are used to enhance the productivity of the organization.

Operations Efficiency aims at reducing the operational expenses. In other words, operations efficiency assists in increasing the operational profits, the biggest benefit for any organization.

Operations Efficiency aims at standardizing and implementing processes which brings in organizational discipline and rigor. In today's highly competitive business world, it separates the "Winners" from the "Also Rans".

Unit 2

What are the topics covered in this Course?

(14hrs)

1. "Explore" Phase
 - Problem Identification
 - Root Cause Analysis
 - Case Study from Food & Beverage Industry
2. "Define" Phase
 - Business Process Reengineering
 - Compare and Contrast; Cost-Benefit Analysis
 - Formalize the Solution
 - Case Study from Air Transportation Industry

Unit 3

What are the topics covered in this Course?

(11hrs)

3. "Implement" Phase
 - Process Planning and Standardization
 - Change Management
 - Phased Roll-out
 - Case Study from Apparel Retail Industry
4. "Sustenance" Phase
 - Process Management through ERP Tools
 - Continuous Process Improvement
 - Spot Audits and MIS monitoring
 - Case Study from Telecom Industry

Unit 4

What are the topics covered in this Course?

(11hrs)

5. "Benefits" Phase
 - On-going process benefits; systems integration
 - On-going financial benefits
 - On-going competitive benefits

Case Studies from various Industries
Successful Transfer of the Operations Efficiency Practices across Industries is also covered in this Course.

Text Books

There is no official reference book for this Course since it is primarily centered around professional situations.

The Instructor's professional experiences and analytical cases at industry leading organizations like UPS, Gap Inc., Starbucks Coffee Company, Madura Garments and Idea Cellular Limited will form the core material of the Course.

Reference Books

For additional information on this topic, students can check the below mentioned reference materials.

Good to Great	Jim Collins	Harper Collins Publishers, 2002
Built to Last	Jim Collins	Harper Collins Publishers, 2005
The McKinsey Way	Ethan M. Rasiel	Tata McGraw Hill, 2003
How Dell Does It	Steven Holzner	Tata McGraw Hill, 2006
The Wal-Mart Effect	Charles Fishman	Penguin Books, 2007
Harvard Business Review,	Various Authors	Monthly Editions, 2009