

B.Voc Mechanical Manufacturing –Senior India

SEMESTER – I

SUBJECT: Work Shop Technology

CODE: LBME-101

CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

Learning Outcomes

- Exposure to mechanical workshop layout and safety aspects.
- Understand the functions of various machines and cutting tools used in machine shop
- Practical real time job preparation using various operations related to machine shop such as filing, drilling, milling, turning, grinding, welding etc.
- Practice job preparation on welding shop.
- Learn to use different measuring tools like Vernier caliper, micrometer, height gauge etc.
- Practice job preparation in fitting shop

Unit	Topic	Key Learning
I	Introduction to Manufacturing and Metal cutting	<ul style="list-style-type: none"> • Definition of manufacturing process, its classification types, primary and secondary manufacturing processes • selection of a manufacturing process, types of production. Machine Tools; Definition, • its functions and classification, introduction to machining operations and common features of metal cutting • Definition and working principle of single point cutting tool, geometry of single point cutting tool, tool signature, orthogonal and oblique cutting • chips formation, types of chips, Cutting parameters-Cutting speed, feed and depth of cut.
II	Cutting Tool Materials and Introduction to welding processes	<ul style="list-style-type: none"> • Properties and uses of cutting tool material viz; High-speed steel, tungsten carbide, cobalt steel cemented carbides, ceramics and diamond • Introduction, Function and its types, Specification and selection of cutting fluid • Electric arc welding: working principle, use of AC and DC current in welding • TIG welding, MIG welding, Introduction to gas welding.
III	Lathe and Grinding machines	<p>Introduction, working principle, its construction and specifications.</p> <p><i>Lathe classification; Bench, Tool room, Capstan and Turret, Automatic and Special purpose lathes.</i></p> <ul style="list-style-type: none"> • <i>Lathe Operations:</i> Plain and step turning, Taper turning; taper calculations, methods of taper turning, parting off, drilling, boring, knurling

		<ul style="list-style-type: none"> • Screw cutting on lathe-introduction to right and left threads, lathe setting for screw cutting-simple and compound gear trains • Cutting parameters- Speed, feed and depth of cut, machining time. • <i>Lathe Accessories</i>: Centres; live and dead centre, Chucks; three jaw universal chuck, four jaw independent chuck, magnetic chuck, air or hydraulic chuck, Lathe carriers or dogs • Driving plate, Face plate, angle plate, mandrels, rests; steady and follower. • <i>Lathe Attachments</i>; Grinding attachment, Milling attachment, Taper turning attachment • Introduction- Abrasive tools, stones and sticks, grinding wheels– materials, specifications, selection of grinding wheels • Truing and dressing of grinding wheels, abrasives-natural and artificial, speed, feed and depth of cut, use of coolants • <i>Types of grinding machines</i>; cylindrical grinders, surface grinders, centreless grinders, special grinding machines
IV	Drilling, Reaming and Boring machines	<ul style="list-style-type: none"> • Introduction, tools for drilling, its classification, twist drills, twist drill parts and terminology, some important drill dimensions and important angles of drill, drill size and specifications, straight flute drills, • <i>Drilling machine types</i>; Portable, Bench, Radial, Universal, Multiple spindle, Gange, Horizontal and automatic drilling machines • <i>Drilling machine operation</i>; Drilling, Spot facing, Reaming, Boring, Counter boring, Counter Sinking, tap drill size • <i>Drilling machine operation</i>; Drilling, Spot facing, Reaming, Boring, Counter boring, Counter Sinking, tap drill size • Reaming Machine; Introduction, Reamer terminology, Types of reamers-hand reamers, machine reamers, adjustable and taper reamers • Boring Machines: Introduction, Horizontal boring machines, Vertical boring machines
V	Milling machines and Introduction to Jigs & Fixtures	<p>Introduction, working principle, principal parts, Size and specification, up milling and down milling,</p> <p><i>Milling machine types</i>: Column and Knee type-hand, plain or horizontal, vertical, universal, Universal milling machine, Planer type milling machine or plan mill.</p> <p><i>Milling cutters</i>: Plain, Side, End, Face, Metal slitting, Angle milling, Form milling, Woodruff-Key and T-slot milling cutters, Materials for milling cutters, cutting speed and feed.</p> <ul style="list-style-type: none"> • Milling operations; Plain or Slab, Face, Angle, Form, Straddle and Gang, Slot and Groove, Keyway, Side, End, Profile, Gear milling operations • Importance and use of jigs and fixtures, types of jigs, principle of location, locating and clamping devices, advantages of jigs and fixtures

Suggested Readings:

1. Comprehensive Workshop Technology (Manufacturing Processes), by S. K. Garg, Laxmi Publication
2. Elements of Workshop Technology, S. K. Hajra Choudhury, Hajra Choudhury A K

Reference Book:

1. Production Technology by R. K. Jain, Khanna Publishers

SUBJECT: Welding Technology

CODE: LBME-102

CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Objectives

- Able to perform different types of welding.

Learning Outcomes

- Students will be able to perform different types of welding.
- Able to know in details all the processes occurred in welding.

Unit	Topic	Key Learning
I	Laser welding and laser cutting	<ul style="list-style-type: none">• (introduction and awareness)
II	Pressure vessel welding	<ul style="list-style-type: none">• introduction and awareness
III	Awareness of Dissimilar metals	<ul style="list-style-type: none">• (cast iron to steel, stainless steel to aluminium, Aluminium to mild steel), details of electrodes to be used, any preheating required to be done, inert gases to be used for welding, pressure and flow rates, current and voltage setting and technology of welding.
IV	Spot welding	<ul style="list-style-type: none">• understanding the varieties of guns for welding for spot welding and their importance viz-a- viz the configuration of the job , size of spot, number of plates to be spot welded and their thickness, Setting of squeeze pressure, current, voltage, water temperature at the outlet and inlet, size of tips, nugget formation and its strength, penetration and method of checking, shape and size of tips and their metal, dressing of tips
V	Seam welding	<ul style="list-style-type: none">• Size of weld, configuration of welding, types of rollers, types of machines, setting of machines for voltage, current and squeeze pressure etc. fixturing for seam welding, Special Purpose machine for seam welding, Manual handling and orientation of components for seam welding. Quality checking of seam welding and rectification process, leakages and its testing and its rectification

Suggested Readings:

1. Workshop technology manufacturing process by S.K Garg
2. Manufacturing Technology by P.N Rao (Vol.1 & Vol.2)
3. Elements of workshop technology (Vol.1 & Vol2) by Raghuvanshi.

SUBJECT: Applied Mathematics**CODE: ZBSC-101****CATEGORY:** General Education Component

Credit	Hours	Marks		
		I	E	To
4	60	30	70	100

Objectives

- Acquire knowledge in matrix theory, a part of linear algebra, which has wider application in engineering problems.
- To make the student knowledgeable in the area of Permutation and combination, trigonometric functions and to solve engineering problems based on the above concepts.
 - To make the student knowledgeable with basic and applied mathematics for further application.

Learning Outcomes

- The graduates will become familiar with fundamentals of various Mathematical concepts.
- Students will be able to set up and solve linear systems/linear inequalities graphically/geometrically and algebraically
- Students will be able to formulate problems in the language of sets and perform set operations, and will be able apply the Fundamental Principle of Counting, Multiplication Principle.
- Solve equations and inequalities, both algebraically and graphically, and Solving and model applied problems.
- Acquire more knowledge in basic concepts of engineering mathematics.
- To improve problem evaluation technique.
- Choose an appropriate method to solve a practical problem.

Unit	Topic	Key Learning
I	Algebra:	<ul style="list-style-type: none"> • Set theory • Permutation and Combination • Binomial theorem (expansion without proof) • Types of functions – linear, quadratic, polynomial, exponential and logarithmic
II	Trigonometric functions:	<ul style="list-style-type: none"> • Review of ratio of some standard angles (0, 30, 45, 60, 90 degrees) • Addition, subtraction and product formulae • Multiple and submultiples angles (2A, 3A, A/2) • Height and distance
III	Determinants and matrix:	<ul style="list-style-type: none"> • Introduction to Determinant and matrices <ul style="list-style-type: none"> • Algebra of matrices (up to third order) • Inverse of matrix by Adjoint method (up to second order) • Solution of system of linear equations by Cramer's rule

IV	Differential calculus:	<ul style="list-style-type: none"> • Rules of differentiation – simple standard forms (involving one variable) • Derivatives of algebraic and trigonometric functions • Differentiation of function of a function <p>Chain rule</p>
V	Integral calculus:	<ul style="list-style-type: none"> • Integral of standard forms • Simple integration by substitution • Integration by parts and by fractions (for linear factor only) • Evaluation of definite integrals

Suggested Readings:

- NCERT- 11th and 12th Mathematics.
- Advanced Engineering Mathematics, E. Kresyzig, John Wiley and Sons. (latest edition).
- Higher Engineering Mathematics, B.S. Grewal, Khanna Publications
- Advanced Engineering Mathematics, R.A Jain and S.R.K Iyengar. Narosa Publications.
- Engineering Mathematics, N.P Bali, Laxmi Publications.

SUBJECT: Basics of Electrical & Electronics Engineering**CODE: ZBEE-105****CATEGORY:** General Education Component

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Objectives

- To provide knowledge of Electrical Circuits.
- To provide knowledge of Electrical Protective Equipment's.
- To provide knowledge of Semiconductor and Applications.

Learning Outcomes

- Able to understand the concept of Current, Voltage and Power.
- Able to understand the concept of Transformers and Motor.
- Able to understand the concept of Relay and Circuit Breaker.
- Able to understand the concept of Semiconductor diodes & Bipolar Junction Transistor.

Unit	Topic	Key Learning
I	D.C Circuits	<ul style="list-style-type: none"> • Definition of Voltage, Current, Power, Resistance, Inductance and Capacitance with their units, Ohm's law, Kirchhoff's Law, Series -Parallel Circuit, Conversion of Current and Voltage Source.
II	Three Phase A.C Circuits	<ul style="list-style-type: none"> • Generation of 3 phase E.M.F, Difference between three-phase and single-phase supply, Star connection, Delta Connection and its Conversion.
III	Electrical Machines	<ul style="list-style-type: none"> • Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Transformer, Induction Motor, Servo & Stepper motors.
IV	Protective Devices & Safety Precautions	<ul style="list-style-type: none"> • Introduction to PPE (Personal Protective Equipment) & Safety Precautions, Introduction of Relays, Contactors, MCBs, ELCBs, Fuses, Concept of Neutral and Earthing.
V	Semiconductor Devices & its Applications	<ul style="list-style-type: none"> • Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, symbols, identification of terminals of transistor, current flowing in a transistor, its characteristics and uses. Characteristics and applications of a thyristor.

Suggested Readings:**Text Books**

- Basic of Electrical and Electronics Engineering by S.k. Sahdev, Dhanpatrai Publications, 2013.
- Text Book of Electrical Technology by B.L Theraja, S.Chand Publications, 2014

Reference Books

- A Course in Electrical Technology by J.B Gupta, Katson Publications, 2013
- Electrical Technology by J.S Katre, Techmax Publications, 2016

SUBJECT: Applied Physics

CODE: ZBSC-103

CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Objectives

- The aim of this subject is to provide the students with the basic concepts of measurement, properties of fluid, laser and fibre optics, Nanoscience etc.

Learning Outcomes

- Able to explain different system of units used in measurement system.
- Able to explain different properties of fluid
- Able to explain simple and compound machines.
- Able to explain the properties of laser.
- Able to explain concept of photoconductivity

Unit	Topic	Key Learning
I	Mechanical Measurement	<ul style="list-style-type: none">• Basics of Measurements: Introduction, General measurement system, systems of units (FPS, CGS and SI units), Thermometry: Thermoelectric temperature measurement, Resistance thermometry.
II	Properties of Matter and Thermal Physics	<ul style="list-style-type: none">• Definition and types of stress and strain, Hooke's law, Fluid properties – density, Specific weight, Specific gravity, Surface tension, Viscosity, Pressure - atmospheric pressure, gauge pressure, absolute pressure, Pascal's law, buoyancy, Introduction to laminar and turbulent flow. Modes of heat transfer- thermal conductivity.
III	Simple Machines	<ul style="list-style-type: none">• Definition of simple and compound machine (examples), definition of load, effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, definition of an ideal machine, reversible and self-locking machines. Working principle and application of simple screw jack and worm & worm wheel.
IV	Lasers and Fibre Optics	<ul style="list-style-type: none">• Characteristics of Lasers, Spontaneous and stimulated emission of radiation, Ruby laser, Helium-Neon Laser, Applications of lasers. Principle of optical fibre, Acceptance angle and acceptance cone - Numerical aperture - Types of optical fibres and refractive index profiles, Application of optical fibres
V	Photoconductivity and Nanoscience	<ul style="list-style-type: none">• Photoconductivity & Photovoltaics: application of photoconductivity, photovoltaic cells, solar cell and its characteristics. Introduction to Nano materials - Basic principles of Nanoscience & Technology, applications of nanotechnology.

Suggested Readings:

- Applied Physics Vol. I, TTI Publication; Tata McGraw Hill, Delhi
- Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
- Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
- Numerical Problems in Physics-Volume I and II by RS Bharaj; Tata McGraw Hill

- Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
- Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar

Semester – II

SUBJECT: Fundamentals of CNC Machines
CODE: CBME-102
CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
2	30	30	70	100

Objectives

- To give overview of CNC Machine in terms of its working, parts , tools used, & holding devices

Learning Outcomes

- To be able to differentiate between conventional & CNC Machine in respect to working, components, operation.
- To have an understanding of setting up of tooling for CNC. One should have knowledge of types of cutting tools & tool material used.
- To have an understanding of tool & work holding devices used & locating principle.
- To know about tool changing mechanism, working, its type used in CNC.
- To have an understanding of components used in CNC, their function.

Unit	Topic	Key Learning
I	Introduction to CNC Machines	<ul style="list-style-type: none"> • Basic components of CNC machines, Comparison of conventional machine tools and CNC Machine tools, Advantages and Disadvantages of CNC machines • Application of CNC machines, difference between Conventional and CNC machines • Environmental control for CNC Machines.
II	NC Machine Tooling	<ul style="list-style-type: none"> • Introduction to cutting tools for CNC Machine on the basis of Setting up of cutting tools- pre-set tooling, qualified tools, on the basis of Cutting tool construction- solid tools, • brazed tools, inserted bit Tools, on the basis of cutting tool material- high carbon tools steels (HCS) • Cast alloys, Cemented carbides and others. Factors considered in selecting the tooling for CNC Machines.
III	Holding Devices	<ul style="list-style-type: none"> • Classification, Basic Principle of tool design, • types of tool holding devices-spindle tooling-flexible tooling, work locating and holding devices • basic principles of working holding and location, special devices used in CNC Machines
IV	Automatic Tool Changer (ATC) in CNC	<ul style="list-style-type: none"> • Introduction of ATC, Features of ATC, • Basic types of ATC, working of ATC • stages of tool change • cycle-tool selection- tool transfer
V	Components of CNC Machine	<ul style="list-style-type: none"> • Components of a CNC System,. Constructional details CNC Turning and Machining Centre, Slide ways and guide ways, Swarf removal • Feedback devices, speed control

		Safety devices. Programmable logic controllers and micro controllers.
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Suggested Readings:

1. CNC Machines by By B. S. Pabla, M. Adithan(First Edition), New Age International (P) Ltd.
2. CNC Machines and Automation Paperback – 2014, by Khushdeep Goyal, Katson Books
3. CNC Machines by Sandeep Bajaj, Ishan Publication

Reference Book:-

CNC Technology & Programming by Tilak Raj, DhanpatRai Publication

SUBJECT: Advance Welding Technology
CODE : BBME- 212
CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Objectives

- To impart knowledge of Advance welding processes, its types, its process, and types of defects.

Learning Outcomes

- Able to know the concept of advanced welding process.
- Able to know different types of defects occur in different types of welding.

Unit	Topic	Key Learning
I	Projection welding	<ul style="list-style-type: none"> • Types of welds, types of machines, setting of machines, voltage, current and squeeze pressure, inspection methods, types of defects and its rectification procedure
II	Friction Welding	<ul style="list-style-type: none"> • Types of metal, types of components, type of machines, setting of machines and process of welding, types of defects and its correction, inspection methods
III	Thermite Welding:	<ul style="list-style-type: none"> • Concept of welding, its process, types of machines, setting of machines and process of welding, types of defects and its correction, inspection methods.
IV	Submerge arc Welding	<ul style="list-style-type: none"> • Concept of welding, its process , types of machines, setting of machines and process of welding, types of defects and its correction, inspection methods

Suggested Readings:

- Welding and welding Technology by RICHARD L Little.
- Welding engineering and technology by R.S Parmar.
- Robotic Welding (International Trends in Manufacturing Technology) by Lane J.D

SUBJECT: Fundamental of Computers

CODE: ZBCE-101

CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
3	45	15	35	50

Objectives

The syllabus introduces students to basic information and communication technology and proper paradigms that need to be implemented to develop any kind of computer applications. The course will help in developing the basic technical skills by hands on experience.

Learning Outcomes

- Students will be able to use the computer for basic purposes of preparing personnel/business letters, viewing information on Internet, sending mails, using internet banking services etc.
- Understand basic computer operations and ICT applications.
- Understand Network troubleshooting.
- Undertake data entry services

Unit	Topic	Key Learning
I	Introduction to Computer System:	<ul style="list-style-type: none">• What is Computer, Basic Applications of Computer; Block Diagram of Computer System• Input / Output Devices, Computer Memory, Concepts of Hardware and Software, Data and Information; Applications of IECT• Computer Virus: Definition, Types of viruses, Characteristics of viruses, Anti-virus software.• Introduction to number system.
II	Operating System:	<ul style="list-style-type: none">• Overview of operating system: Definition, Functions of operating system, Need and its services, Types of operating system, Batch Processing, Spooling, Multiprocessing, Multiprogramming, Time-Sharing, On-Line Processing, Real-Time Processing Basics of window operating system, Comparison between DOS and windows, Switching between DOS and windows, Comparison between Unix and Windows.
III	Understanding Office Applications:	<ul style="list-style-type: none">• Introduction to MS Word, Introduction to MS Excel and its applications, Introduction to MS PowerPoint, Menus, Shortcuts, Document types, Formatting documents, spread sheet and presentations, Working with Spreadsheets, Different templates, Macros, Mail merge.
IV	Networking	<ul style="list-style-type: none">• Network Technologies, Introduction to Internet and protocols: TCP/ IP, Network connecting devices, Topologies, HTTP, HTTPS DNS, Hub, Switches, Router, Repeater, Firewalls, Digital Signature.
V	Introduction to World Wide Web:	<ul style="list-style-type: none">• WWW and Web Browsers Introduction, Objectives, Concept of internet, Overview of search engines, popular search engines in use, Surfing the web and websites, Hosting your

		websites, Planning and Developing the websites, Internet service provider.
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Suggested Readings:

Text Books

- Computers and Beginners by Jain, V.K.;
- Computer Fundamentals by Anita Goel, Pearson.

Reference Books

- Introduction to Information Technology, Leon Tech World by Leon and Leon
- Foundations of Computing, BPB Publication by Sinha, Kr. Pradeep and Preeti Sinha;
- Word Processing and Typing by Sharon Spencer, Heinemann.
- MS Office by S.S. Srivastava, Firewall Media.
- Microsoft Office 2010 by Bittu Kumar, V & S Publications
- Data Communication and Networking by Behrouz.A. Forouzan, McGraw Hill
- **Web Link**<http://cec.nic.in/E-Content/Pages/default.aspx>

SUBJECT: Communication Skills and soft skills

CODE: ZBSE-101

CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
3	45	15	35	50

Objectives

- To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach and an ability to understand engineer's social responsibilities.
- To inculcate in students written communication skills.

Learning Outcomes

- The syllabus introduces students to have basic skill set of channelizing information, self-development, decision making and interpersonal skills.

Unit	Topic	Key Learning
I	Communication:	<ul style="list-style-type: none">• Meaning of Communication, Importance of Communication, Types of communication. Process of communication, Communication network in an organization, Barriers to communication, Essentials of good communication.
II	Remedial English Grammar:	<ul style="list-style-type: none">• Articles, agreement between verb and subject, uses of tenses, Modal and their uses, Prepositions.• Understanding and applying Vocabulary: One word substitutes, Synonyms and Antonyms• Word formation:-Prefixes, Bases and Suffixes.
III	Listening Skills:	<ul style="list-style-type: none">• The process of listening, Types of listening, Benefits of effective listening, Barriers to listening, listening to announcements at work place.
IV	Reading Skills:	<ul style="list-style-type: none">• Process and methodologies of reading, Skimming and scanning, Levels of reading, Proofreading, Summarizing, Precise writing, Unseen comprehension passage, Note taking and reviewing, convert the given information into charts and graphs.
V	Writing Skills:	<ul style="list-style-type: none">• Main Forms of Written Communication: Notices, Drafting an E-mail. Correspondence: Personal and Official, Notices, Technical Report Writing, Preparing agenda and minutes of meetings

Suggested Readings:

- Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
- Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
- Prasad, P. Communication Skills, S.K. Kataria & Sons.
- Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.

- Roach Peter. English Phonetics and Phonology.
- A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.
- Prasad, P. The Functional Aspects of Communication Skills, Delhi.
- McCarthy, Michael. English Vocabulary in Use, Cambridge University Press.
- Rajinder Pal and PremLata. English Grammar and Composition, Sultan Chand Publication.
- Idioms & Phrases (English-Hindi), Arihant Publication (India) Pvt. Ltd.

One Word Substitution, Dr. Ashok Kumar Singh, Arihant Publications (India) Pvt, Ltd.

SUBJECT: Fundamental of Industrial Management

CODE: ZBME-101

CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
3	45	15	35	50

Objectives

- Understanding the knowledge of Quality Control, inspection and quality assurance management used in the organization.
- Develop the skill for using tool and techniques for quality in Industry
- Apply elementary knowledge of quality concepts for quality assurance.

Learning Outcomes

- Students will be able to understand the daily management system related to Quality in the shop floor.
- Students will be able to understand all the required processes, ensuring implementation of the same and providing basic inputs for its improvement. Student will be able to ensure that the final products manufactured by is as per the quality norms set by the organization.
- Student will able to solve different type of problems in their manufacturing processes.
- Ensure implementation of 5S activities at the shop floor/ office area. Students will be able to analyse the root cause problems in the product & process by using different problem solving techniques
- Students will able to apply 5S and safety in their work place.

Unit	Topic	Key Learning
I	Concept of Quality:	<ul style="list-style-type: none"> • Quality: Definition, History, Importance • Approaches to define Quality, Cost of Quality, Hierarchy of Quality Management • Introduction to Quality Control.
II	Organizational Aspects of Quality Assurance:	<ul style="list-style-type: none"> • Quality Assurance (QA): Introduction, Definition, Management principles in QA, QA in different stages, QualityPlanning. • ISO: Introduction, ISO 9000 series of standard, Benefits ofISO. • ISO 9001, Benefits of ISO 9001. • Quality survey: Scope, Types of audit, inspection methods, Quality budget, Vendor Quality Rating
III	Problem solving tools and techniques:	<ul style="list-style-type: none"> • Definition of a problem • Type of problems, classification of problems • What is problem solving, barriers to problem solving • Problem solving tools: Cause and effect diagram, Histogram, flow charts, Check sheets, Histogram, Brain-storming, Pareto charts, Control charts, Scatter Diagram 3.5 Problem solving techniques: Brain storming, Flow diagram, PDCA Cycle etc
IV	Total Quality Management:	<ul style="list-style-type: none"> • Basic concept of TQM, features of TQM • principles of TQM • leadership concepts

		<ul style="list-style-type: none"> • Quality statements • Barriers to TQM implementation • Concept of TPM • Quality allied concept: KAIZEN, Poke yoke, JIT, KAPA
V	5 S and Safety:	<ul style="list-style-type: none"> • Detailed concept of 5S and safety used in Industries • Integrated Management system

Suggested Readings:

1. Total quality Management by L.Sganthi&Anand A. Samuel, PHI Publication.
2. Total quality Management by Poornima M Charantimath, Pearson Publication.

SEMESTER- III

SUBJECT: Automobile Engineering
CODE: CBME-201
CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
3	45	15	35	50

Objectives

- To provides basic knowledge about the automobile body, power unit, transmission system, braking system etc.
- It also provides general tools and technique of maintenance and servicing of the automobile as per the requirement.
- Introduction to electrical and other auxiliary component and their maintenance.

Overall objective of this course is to impart skills to students to covers the current expectation and requirements of automotive manufacturing industry.

Learning Outcomes

- Understand the construction, function and working of individual component of a vehicle and the system in which they function.
- Understand the need of maintenance service to prevent or remove the defects that may come up in running life of a vehicle.
- To perform and understand the assembly, dismantling and servicing tools, technique of a vehicle.

Unit	Topic	Key Learning
I	Introduction to Automobile	<ul style="list-style-type: none"> • Introduction to automobiles, their utility and classification. Main components of an automobile, functions and working principle. Various mechanisms and systems in an automobile, Scheduled and preventive maintenance. Servicing of a vehicle, electrical system: lights, fuses, computer and alternator, battery etc, wiring harness etc.
II	Engine System	<ul style="list-style-type: none"> • Automobile engine, its main components, construction and working. Types of engines – two stroke/ four stroke cycle, petrol / diesel fuel, Engine specifications. Basics of Engine cooling system and lubrication system. Introduction to Concept of Knock & detonation. Concept of carburettor, exhaust and emission system (Bharat IV and Bharat VI).
III	Transmission & Braking System	<ul style="list-style-type: none"> • Transmission System: Working of single and multi-plate clutches. Testing and adjustment of clutch unit. Construction, function and working of a gearbox. Manual shifting and automatic transmission. Troubles in gear box and rectifications. Function and principles of braking system, classification of various brakes, working of mechanical, hydraulic, pneumatic,

		air-assisted hydraulic brake, disc brakes, parking brake, ABS System.
IV	Advancement in Automobile	<ul style="list-style-type: none"> • Methods employed for increasing the efficiency of present automobiles- Supercharging and Turbocharging, regenerative braking etc. Innovation and new trends in automobiles- Electric vehicles, Hybrid Vehicles, environment friendly vehicles and other advancements.
V	Ignition & Injection System	<ul style="list-style-type: none"> • Types of ignition system, Auto Electronics and electrical, transistorized coil ignition system (TCI), capacitive discharge ignition system (CDI). Ignition system testing, Spark plug testing, ignition timing and setting. Introduction to Injection system in engine.

Suggested Readings:

Text Books:

- 1. Automobile engineering Vol.1 & Vol.2 by Dr. Kripal Singh
- 2. Automobile Engineering by S.K Gupta
- 3. Automobile Engineering by K.K Jain and R.B Asthana

SUBJECT: Programming in CNC Machines

CODE: CBME-203

CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Objectives

Learning Outcomes

- To understand & use Basic codes used in programming.
- Able to write Part programming using different techniques such as Manual & CAPP
- To be able to write part programme for different operations.
- To write programme for repetitive operations.
- To use APT for part programming

Unit	Topic	Key Learning
I	Introduction to Part Programming	<ul style="list-style-type: none"> • Part Programming, definition and need, Basis concepts of part programming • basic terms-Bit, Byte, Character • NC Work, Block • G and M Codes
II	Techniques of Part Programming	<ul style="list-style-type: none"> • Type of part programming- Manual Part Programming • Computer Aided Part Programming • Procedure for Manual Part Programming
III	Part Programming for different operations	<ul style="list-style-type: none"> • Methods of writing a part program, axis identification, part zero, floating zero and machine zero, part programming (point to point machining), • Part Programming of drilling machine (point to point), Part Programming for machining along straight line and curved surface • part program for lathe operation, part programming for milling machine operations
IV	Advanced Part Programming	<ul style="list-style-type: none"> • Introduction, Standardized Fixed cycles (Canned Cycles)- Drill Cycle, Dwell Cycle, Basic Mill Cycle • Peck Drill Cycle, Bore Cycle, Tap Cycle • Do- Loops, Sub routines, Parametric Subroutines, Sub routine Nesting
V	Automatically Programmed Tools	<ul style="list-style-type: none"> • Introduction, Computer aided Part Programming, Programming language: APT, Adapt, Auto Map, Exapt, and Prompt. APT Programming sequence • part geometric definition in APT-> Defining a point, defining a line, defining a circle, defining a plane. Miscellaneous/Auxiliary statements-> Spindle speed • feed rate, tool change. Tool definition and others

		<ul style="list-style-type: none">• Manual data input. On line editing of programme
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Suggested Readings:

1. T. K. Kundra, P. N. Rao and N. K. Tiwari, “Numerical Control and Computer Aided Manufacturing”, TMH
2. P. Radhakrishnan, “Computer Numerical Control Machine & Computer Aided Manufacturing”, New, Academic Science Limited

Reference: -

Tilak Raj, “CNC Technology & Programming”, DhanpatRai publishing Company (P) ltd, N Delhi

SUBJECT: Introduction to Press Tools, Dies & Moulds

CODE: CBME-205

CATEGORY: General Education Component

Objectives

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Learning Outcomes

- To learn about basic principles and applications of press tools
- To understand various parameter of press tool
- To learn about the **Press tool cutting operations**
- To learn about **Press tool non- cutting operations**
- To learn about the Designing of mould and die

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Unit	Topic	Key Learning
I	Press tools	<ul style="list-style-type: none">• Introduction• application of press tools• Classification of press tools.
II	Press Tool Construction	<ul style="list-style-type: none">• Various elements of general press tool- shank, top plate• punch holder, punch, die plate• guide pillar, guide bush, bottom plate, and stripper plate
III	Press tool cutting operations:	<ul style="list-style-type: none">• Blanking, piercing, cut off• trimming, shaving, Progressive tool• combined tool , combination tool
IV	Press tool non-cutting operations	<ul style="list-style-type: none">• forming, bending,• curling• coining• embossing
V	Introduction to Dies & Moulds	<ul style="list-style-type: none">• Die classification & types• their uses in press tools• Moulds- function• application

Suggested Readings:

Text Books:

1. P.H. Joshi, "Press Tool Design and Construction", Wheeler Publishing, Delhi, 2000
2. Die, Mould and Jigs by V. VladimiRov, MIR. Publisher.

Reference

A Textbook of Manufacturing Technology: Manufacturing Processes, by R. K. Rajput, Laxmi Publication

SUBJECT: EVS & Industrial Ethics
CODE: ZBGE-201
CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
2	30	30	70	100

Objectives

- To create awareness between the students about our ecosystem, related problems and our role in that.
- To encourage students to solve the environment related problems
- To develop moral responsibility and mould them as best professionals..
- To create an ethical vision and achieve harmony in life

Learning Outcomes

- Able to think on ecosystem and environment problems; make other people aware about environment problems.
- Able to understand the importance of ethics and values in life and society.

Unit	Topic	Key Learning
I	Multidisciplinary Nature of Environmental Studies	<ul style="list-style-type: none">• Definition• Scope and importance• Need for public awareness• Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems• Forest resources• Water resources• Mineral resources• Food resources• Energy resources• Land resources: Land as a resource• Land degradation, man induced landslides• Soil erosion and desertification• Role of an individual in conservation of natural resources• Equitable use of resources for sustainable lifestyles.
II	Ecosystems	<ul style="list-style-type: none">• Structure and function of ecosystem• Energy flow in an ecosystem: food chains• Food webs and ecological succession• Forest ecosystem• Grassland ecosystem• Desert ecosystem• Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
III	Environmental pollution	<ul style="list-style-type: none">• Types• causes

		<ul style="list-style-type: none"> • effects and controls • Air • Water • Soil and noise pollution • Nuclear hazards and human health risks • Case Studies: Bhopal Tragedy • Cherbonyl disaster etc. • Swach Bharat Abhiyan • Solid waste management- Causes • effects and control measures of urban and industrial wastes.
IV	Self-Exploration	<ul style="list-style-type: none"> • What is it? - its content and process • Ethics and Business Ethics • Concepts Values and Ethics • Human Values-Classification of Values • Understanding Harmony in the Human Being • Ethical Corporate Behaviour • Its Development • Ethical Leadership • Social • Responsibility of Business and Corporate Governance • Profession and Professionalism • Professional Ethics • Intellectual property rights.
V	Ethic in Functional Areas	<ul style="list-style-type: none"> • Marketing • Finance • Human Resource and Information Technology • Gender Discrimination • Sexual Harassment at work place • Globalization and MNCs • Environmental Ethics • Computer Ethics • Cyber Crimes • Truthfulness • Constructivity • Sacrifice • Sincerity • Self Control • Altruism • Tolerance • Scientific Vision.

Suggested Readings:

- Govindharajan, M., Natarajan, S. and Senthil Kumar, V.S., Engineering Ethics, Prentice Hall of India, (PHI) Delhi, 2004.
- Subramainam, R., Professional Ethics, Oxford University Press, New Delhi, 2013.
- Business Ethics & Corporate Governance, Utkal University
- E- book: <https://ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
- Industrial Safety and Health management” Pearson Prentice Hall,2003 by C.Ray Asfahl

- National Safety Council, “Accident Prevention Manual for Industrial Operations”, N. S. C. Chicago, 1988.

SUBJECT: Metrology

CODE: CBME-207

CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
3	45	15	35	50

Objectives

Learning Outcomes

- To learn about metrology
- To learn about the linear and angular measurement
- To learn about the Limits fits and tolerances
- To learn about the surface roughness parameters
- To learn about the Screw thread metrology.

Unit	Topic	Key Learning
I	Introduction to metrology	<ul style="list-style-type: none"> • Definition, types, need of inspection, terminologies, • methods of measurement, selection of instruments • measurement errors, units • Measurement standards, calibration.
II	Linear and Angular metrology	<ul style="list-style-type: none"> • Steel rule, callipers, verniercaliper, • Vernier height gauge • Vernier depth gauge, micro meters • universal calliper.
III	Limits fits and tolerances	<ul style="list-style-type: none"> • Interchange ability, selective assembly, limits, fit and tolerances • limit gauging, Measurement of straightness, flatness • squareness, parallelism, roundness • cylindricity, non-contact profiling systems
IV	Measurement of surface finish	<ul style="list-style-type: none"> • Introduction, terminology, specifying roughness on drawings • surface roughness parameters, factors affecting surface roughness • ideal surface roughness, roughness measurement methods, precautions in measurement • surface microscopy
V	Screw thread metrology	<ul style="list-style-type: none"> • Introduction • screw thread terminology • screw thread measurement

Suggested Readings:

Text Books:

- R.K. Jain, “Engineering Metrology”, Khanna Publishers, Delhi
- I.C. Gupta, “Engineering Metrology”, DhanpatRai Publications, Delhi

Reference: - Anand K Bewoor, Vinay A Kulkarni “Metrology and Measurement”, TMH

SEMESTER – IV

SUBJECT: CAD-1

CODE: CBME-204

CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
1	15	15	35	50

Objectives

- This course introduces students to CAD in general and students will learn theory and practice related to tools & commands used in CAD models for designing.

Learning Outcomes

- Design a part or assembly of parts using Computer-Aided Design software.
- Use parametric modelling techniques to reflect engineering requirements.
- Apply top-down design principles to model a design.
- Use motion and interference checking to ensure that parts will not interfere throughout their complete range of motion.
- Use CAD software collaboratively when designing on a team.

Unit	Topic	Key Learning
I	Introduction	<ul style="list-style-type: none">• Graphics Displays, Refresh display, DVST, Raster display• lookup table, estimation of graphical memory• Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System.
II	Transformation	<ul style="list-style-type: none">• Output primitives (points, lines, curves, etc.)• 2D Transformation (Translation, Scaling & rotation)• 3D Transformation (Translation, Scaling & rotation)
III	Curves	<ul style="list-style-type: none">• Introduction, Analytic curves-line• circle, ellipse, parabola, hyperbola• Synthetic curves: Hermite cubic spline• bezier curve, B- spline curve
IV	Surface Modelling	<ul style="list-style-type: none">• Introduction, Surface representation• Analytic surface,• synthetic surfaces- hermite bi cubic surface• bezier surface, b- spline surface
V	Solid Modelling	<ul style="list-style-type: none">• Introduction, Geometry & topology• solid representation, boundary representation• sweep representation

Suggested Readings:

Text Books:-

- Computer Aided Design by Sadhu Singh, S.K Kataria& Sons
- Mastering Cad/Cam, by IbrahimZeid, TMH, 2007

Reference:-

- Computer Aided Engineering Design, by AnupamSaxena, BirendraSahay, Springer

SUBJECT: Consumer Affair

CODE: ZBGE-302

CATEGORY: General Education Component

Credit	Hours	Marks		
2	30	I	E	To
		30	70	100

Objectives.

- This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.
- The student should be able to comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.

Learning Outcomes

- Able to understand the conceptual framework of consumer affair
- Able to explain the consumer protection law in India
- Able to explain the Grievance Redressal Mechanism under the Indian Consumer Protection Law
- Able to explain the Role of Industry Regulators in Consumer Protection
- Able to explain the Contemporary Issues in Consumer Affairs

Unit	Topic	Key Learning
I	Conceptual Framework	<ul style="list-style-type: none"> • Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labelling and packaging along with relevant laws, Legal Metrology. • Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite.
II	The Consumer Protection Law in India	<ul style="list-style-type: none"> • Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice and restrictive trade practice. • Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

III	Grievance Redressal Mechanism under the Indian Consumer Protection Law	<ul style="list-style-type: none"> • Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. • Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.
IV	Role of Industry Regulators in Consumer Protection	<ul style="list-style-type: none"> • Banking: RBI and Banking Ombudsman • Insurance: IRDA and Insurance Ombudsman • Telecommunication: TRAI • Food Products: FSSAI • Electricity Supply: Electricity Regulatory Commission • Real Estate Regulatory Authority
V	Contemporary Issues in Consumer Affairs	<ul style="list-style-type: none"> • Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings. • Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified.

Suggested Readings:

- Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. Consumer Affairs” (2007) Delhi University Publication; pp. 334/
- Aggarwal, V. K. (2003). Consumer Protection: Law and Practice. 5th Ed. Bharat Law House, Delhi, or latest edition.
- Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
- Nader, Ralph (1973). The Consumer and Corporate Accountability. USA, Harcourt Brace Jovanovich, Inc.
- Sharma, Deepa (2011). Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry (LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany; pp.263 pp.
- Empowering Consumers e-book, www.consumeraffairs.nic.in
- EBook www.bis.org
- The Consumer Protection Act, 1986

SUBJECT: Internal Combustion Engines**CODE:****CATEGORY:** General Education Component**Objectives**

- Fundamentals of how the design and operation of internal combustion engines affect their performance, operation, fuel requirements, and environmental impact.
- Overall objective of this course is to impart skills to students to covers the current action and requirements of automotive manufacturing industry.

Learning Outcomes

- Understand the construction, function and working of individual component of the IC engine and the system in which it functions.
- Understand and analyses various parameters and the performance measurement criteria of the engine.

Credit	Hours	Marks		
		I	E	To
4	60	15	35	50

Unit	Topic	Key Learning
I	Introduction	<ul style="list-style-type: none"> • Basic components and terminology of IC engines, working of four stroke/two stroke - petrol/diesel engine, classification and application of IC engines, engine performance and emission parameters, numerical.
II	Working cycles of IC engines:	<ul style="list-style-type: none"> • Study of Otto, Diesel and Dual cycle, comparison of air standard and fuel air cycles, effect of operating variables, comparison of air standard and actual cycles, effect of time loss, heat loss and exhaust loss in Petrol and Diesel engines, valve and port timing diagrams.
III	Fuels and its supply system for SI and CI engine	<ul style="list-style-type: none"> • Important qualities of IC engine fuels, rating of fuels, Carburation, mixture requirement for different loads and speeds, simple carburettor and its working, types of carburettors, MPFI, types of injection systems in CI engine, fuel pumps and injectors, types of nozzles, spray formation
IV	Combustion in SI and CI Engines	<ul style="list-style-type: none"> • Combustion equations, stoichiometric air fuel ratio, enthalpy of formation, adiabatic flame temperature, determination of calorific values of fuels – calorimeter- Bomb and Junkers gas calorimeter, Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for SI engines, Stages of combustion in CI engines, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine
V	Measurement and Testing of IC engines	<ul style="list-style-type: none"> • Measurement of indicated power, brake power, fuel consumption and emission, Measurement of friction power by Willan's Line Method and Morse Test, calculation of brake thermal efficiency, brake power and brake specific fuel consumption of IC Engines, variable compression ratio engines, heat balance sheet of IC Engines • Engine Emission and their control: Air pollution due to IC engines, Euro I to VI norms, HC, CO and NOx emission, catalytic convertor

Suggested Readings:

1. Internal combustion Engines by V.Ganeshan, MC Graw Hill.
2. Internal combustion Engines by R.K Rajput.

SEMESTER-V

SUBJECT: Hydraulics and Pneumatics
CODE: CBME- 301
CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
3	45	15	35	50

Objectives

- To introduce the industrial hydraulics and pneumatics, their parts, functions and their structure. To give the required information about hydraulics and pneumatics and to teach the fundamentals of hydraulic and pneumatic circuit design. To teach the hydraulic and pneumatic automation and basics of PLC controls.

Learning Outcomes

- Working principle of various components used for hydraulic & pneumatic systems.
- Identify various components of hydraulic Pumps systems, Hydraulic Actuators and Valve.
- Ability to design hydraulic system for industrial applications.
- Design of hydraulic and pneumatic circuits
- The students who attend to this course; Can explain the similarities and differences of the electrical, pneumatic and hydraulic systems, can decide which system is better for a specific application, can explain the basic parts of the industrial hydraulic and pneumatic systems and their functions, can design a hydraulic or pneumatic system circuit by using related software and make simulations, can design a hydraulic or pneumatic system and outline PLC control algorithm for a predefined automation proce.
-

Unit	Topic	Key Learning
I	Introduction	<ul style="list-style-type: none"> • Need, scope and importance of hydraulic and pneumatic, Hydrostatic and hydrodynamic definitions, properties of fluid, Pascal’s law, Continuity equation and Bernoulli’s equation. Advantages and limitations of hydraulic and pneumatic systems.
II	Hydraulic Pump, Actuators, Control Valves And Pipes	<ul style="list-style-type: none"> • Hydraulic Pump- Type, construction, working applications and selection criteria. Power packs Other Elements such as filters, manifold, receivers, coolers and connectors. • Hydraulic Actuators- Type, working and applications. • Control Valves- Type, designation, symbols, working and applications, • Hydraulic Pipes- Type, materials, designations, pressure ratings and selection criteria. Piping Layout, Concept, rules/norms.
III	Fundamentals of Pneumatics	<ul style="list-style-type: none"> • Compressible fluid flow, mass flow rate, compressible fluid- Type, properties and applications

IV	Pneumatic Element	<ul style="list-style-type: none"> • Pipes- Type, designations, applications and properties. • Air Compressor- Type (Reciprocating and rotary), working and selection • Pneumatic Cylinders- Type, symbol, cushion, assemblies, mounting and, • Pneumatic Valves- Type, symbols, working, applications and selection • Air Motors- Type, working and applications. Installation. <p>Other Elements - Air receivers, filters, pressure regulator, lubricator.</p>
V	Hydraulic and Pneumatic Circuits	<ul style="list-style-type: none"> • Concept, Meaning and ISO symbols, Basic hydraulic and pneumatic Rules/ Norms for designing hydraulic and pneumatic circuits, circuits- Type, circuit diagrams and PLC control.

Suggested Readings:

- Fluid Mechanics & hydraulic machines, R.K Rajput, S.Chand Limited.
- A Text Book of Fluid Mechanics and Hydraulic Machines by R.K Bansal.

SUBJECT: Dies & moulds
CODE: CBME-305
CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
1	15	15	35	50

Objectives

Learning Outcomes

- Apply contemporary design principles when designing advanced moulds and dies
- Assess the performance of a given tool design based on the design criteria
- Evaluate the effects of a given tool design on the quality of the work
- To understand heat treatment in die and punch
- To learn about the difference feeding system

Unit	Topic	Key Learning
I	Introduction to Molding Process	<ul style="list-style-type: none"> • Injection molding, blow/rotational molding, compression/transfer molding • Extrusion, thermoforming • examples for the above machines used.
II	Material for Mould	<ul style="list-style-type: none"> • Parts Materials used for various mould parts • their treatment like hardening • tempering electroplating
III	Types of die	<ul style="list-style-type: none"> • Simple die, inverted dies, compound die, combination die, progressive die • Constructions of progressive tool, Types, sketch, • working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole
IV	PUNCH AND DIE	<ul style="list-style-type: none"> • Materials for punch and die, Heat treatment of punch and die • Methods of manufacturing punch and die • Fastening of die block, Method of Holding
V	Feeding system	<ul style="list-style-type: none"> • purpose, types, advantages, Attachments for presses • Power source • Introduction to surface roughness-instruments and its measuring principle In dies

Suggested Readings:

1. Forging die design and practice by R. Sharam, S.N. Parsad, N.P. Saxena; S. Chand and Company
2. Die, Mould and Jigs by V. VladimiRov, MIR. Publisher.

REFERENCE BOOKS:-

1. Injection Moulding by A.S. Athalye, Multitech Publishers Co. Mumbai.
2. Plastics Mould Engineering Handbook by J. Harry Du Bois and Wayne Pribble

SUBJECT: Quality Control and Reliability

Engineering

CODE: BBME- 206

CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- The objective is to develop methods and tools to evaluate and demonstrate reliability, maintainability, availability, and safety of components, equipment and systems.

Learning Outcomes

- Students will be able to know the concept of Statistical process control.
- Able to know the concept of Acceptance sampling
- Able to know concept of Reliability engineering.

Unit	Topic	Key Learning
I	Quality Concepts	• Quality-Factors influencing quality, quality costs, economics of quality, quality assurance statistical tools used in quality in SQC, Quality planning, Organization for quality. Bureau of Indian standards, ISO 9000-quality circles KAIZEN-TQM concepts-Quality audit.
II	Statistical Process Control	• Variation in processes, Factors, Process capability, Analysis of process capability, control charts, variables, Attributes, Establishing and interpreting control charts, X,R, chart for variables, defects, P chart, C-chart and U chart-Con-troll charts for defective quality rating
III	Acceptance Sampling	• Lot-by-lot sampling, types probability of acceptance in single double, multiple sampling techniques-O.C. curves procedure's Risk and consumers Risk AQL, LTPD, AOQL concepts-standard sampling plans for AQL AND LTPD- uses of standard sampling plans
IV	Life Testing-Reliability-Systems Approach:	• Life testing- objectives- classification- failure characteristics-failure data analysis- mean time to failure-maintainability and availability- reliability- system reliability- series and parallel systems-systems reliability in terms of probability of failure -MTBF-Acceptance sampling based on reliability test OC curves.
V	Quality and Reliability	• Reliability improvement-techniques, use of pareto analysis - Design for reliability, Redundancy, standby redundancy, failsafe systems-optimization in reliability, product design, product analysis, product development product cycle

Suggested Readings:

References:

- Betster field D.H. Quality Control-Prentice Hall Pub (1993) (Revised Edn.)
- Sharma S.C. Inspection Quality Control and Reliability –Khanna Publishers New Delhi (1998)

- John Bank, The Essence of Total Quality Management, Prentice Hall of India P Ltd New Delhi 1995.
- Danny Samson, Manufacturing & Operations strategy. Prentice Hall New York (1991)
- Ganapathy K. Subramaniam B. Narayana V-Quality Circle concepts and implementation – QCFI. Secendrabad 919940.
- Tapan P. Bagchi ISO9000. Concepts methods and implementation – Wheeler Publisher Allahbad (1994) Automobile Engineering Syllabus 17
- Conner P.D.T.O. Practical Reliability Engineering John Wiley (1993) 8. Green A.E. and Bourne A.J. Reliability, Technology, Wiley Interscience 1991.

SUBJECT: Entrepreneurship

CODE: ZBGE-313

CATEGORY: General Education Component

Credit	Hours	Marks		
		I	E	To
3	45	30	70	100

Objectives

- Enable the students to develop the insight needed to discover and create entrepreneurial opportunities.
- Successfully start and manage their own businesses to take the advantage of these opportunities.

Learning Outcomes

- The course will create awareness among the students about the entrepreneurship and factors that will help in facilitating the entrepreneurial development with a focus on new ventures/ start ups.

Unit	Topic	Key Learning
I	Entrepreneurship	<ul style="list-style-type: none">• Entrepreneurship- Meaning, Nature and Scope 1.2• Characteristics and Qualities of a Successful Entrepreneur• Relationship between Entrepreneurship Development and Economic Development.
II	Overview of business and its functioning	<ul style="list-style-type: none">• Entrepreneurship and Society• New Venture Development- Meaning and Stages• Sources of Financing Entrepreneurship, Managerial Vs Entrepreneurial Approach.
III	Foundations of New Venture Finance	<ul style="list-style-type: none">• EDP Programmes, Concept of Economic Freedom, Financial Markets and Entrepreneurship• Venture Capital; Angel Capital, Project Report Preparation, Balance Sheet, Cash Statement, Asset Vs Liability Gamification.
IV	Concepts related to planning and efficiency	<ul style="list-style-type: none">• Entrepreneurial Strategies and Business Plan, Presenting Business Plans to the Investors• Future of Entrepreneurship in India.
V	Women Entrepreneurship and Marketing Strategy	<ul style="list-style-type: none">• Concept, Factors governing women entrepreneurship, Schemes for women entrepreneurship• Rural Entrepreneurship, Concept, advantage and challenges, Introduction to Market Forecasting.

Suggested Readings:

- Dollinger, MJ, Entrepreneurship- Strategies and Resources, Pearson Education.
- Desai, Vasant, Entrepreneurship Development, Himalaya Publishing House.
- Gupta, C.B. and Srinivasan, P., Entrepreneurship Development, Sultan Chand & Sons.
- Charanthimath, P.M., Entrepreneurship Development and Small Business Enterprise, Pearson Education.
- Havinal, Veerbhadrapa, Management and Entrepreneurship, 1st Edition, New Age International Publishers,

SEMESTER- VI

SUBJECT: Advanced welding processes
CODE :
CATEGORY: Skill Education Component

Credit	Hours	Marks		
		I	E	To
2	30	15	35	50

Objectives

- To impart knowledge of Advance welding processes, its types, its process, and types of defects.

Learning Outcomes

- Able to know the concept of advanced welding process.
- Able to know different types of defects occur in different types of welding.

Unit	Topic	Key Learning
I	Projection welding	<ul style="list-style-type: none"> • Types of welds, types of machines, setting of machines, voltage, current and squeeze pressure, inspection methods, types of defects and its rectification procedure
II	Friction Welding	<ul style="list-style-type: none"> • Types of metal, types of components, type of machines, setting of machines and process of welding, types of defects and its correction, inspection methods
III	Thermite Welding:	<ul style="list-style-type: none"> • Concept of welding, its process, types of machines, setting of machines and process of welding, types of defects and its correction, inspection methods.
IV	Submerge arc Welding	<ul style="list-style-type: none"> • Concept of welding, its process , types of machines, setting of machines and process of welding, types of defects and its correction, inspection methods

Suggested Readings:

- Welding and welding Technology by RICHARD L Little.
- Welding engineering and technology by R.S Parmar.
- Robotic Welding (International Trends in Manufacturing Technology) by Lane J.D

SUBJECT: Foreign Language

CODE: ZBGE301

CATEGORY: General Education Component

Credit	Hours	Marks		
2	30	I	E	To
		50	50	100

Objectives

- To familiarise the students with basics of foreign language so as to enhance the effectiveness of their work associated with other economies.

Learning Outcomes

Unit	Topic	Key Learning
		French or German: Max Muller for German Classes

Suggested Readings: