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SCHEME & SYLLABUS FOR

Bachelor of Vocational Studies (B.VoC.) Production Technology

NAAC GRADE B+ Accredited University

nirf RANKING 2024 Ranked in Top 151-200 Universities

Kalinga University, Naya Raipur, Chhattisgarh

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B.VOC IN (PRODUCTION TECHNOLOGY)

Semester-01								
Course Code	**Course Title**	**Credits**	**L**	**T**	**P**	**Internal Marks**	**End Semester Exam Marks**	**Total Marks**
BVPDT101	Communication Skills	3	3	0	0	30	70	100
BVPDT102	Fundamentals of Information Technology	3	3	0	0	30	70	100
BVPDT103	Material Science	3	3	0	0	30	70	100
BVPDT104	Production Drawing and Modeling	3	3	0	0	30	70	100
BVPDT105P	**Industrial Training/On Job Training/Workshop**	18	0	0	36	50	150	200
Total		**30**	**12**	**0**	**36**	**170**	**430**	**600**

Semester-02								
Course Code	**Course Title**	**Credits**	**L**	**T**	**P**	**Internal Marks**	**End Semester Exam Marks**	**Total Marks**
BVPDT201	Strength of Materials	3	3	0	0	30	70	100
BVPDT202	Environmental Studies	3	3	0	0	30	70	100
BVPDT203	Production Technology	3	3	0	0	30	70	100
BVPDT204	Metrology and Metallography	3	3	0	0	30	70	100
BVPDT205P	**Industrial Training/On Job Training/Workshop**	18	0	0	36	50	150	200
Total		**30**	**12**	**0**	**36**	**170**	**430**	**600**

Semester-03								
Course Code	**Course Title**	**Credits**	**L**	**T**	**P**	**Internal Marks**	**End Semester Exam Marks**	**Total Marks**
BVPDT301	Composite Materials	3	3	0	0	30	70	100
BVPDT302	Manufacturing Technology - I	3	3	0	0	30	70	100
BVPDT303	Machine Tool Technology	3	3	0	0	30	70	100
BVPDT304	Mass Production Devices	3	3	0	0	30	70	100
BVPDT305P	**Industrial Training/On Job Training/Workshop**	18	0	0	36	50	150	200
Total		**30**	**12**	**0**	**36**	**170**	**430**	**600**

Semester-04								
Course Code	**Course Title**	**Credits**	**L**	**T**	**P**	**Internal Marks**	**End Semester Exam Marks**	**Total Marks**
BVPDT401	Industrial drives and control	3	3	0	0	30	70	100
BVPDT402	Manufacturing Technology - II	3	3	0	0	30	70	100
BVPDT403	Green Manufacturing	3	3	0	0	30	70	100
BVPDT404	Product Design for Manufacturing	3	3	0	0	30	70	100
BVPDT405P	**Industrial Training/ On Job Training/ Workshop**	18	0	0	36	50	150	200
Total		**30**	**12**	**0**	**36**	**170**	**430**	**600**

Semester-05								
Course Code	**Course Title**	**Credits**	**L**	**T**	**P**	**Internal Marks**	**End Semester Exam Marks**	**Total Marks**
BVPDT501	Metal Casting Technology	3	3	0	0	30	70	100
BVPDT502	Maintenance, Repairs and Service	3	3	0	0	30	70	100
BVPDT503	Quality Control	3	3	0	0	30	70	100
BVPDT504	Lean and Agile Manufacturing	3	3	0	0	30	70	100
BVPDT505P	**Industrial Training/ On Job Training/ Workshop**	18	0	0	36	50	150	200
Total		**30**	**12**	**0**	**36**	**170**	**430**	**600**

Semester-06								
Course Code	**Course Title**	**Credits**	**L**	**T**	**P**	**Internal Marks**	**End Semester Exam Marks**	**Total Marks**
BVPDT601	Production Automation and Computer Integrated Manufacturing	3	3	0	0	30	70	100
BVPDT602	Plant Layout and Product Handling	3	3	0	0	30	70	100
BVPDT603	Non-conventional Machining	3	3	0	0	30	70	100
BVPDT604	Reliability, Maintenance and Safety Engineering	3	3	0	0	30	70	100
BVPDT605P	**Industrial Training/ On Job Training/ Workshop**	18	0	0	36	50	150	200
Total		**30**	**12**	**0**	**36**	**170**	**430**	**600**

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SEMESTER-01

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BVPDT101
COMMUNICATION SKILLS

Course Objective:
The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Course outcomes:
- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication.
- To develop vital communication skills which should be integral to personal, social and professional interactions.
- One of the critical links between human beings.
- An important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal.
- In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Unit - 1 **06**
Introduction: Theory of communication, types and modes of communication, mediums and channels of communication, barriers to communication, English as a global language, the lingua franca, social influences on English

Unit - 2 **06**
Language of Communication: Verbal and non-verbal (spoken and written) personal, social and business barriers and strategies intra-personal, inter-personal and group communication, varieties of English, language, accent, dialect, colloquialism, historical influences on English

Unit - 3 **06**
Speaking Skills: Monologue dialogue group discussion effective communication/ mis-communication interview public speech, regional influences on English, convergence and divergence, linguistic imperialism

Unit - 4 **06**
Reading and Understanding Close reading, reading analysis of a text - audience and purpose, content and theme, tone and mood, stylistic devices, structure comprehension- analysis and interpretation translation (from Indian language to English and vice-versa) literary/knowledge texts

Unit - 5 **06**

Writing Skills: Documenting report writing making notes letter writing, writing tabloids, diary entry, open letters, essays, newsletter and magazine articles, skits, short stories, impersonating characters it will enhance language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc. while, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. it is hoped that after studying this course, students will find a difference in their personal and professional interactions.

References:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brati Biswas.

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BVPDT102
FUNDAMENTALS OF INFORMATION TECHNOLOGY

Course objective:
This is a basic course for commerce students to familiarize with computer and it's applications in the relevant fields and exposes them to other related courses of IT.

Course Outcomes:
- Gain a foundational understanding of key IT concepts, including hardware, software, and networks.
- Develop proficiency in using common computer applications, such as word processing and spreadsheet software.
- Explore the ethical and security considerations in IT, emphasizing responsible digital behaviour.
- Acquire problem-solving skills by applying IT knowledge to real world scenarios.
- Prepare for further studies in IT or related fields by establishing a strong IT knowledge base.

Unit - 1 **06**
- **Computer characteristics:** Speed, storage, accuracy, diligence; digital signals, binary system, ASCII; historic evolution of computers;
- **Classification of computers:** microcomputer, minicomputer, mainframes, supercomputers;
- **Personal computers:** desktop, laptops, palmtop, tablet; hardware & software; von Neumann model.

Unit - 2 **06**
- **Hardware:** CPU, memory, input devices, output devices.
- **Memory units:** RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory;
- **Auxiliary storage:** Magnetic devices, optical devices; floppy, hard disk, memory stick, CD, DVD, CD/DVD-Writer**;**
- **Input devices -** keyboard, mouse, scanner, speech input devices, digital camera, touch screen voice input, joystick, optical readers, bar code reader;
- **Output devices:** Display device, size and resolution; CRT, LCD, LED;
- **Printers:** Dot-matrix, inkjet, laser; plotters, sound cards & speaker.

Unit - 3 **06**
- **Software:** System software, application software; concepts of files and folders, introduction to operating systems, different types of operating systems: single user, multitasking, time-sharing multi-user; booting, POST;
- **Basic features of two GUI operating systems:** Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases;
- **Application software:** Generic features of word processors, spread sheets and presentation software; generic introduction to latex for scientific typesetting; utilities and their use; computer viruses & protection, free software, open source.

Unit - 4 **06**

Computer Networks and Internet: Connecting computers, requirements for a network: server, workstation, switch, router, network operating systems; internet: brief history, world wide web, websites, URL, browsers, search engines, search tips; internet connections: isp, dial-up, cable modem, well, dsl, leased line wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, web pages, web programming languages.

Unit - 5 **06**

Information Technology and Society: Indian IT Act, intellectual property rights, issues. application of information technology in railways, airlines, banking, insurance, inventory control, financial systems, hotel management, education, video games, telephone exchanges, mobile phones, information kiosks, special effects in movies.

Programming Concepts & Techniques: Program concept, characteristics of programme, stages in program development, tips for program designing, programming aids, algorithms, pseudo code, notations, design, flowcharts, symbols, rules, compiler & interpreter. introduction to programming techniques, top-down & bottom-up approach, unstructured, & modular programming, cohesion, coupling, debugging, syntax & logical errors, linking and loading, testing and debugging, documentation.

References:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

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BVPDT103
MATERIAL SCIENCE

Course Objectives:

- To understand the classification of materials, bonding and the crystal structure.
- To understand the Properties of conducting, insulating, semiconducting, dielectric and semiconductor materials.

Course Outcomes:

After the completion of this course the student will be able to:

- Describe the fundamentals of material science and concepts of unit cell & crystallography.
- Classify materials based on their conducting, insulating, semiconducting, dielectric properties.
- Know the practical uses of various materials in different electrical engineering field.

Unit - 1 **08**

- **Introduction:** Introduction and historical importance of Materials, Classification of Materials, Engineering Materials, Advanced Materials and Future Materials like ceramics, polymers, composites, Dielectric etc.
- Bravais Lattices, Crystal Structures, Crystalline, Quasi Crystalline and Non-Crystalline Materials, Miller Indices, Miller-Bravais Indices for Planes and Directions of Cubic and Non-Cubic Structures, structure of ceramics, polymers, and composites materials. Classical theory of electrical and thermal conduction in solids, temperature dependence of resistivity, skin effect, Hall Effect.

Unit - 2 **08**

- **Diffusion and Heat treatment:** Phase Diagrams: Phase Rule, Equilibrium Phase Diagrams, Phase Systems - Isomorphous, Eutectic with No and Limited Solid Solubility and Peritectic, Iron-Carbon Phase Diagram, TTT Diagram.
- **Imperfections in Solids and Strengthening Mechanisms:** Point Defects, Line Defects and Dislocations, Interfacial Defects and Bulk or Volume Defects, Recovery, Recrystallization and Grain Growth. Alteration of properties by heat treatment, Heat treatment method, Quantification of altered material properties by heat treatments.

Unit - 3 **07**

- **Mechanical behavior of Metals and Alloys:** Types of Loading, Stress-Strain Curves for Brittle and Ductile Materials, Theoretical and Observed Shear Stress, Critical Resolved Shear Stress, Deformation – Elastic, Anelastic, Plastic and Super Plastic, Yield Criteria, Macroscopic Aspects of Plastic Deformation, Toughness Measurements by S-S Curve, Impact Testing and Fracture Toughness Testing.
- **Types of Mechanical Loading and Failures**: Ductile and Brittle Fracture, Modes of Fracture Toughness, Impact Fracture, Ductile-Brittle Transition, Types of Impact Testing, Fatigue, Crack Initiation and Propagation, Fatigue Testing, Creep, Stages of Creep Curve, Stress and Temperature Effects.

Unit - 4 **07**

- **Dielectric and Magnetic Property of Materials:** Introduction, polarization of dielectric material, dielectric constant of monatomic gases, frequency dependence of permittivity, dielectric losses, frequency and temperature dependence of the dielectric constant, dielectric properties of polymeric system, ionic conductivity in insulators, insulating materials, Ferro electricity, piezoelectricity.
- Introduction, Classification of magnetic materials, diamagnetism, paramagnetism, ferromagnetism, magnetization curve, the hysteresis loop, factors affecting permeability and hysteresis loss, common magnetic materials, magnetic resonance.
- **Properties of Metals and Semiconductors:** Energy band in Metals, Semiconductors and Insulators, types of semiconductors, Intrinsic and Extrinsic semiconductors, Effect of temperature on the electrical conductivity of metals, insulator and semiconductor, thermal properties, thermal conductivity of metals and semiconductors, factors affecting the resistivity of electrical materials, electrical conductivity of doped materials, thermoelectric effects.

References:

1. C.S. Indulkar and S. Thiruvengadam, S., “An Introduction to Electrical Engineering”.
2. P L Kapoor. A Textbook of Electrical and Electronics Engineering Materials: Khanna publishers
3. Kenneth G. Budinski, “Engineering Materials: Prentice Hall of India, New Delhi

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BVPDT104
PRODUCTION DRAWING AND MODELING

Course Outcomes:

- Interpret the drawing and symbols in the Engineering field.
- Demonstrate proficiency in 3D modelling by creating and assembling machine components.

Unit - 1 **08**

Sectional Views:

- Sectioning - sectional views – representation of sectional plane – hatching –
- inclination – spacing – hatching large areas – hatching adjacent parts - full section – half section – types of half sections – conventional representation of materials in section.

Geometric Dimensioning and Tolerances:

- Importance of GD&T - Tolerance specification and interpretation - Tolerance symbols - Features - Datum plane and Axis - Shaft basis and hole basis system.
- Material Condition Modifiers. Maximum Material Condition (MMC) - Least Material Condition (LMC) - Feature Control Frames

Unit - 2 **08**

Manual Drawing Practice:

Detailed drawings of the following machine components will be given to students to draw the assembled views. Only the assembled Front view (Without section / Full Section / Half Section) and Top view or Side view (Without section / Full Section / Half Section) with dimensions and Bill of materials in the Drawing Sheet.

Unit - 3 **07**

Computer Aided Drafting (CAD) Practices:

- **PART A - Drafting Practices:** 2D Drafting Practices - Draw the front view of the assembled drawing of the components with dimensions.
- **PART B - Solid modelling Practices:** Detailed drawings of the machine components will be given to students to create the solid modelling and assemble using any CAD software in the computer and take the printout.

Unit - 4 **07**

Machine Components for the Practical Exercises:

- Sleeve and Cotter Joint.
- Plummer Block.
- Flange Coupling.
- Bushed Bearing.

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BVPDT105P
INDUSTRIAL TRAINING/ON JOB TRAINING/ WORKSHOP

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SEMESTER-02

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BVPDT201
STRENGTH OF MATERIALS

Course Objectives:

- Understand the fundamentals of solid mechanics.
- Acquire elementary knowledge of stresses, strains & material properties.
- Understand & analyse the basic principles involved in the behaviour of machine parts under load in the context of designing it.
- Understand & analyse the mechanical properties of the various materials.

Unit - 1 **06**

Basic Concepts: Definition, elastic & plastic properties of material, stress & strain diagram for ductile & brittle materials, introductory remarks on fatigue, creep & fracture. Simple stresses and strains: Stress & strain, Simple stress and strain in composite sections, Thermal stresses, relation between elastic constants.

Unit - 2 **06**

Principal Planes and Stresses: Principal stresses and principal planes, Mohr's circle for biaxial stresses.

Unit - 3 **06**

Bending Moment and shearing forces: Types of beams, types of support, shear force and bending moment diagram for simply supported, and cantilever subjected to point and uniformly distributed loads, relation between intensity of loading shear force and bending moment.

Unit - 4 **06**

Bending, slope and deflection of beams: Definitions, theory of simple bending, relation between slope and deflection calculations for cantilever & simply supported beams.

Unit - 5 **06**

Torsion & Vibration: Concept of Pure Torsion, Torsion equation for solid and hollow circular shafts, power Transmitted and stiffness of shaft. Assumptions in theory of pure Torsion, Comparison between Solid and Hollow Shafts, Theory of Failure for Brittle and Ductile material. Types of vibrations, free vibrations.

References:

1. Strength of materials – Ryder
2. Strength of materials – Sadhu Singh
3. Strength of materials – Rajput
4. Strength of materials – Bansal

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BVPDT202
ENVIRONMENTAL STUDIES

Course Outcomes:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

Unit - 1 **06**

Introduction to Environmental Studies:

Multidisciplinary nature of environmental studies, Scope & importance; concept of sustainability & sustainable development.

Ecosystems:

- What is an ecosystem? Structure and function of the ecosystem;
- **Energy flow in an ecosystem:** food chains, food webs and ecological succession.
- **Case studies of the following ecosystems**: Forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit - 2 **06**

Natural Resources:

- **Renewable and Non--renewable Resources:** Land resources and land use change; Land degradation, soil erosion and desertification
- **Deforestation:** Causes & impacts due to mining, dam building on environment, forests, biodiversity & tribal populations
- **Water:** Use & over-exploitation of surface & ground water, floods, droughts, conflicts over water (international & inter-state)
- **Energy resources:** Renewable & non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies

Unit - 3 **06**

Biodiversity and Conservation:

- **Levels of biological diversity:** genetic, species & ecosystem diversity; Biogeographic zones of India; Biodiversity patterns & global biodiversity hot spots, India as a mega--biodiversity nation; Endangered & endemic species of India
- **Threats to biodiversity:** Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions;
- **Conservation of biodiversity:** In--situ and Ex--situ conservation of biodiversity.
- **Ecosystem and biodiversity services:** Ecological, economic, social, ethical, aesthetic and Informational value.

Unit - 4 **06**

Environmental Pollution:

- Types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks
- **Solid waste management:** Control measures of urban and industrial waste. Pollution case studies.

Environmental Policies & Practices:

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- **Environment Laws:** Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit - 5 **06**

Human Communities and the Environment:

- **Human population growth:** Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies.
- **Disaster management:** floods, earthquake, cyclones and landslides.
- **Environmental movements:** Chipko, Silent valley, Bishnois of Rajasthan.
- **Environmental ethics:** Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

References:

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29--64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971.Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.Environment. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E. O. 2006.The Creation: An appeal to save life on earth. New York: Norton.
20. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press.

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BVPDT203
PRODUCTION TECHNOLOGY

Unit - 1 **06**

- **Production Machine Tools:** Machine tools used for quantity production, semi-automatic multi tools centre lathe. Auto-lathes, sliding head types, Single spindle automatics, Multi-spindle automatics, Mechanical copying systems, Hydraulic servo copying systems for lathe, Electric copying systems.
- **Transfer Machines:** Types of productions. Types of layout, Economic justification of transfer machines, Inline transfer, drum type transfer machines. Automatic loading & Transferring methods, Machining heads, Automatic inspections, Tool servicing, Transfer press linked lines.

Unit - 2 **06**

Generation Of Forms: Forming `V' generating. Thread chasing. Die heads. Thread rolling. Thread milling. Thread grinding. Gear planning, Gear shaping, Gear hobbing, Straight Bevel Gear Manufacture. Spiral bevel Gear Manufacture.

Unit - 3 **06**

- **Surface Treatment & Finishing:** Meaning of the terms surface treatment and its purpose, Elements of surface treatment cleaning protecting, Colouring, Altering surface properties.
- **Surface Treatment Processes-** Wire brushing, Belt sanding, Alkaline cleaning, Vapour degreasing, Pickling, Latest trends in Surface preparation, Ultrasonic cleaning, Solvent cleaning, Painting application by dipping, Hand spraying, Automatic spraying, Electrostatic spray finishing. Electro-coating, Hot dip coating, phosphate coating- Packerising and bonderasing, Buffing, Blackening, Anodising. Electro Nickle Plating, Nickle carbide plating, Sputtering, Automation in Painting,
- **Auto Control of Size:** Auto sizing, Mechanical calliper for turning operation, Pneumatic sizing of external cylindrical ground work, Pneumatic slide position measuring device, Digital slide position measuring device, Auto sizing device for centre-less grinding operation. Friction rollers, Optical measurement

Unit - 4 **06**

Cutting Tools for Machining: Elements of machining process, Single point tools - Basic angles, Chip formation, Effect of manipulating factors such as velocity, size of cut, effect of tool geometry, Tool material, Cutting fluids and contamination in them, Work piece material, Tool life model, Machining economics, Specific power consumption Basic principles of multipoint tools, Linear travel tools, Broaches, Gear shaper cutters, Axial feed rotary tools-Twist drill, Reamers, Core drills, Counter bores and counter sinks, Multiple diameter tools, Hobs, Characteristics of tools materials,. Tool materials, Tool steels, High speed steel, Cast cobalt alloys. Carbides or cintered carbide, Ceramics, Carbide tools Surface treatment of cutting tools- Its advantage, Tin coated high speed steel diamonds. Cubic boron nitrides, Specialised knowledge of steel cutting

Unit - 5 **06**

- **Press Tools:** Factors affecting press tool design, Shearing, Bending, Drawing, combination tools, Progression tools, Rubber die formatting, high energy forming, Explosive forming
- **Specification of Quality & Reliability:** Quality, Specification Designing for production Standardisation, Preferred numbers, Limits and fits, Tolerance build up, Geometric tolerances. Limit gauging.

References:

1. Production Engineering: PC Sharma
2. 2.Production Technology: CK Singh

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BVPDT204
METROLOGY AND METALLOGRAPHY

Course Objectives:
The objective of this course is to prepare the student:

- To provide a solid foundation in the principles of measurement, including accuracy, precision, calibration, and uncertainty analysis.
- To acquire knowledge regarding the measurement of linear and angular dimensions of components and assemblies.
- To familiarize the properties, Behavior, and characteristics of various engineering materials such as metals, polymers, ceramics, and composites.
- To introduce students to the principles of metallography, including sample preparation techniques and microscopic examination methods.

Course Outcomes:

- Comprehend the use of metrology instruments and measurement methods.
- Demonstrate the necessary skills for the calibration and testing of different gauges and measuring instruments.
- Measure the geometrical dimensions of V-threads and Spur gears.
- Identify the given specimen microstructure using a metallurgical microscope.
- Inspect cracks in casting using dye penetrate test and magnetic particle test.

Unit - 1 **08**

Linear, Angular Measurements And Form Measurements:

Basics of Metrology:

Scope of Metrology, basic units, important terminology, Measurement – Need, Process, Role in quality control; Factors affecting measurement – international standardization, the bureau of Indian standards – important elements of measurements – methods of measurements. sensitivity, stability, range, Precision and Accuracy- definition – reliability – definition , error – definition – sources of errors – classification of error – Calibration of measuring instruments.

Linear Measurements:

Linear Measuring Instruments – Vernier caliper, Micrometer, Depth Micrometer – Use and precautions, possible sources of errors in vernier caliper and micrometer– slip gauges –requirements – Indian standard – care and use.

Unit - 2 **08**

Angular Measurements:

Angular measuring instruments – Introduction – vernier bevel protractor – universal bevel protractor – optical bevel protractor. Sine bar – types – uses and limitations – working principle of clinometer, autocollimator, angle dekkor.

Form Measurement:

Screw thread terminology – Screw thread micrometer measurement of various elements of thread – Vernier gear tooth caliper – Pitch Diameter, Lead, Pitch. Measurement of Gears – purpose – Analytical measurement.

Unit - 3 **07**

Structure Of Solids, Phase Diagrams, Engineering Materials And Testing Of Materials:

Structure of Solids:

Introduction to Atomic Structure – Crystal Structure – Unit Cell and Space Lattice – Crystal System – The seven basic crystal systems – Crystal structure for Metallic Elements – BCC, FCC, and HCP – Definition – Coordination Number – Atomic Radius – Atomic Packing Factor for Simple Cubic, BCC, FCC, and HCP structures.

Phase Diagrams:

Isomorphous, Eutectic and Eutectoid systems – Iron Carbon equilibrium diagram.

Unit - 4 **07**

Engineering Materials:

Classification – Ferrous and Nonferrous metals and their alloys – Definition of Mechanical properties.

Testing of Materials:

Destructive Testing – Types – Non-destructive testing – Visual Inspection – Magnetic Particle inspection – Liquid penetrant test – Ultrasonic inspection, Radiography (Descriptive treatment only).

References:

1. "Applied Metrology for Manufacturing Engineering", Ammar Grous, J Wiley- ISTE, 2011.
2. "Metrology & Measurements", Anand K Bewoor & Vinay A Kulkarni, Tata McGraw- Hill Education Private Ltd, 2009.
3. "Engineering Metrology", Jain R.K., Khanna Publishers, 2005.
4. "Engineering Metrology and Measurements" Raghavendra N.V. and Krishnamurthy. L., Oxford University Press, 2013.
5. "Introduction to Physical Metallurgy", Sydney Avner, Tata McGraw-Hill Education Private Ltd.

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BVPDT205P
INDUSTRIAL TRAINING/ON JOB TRAINING/ WORKSHOP

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SEMESTER-03

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BVPDT301
COMPOSITE MATERIALS

Course Outcomes:
On successful completion of this course, the student will be able to,

- Identify the types of composites and the properties of matrix and reinforcements.
- Familiarize the methods used to manufacture polymer matrix composites(PMC) and its applications in different environments.
- Explain the manufacturing methods, concepts and applications of metal matrix composite(MMC) and ceramics composites.
- Explain the recent development in composite manufacturing and its applications.
- Apply the concept of composite materials for various applications with the support of mechanical testing.

Unit - 1 **06**

Introduction To Composites:

- **Fundamentals of composites-matrix and reinforcements Matrix-** Types of Matrix-Polymer matrix composites(PMC)-Metal Matrix
- **Composites (MMC)-** Ceramics Matrix Composites-Concepts and different application Reinforcements-Basic requirements of selection of Reinforcements-Types of Reinforcements-Whiskers-Glass Fiber-Carbon fibers-Aramid fibers-Ceramic fibers-properties and applications.

Unit - 2 **06**

Manufacturing Of Polymer Matrix Composites:

Types of PPC manufacturing methods- Hand layup- Spray Layup-Compression Moulding-Sheet forming-Pultrusions-hot press and Autoclave-Filament Winding-Basic principles, construction and application of PPC.

Unit - 3 **06**

Manufacturing Of Metal Matrix Composites (MMC) and Ceramics Matrix Composites (CMC):

- **MMC manufacturing methods-** Casting methods- Gravity and low pressure die-squeeze –spray forming-thixo-moulding- basic principles construction and applications
- **CMC manufacturing Methods-**Reaction Sintering-Electro Deposition-Spray forming-infiltration-basic principles construction and applications

Unit - 4 **06**

Recent Development In Composite Manufacturing:

Advanced composites-self healing composites-micro and nano-composites-biodegradable composites-left handed composites-stiffer than stiff composites-carbon and carbon composites- process, applications and limitations.

Unit - 5 **06**

Selection Of Composites And Mechanical Testing:

- **Selection of composites for industrial applications-** design and process selection for new applications- Daily usage-automobile sectors- aerospace - Product examples and applications.
- **Mechanical testing of Composites-**Tensile testing-fatigue testing (three-point bend test)-Toughness mechanism-basic testing procedure, equipment used and test applications.

References:

1. Suresh, S., Martensen, A., and Needleman, A., "Fundamentals of Metal MatrixComposites", Butterworth, Heinemann, 2013.ISBN: 0080523714, 9780080523712.
2. Strong, A. Brent, "Fundamentals of Composites Manufacturing : Materials, Methods and Applications", First Edition, Society of Manufacturing Engineers, 2008, ISBN 13: 9780872638549.
3. Ru-Min Wang, Shui-Rong Zheng,Ya-Ping Zheng,"Polymer Matrix Composites and Tchnology", First Edition, Woodhead publisher, 2011, ISBN:978-0-85709-221-2.

KALINGA UNIVERSITY
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BVPDT302
MANUFACTURING TECHNOLOGY - I

Unit - 1 **06**

(A) General Introduction:

i. Scope of subject "Workshop Technology" in engineering
ii. different shop activities and broad division of the shops on the basis of nature of work done such as
   - Wooden Fabrication-carpentry
   - Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

(B) Carpentry:

i. Fundamental of wood working operations
ii. Common Carpentry Tools-

Their classification, size, specification (name of the parts and use only):

i. Marking and measuring tools
ii. Holding and supporting tools:
iii. Cutting and Sawing Tools:
iv. Drilling and Boring Tools
v. Striking Tools-Mallet and Claw hammer
vi. Turning Tools & Equipment
vii. Miscellaneous Tools

Unit - 2 **06**

Production Technology:

(A) Joining of Timber Components for Fabrications Works:

- Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet, Groove, Tongue, Dowel, operations in assembly-simple lap and butt, Mortise, Tenon, Dovetail, Miter & briddle joints. Metal Fabrication.

(B) Metal Shaping-Smithy:

i. Operations involved (concept only)
ii. Tool and equipment used (Names, size, specification for identification only)
iii. Heating and fuel handling equipment
iv. Holding and supporting tools
v. Striking Tools
vi. Cutting tools
vii. Punching & Drifting Tools
viii. Bending Tools and figures
ix. Forming & Finishing Tools
x. Defects Occurring & its remedy

Unit - 3 **06**

Sheet metal working-

Tools and operation:

a) Operations involved (Names and concept only)
b) Sheet metal joints
c) Tools and equipment used (Name, size, specifications for identification only)
d) Marking tools
e) Cutting and shearing Tools
f) Straightening tool
g) Striking Tools
h) Holding Tools
i) Supporting Tools
j) Bending tools
k) Punching-Piercing and Drafting tools
l) Burring Tools-Files
m) Defects Occurring & its remedy

Unit - 4 **06**

(A) Metal Joining During Fabrication-

(a) Permanent Joining:

i. Welding methods
ii. Electric welding

(b) Soldering & Brazing:

i. Its concept, comparison with welding as joining method and classification
ii. Soldering operation
iii. Materials Used
iv. Defects Occurring & its remedy

(B) Riveting-

a) Its comparison with welding as joining method.
b) Rivets and Materials.
c) Operation involved
d) Tools and equipment used (Names, Size, specification and uses)), Elementary knowledge about working of pneumatic, hydraulic and electric riveter. Temporary Joining (Fasteners & their uses), General Idea about temporary fasteners & their uses

(C) Familiarity with the Use of Various Tools Used in Mechanical Engineering Workshop:

a) Marking & Measuring Tools
b) Holding Tools
c) Cutting Tools
d) Files
e) Thread Cutting Tools
f) Miscellaneous Tools.

Unit - 5 **06**

(A) Protection of Fabricated Structures From Weather:

(a) Painting:

Its need, Introduction to methods of painting (classification only) operations involved description steps only, surface preparation materials, tools and equipment used (name, size specification for identification), Brushes-round and flat wire brush, scraper, trowel, spray gun, compressor, Defects likely to occur in painting and their remedies

(b) Varnishing & Polishing:

Its need, operation involved (description of steps only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and sprit polish, copal varnish, Defects likely to occur. Safety of Personnel, Equipment & Tools to be observed

(B) Foundry Work:

Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding.

References:

1. Workshop Technology, Vol. I: Hazra & Chaudhry
2. Workshop Technology, Vol. I: BS Raghuwanshi
3. Karyashala Takniki: JK Kapoor

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BVPDT303
MACHINE TOOL TECHNOLOGY

Unit - 1 **06**

Centre Lathe:

The centre lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Head stock and tail stock, Feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrils, Steady rest, Lathe attachments, Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Under cutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe

Unit - 2 **06**

Shaping, Planing & Slotting Machines:

Working principles of planer, shaper and Slotter, Differences and similarities among them, quick return mechanism applied to the machines. types of work done on them, types of tools used, their geometry, General and periodic maintenance of a shaper.

Drilling & Boring Machines:

Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

Unit - 3 **06**

Milling Machines:

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling. Simple, compound and differential indexing, milling of spur gears and racks

Unit - 4 **06**

Grinding Machines:

Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding, Types of grinding machines, precision finishing operations like honing.

Broaching Machines:

Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines

Unit - 5 **06**

Jigs And Fixtures:

Object of Jigs and Fixture, Difference between jigs and fixtures, Principle of location, Principle of clamping, Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs- bushes (Fixed, Liner, Renewal, Slip). Template, Plate jigs. Channel jigs, Leaf jigs, Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures. Welding fixtures

Cooling Process:

Cooling and cutting fluids, difference between coolant and cutting fluid, function and action of cutting fluids, Requirement of good cutting fluids, their selection for different materials and operations

Automation of Machine Tools:

Introduction to CNC lathe (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

References:

1. Production Technology: Jain & Gupta
2. Machine Tool Technology (Hindi): JK Kumar
3. Workshop Technology Vol. II: Hazra & Choudhary

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BVPDT304
MASS PRODUCTION DEVICES

Unit - 1 **06**

Tool holders:

Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

Unit - 2 **06**

Locating and clamping devices:

Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

Unit - 3 **06**

Clamping devices:

Types, Sketches with nomenclature, Working, Applications

Unit - 4 **06**

Jigs and fixtures:

Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures

Unit - 5 **06**

Design of Jigs and Fixtures:

Steps in designing jigs and fixture for given simple component

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BVPDT401
INDUSTRIAL DRIVES AND CONTROL

Unit - 1 **08**

A.C Circuits Period:

Review of Ohm's Law – Review of Series and Parallel Connection – Fundamentals of AC Voltage and Current - Peak Value, Average Value, RMS value of Sine wave – Frequency - Time period – Amplitude - Power and Power Factor – Current calculation by using single phase power formula – Introduction about Three phase ac supply - Current calculation by using three phase power formula - Necessity of Contactor - Solenoid type Contactor - Necessity of Fuse – Function of MCB – Function of ELCB.

Unit - 2 **08**

Analog and Digital Electronics:

Name, Symbol and uses of Semiconductor Devices (Diode, Transistor, LED and SCR) – Importance of current limiting resistor in LED circuit – RGB LED - Working of Half wave and Full wave rectifiers - Block Diagram of Regulated Power Supply.

Logic gates:

Binary Number System - Positive and Negative Logic - Definition, Symbol, Truth table and Boolean expression for OR, AND, NOT, NOR, NAND, EX-OR and EX-NOR gates - Universal Logic Gates: NAND and NOR.

Programmable Logic Controller:

Definition - Block Diagram of Programmable Logic Controller – PLC Scan – Ladder Logic for AND Gate and OR Gate.

Unit - 3 **07**

Electric Drives:

Introduction – Need for Drive – Advantages of Electric Drive – Parts of Electric Drive – Classification of Drives (Group Drive, Individual Drive and Multimotor Drive) – Classification of Electric Motors - Characteristics of DC Shunt Motor and DC Series Motor – Necessity of starters - Three point starter. Construction, Working Principle and Characteristics of Three Phase squirrel cage induction motor – DOL Starter – Star Delta Starter - Effect of Unbalanced source voltage and Single Phasing – Methods of Speed control of three phase induction motor - Block diagram of Variable Frequency Drive (VFD) - Electric Braking – Types of Electrical Braking – Selection of Motors for different applications – Motors used for Traction system.

Unit - 4 **07**

Overview of PMDC Motor, BLDC Motor, Stepper Motor Drive, Servo Motor Drive – L293D Motor Driver IC.

References:

1. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology Volume - II (AC and DC Machines), Multicolour Edition, S. Chand & Co., 2005.
2. V K Mehta, Rohit Mehta, Principles of Electronics, 12 th Edition, S. Chand & Co., 2020.
3. B.N. Sarkar, Fundamentals of Industrial Drives, 1 st Edition, PHI Learning Pvt. Ltd., 2012.
4. Frank D. Petruzella, Programmable Logic Controllers, 6 th Edition, Indian Edition, Mc Graw Hill, 2023.

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BVPDT402
MANUFACTURING TECHNOLOGY – II

Unit - 1 **06**

General Process:

Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Elementary idea of machines used for the above processes.

Welding:

- Weld edge preparation, Introduction to various welding processes with procedure equipment and applications such as
  a) Electric arc welding.
  b) Resistance welding.
  c) Thermit welding
  d) Carbon arc gauging.
  e) Metal-Inert-Gas welding (MIG)
  f) Tungsten Inert Gas welding (TIG)
  g) Atomic Hydrogen arc welding.
  h) Stud welding.
  i) Laser Beam, Electron Beam welding, Explosion welding
- **Welding Arcs:** Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.

Unit - 2 **06**

Welding Of Special Materials:

- Welding of plastics, equipment, filler rods, weldability, procedures and precautions.
- Welding of Grey Cast Iron, shielded metal arc gas welding procedures.
- Welding of Aluminium, Argon arc and gas welding procedures.
- Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG, Oxy-acetylene method.

Testing of Welds & Relevent Welding Codes:

- Destructive methods
- Non- destructive methods-visual, X-ray, Y-ray, Magnetic particles, fluorescent, penetrant and ultrasonic testing.

Unit - 3 **06**

Foundry Practice: Pattern & Moulding:

The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility.

Moulding and Pouring:

Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and iquids, Sand mixing preparation, Moulding defects

Unit - 4 **06**

Melting And Pouring:

Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

Unit - 5 **06**

Foundry Practice:

Elementary idea of special casting processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries

Powder Metallurgy:

Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)

References:

1. Workshop Technology, Vol. I: BS Raghuvanshi
2. Production Technology, Vol. I: Hazra & Chaudhry

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BVPDT403
GREEN MANUFACTURING

Unit - 1 **06**

Introduction to Green Manufacturing:

- Green Manufacturing-Definition-History and evolution of green manufacturing.
- Factors affecting GM- Environmental Impact of Manufacturing, Strategies for Green Manufacturing.
- Tools & techniques required -Environmental Conscious, Design for Environment.
- Design for recycling, Eco friendly Product design methods- Environmental Impact assessment methods and Standards.

Unit - 2 **06**

Industrial Air Pollutants:

- Pollutants-Primary and Secondary Pollutants, Automobile Pollutants, Industrial Pollution, Ambient air quality Standards, Metrological aspects of air Pollution, Temperature lapse Rates and Stability-wind velocity and Turbulence-Pump behavior dispersion of air Pollutants.
- Measurement of air Pollution-Air pollution sampling-collection of gaseous air pollutants-collection of particulate pollutants-stock sampling, analysis of air pollutants-sulfur dioxide-nitrogen dioxide, carbon monoxide, oxidants and ozone.

Unit - 3 **06**

Noise & Water Pollution in Industries:

- Noise pollution in Industries- Frequency and Sound Levels- Effect of human, Environment and properties, Natural and Androgenic Noise Sources-Measuring Instruments for frequency and Noise levels- Masking of sound.
- Water Pollution-Major pollutants of Water- Contaminants in water, Nitrates, Fluorides, Detergents, taste and odour, Radioactivity in water- Criteria, for different impurities in water- Water Quality requirement for industry Uses-Measurement of water pollution.

Unit - 4 **06**

Life Cycle Assessment:

- Life cycle assessment - Principles of Life cycle assessment; Product Life Cycle Assessment -Triple bottom line approach; Industrial Ecology- Ecological footprinting - Future role of LCA - measurement techniques and reporting.
- Clean Energy Supply - Green Manufacturing through Clean Energy Supply - Clean Energy Technologies, Application - Potential of Clean Energy. Characteristics of Green manufacturing processes - Energy efficiency analysis of green manufacturing processes - Sustainability analysis and Scope of green manufacturing centers.

Unit - 5 **06**

Environmental Effect of Green Manufacturing Design:

- Green Manufacturing Assessment -Concept Models and Various Approaches, Product Sustainability and Risk/Benefit assessment; Corporate Social Responsibility.
- Environmental effects of design -Selection of natural friendly material - Eco design - Environmental Damage- Material flow and cycles – Material recycling – Emission less manufacturing- Reduction of toxic emission – design for recycle.

References:

1. Gradel.T.E. and B.R. Allenby – Industrial Ecology – Prentice Hall – 2010
2. World Commission on Environment and Development (WCED), Our Common Future, Oxford University Press 2005.

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BVPDT404
PRODUCT DESIGN FOR MANUFACTURING

Unit - 1 **06**

Importance of New Product-

Importance of new product for growth of enterprise, Definition of product and new product, Classification of products from new product development point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products

Unit - 2 **06**

New product development process and organization-

Generic product development process for Market Pull and Market Push Products, Need Identification and Analysis, Problem Formulation, establishing economic existence of need, Engineering Statement of Problem, Establishing Target Specification

Unit - 3 **06**

Generation of Alternatives and Concept Selection-

Introduction to Concept generation, Tools of creativity like brain storming, Analogy, Inversion, introduction to Concept feasibility and Concept Selection, Establishing Engineering Specification of Products

Unit - 4 **06**

Preliminary and Detailed Design-

Preliminary design, Identification of subsystems, Subsystem specifications, detailed design of subsystems, component design

Unit - 5 **06**

Assembly drawing and review-

Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics

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BVPDT501
METAL CASTING TECHNOLOGY

Unit - 1 **06**

Introduction:

Design advantages of casting, Advantages of casting process, Metallurgical advantage. Technology of pattern making requirement, Pattern material, wood &wood product, plaster, Plastics and rubbers, Polyesters resins waxes, Machines and tools for pattern making machine for wood pattern making, Machines for metal pattern making, Allowance and other Technological considerations – contraction allowance, Machining allowance, Draft or taper allowance, Rapping and shake allowance, Distortion allowance, Core Prints, Core boxes, Use of loose pieces

Unit - 2 **06**

Technology of moulding and core making:

Moulding sands, Principal ingredients of moulding sands, Specification and testing of moulding sands, Classification of Moulding sands, Additives to moulding and Core making sands, Mould Dressings. Sand Conditioning, Sand Preparation equipment.

Unit - 3 **06**

Moulding processes:

Types of sand moulding, Tools for hand moulding, Characteristics of cores and core sands, Types of cores, Use of chaplets, Machine moulding, Core making machines, Processes based on organic binders.

Unit - 4 **06**

Technology of metal casting processes:

Permanent mould casting, Types of die casting machines, Centrifugal casting, continues casting, Electro slag casting, Gating system, Riser of casting, Economic considerations, Melting equipments for foundries, Defects in castings.

Unit - 5 **06**

Modernization & Mechanization of foundries:

Need, Area for mechanization, Material handling, Pollution control in foundries, Pollutants in a foundry, Plant layout for foundries, steps in planning a foundry layout.

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BVPDT502
MAINTENANCE, REPAIRS AND SERVICE

Unit - 1 **08**

Importance of maintenance, Objectives of maintenance, Types of maintenance, Maintenance systems, Planned and unplanned maintenance, Breakdown maintenance, Corrective maintenance, Opportunistic maintenance, Routine maintenance, Preventive maintenance, Predictive maintenance, Condition based maintenance systems, Design-out maintenance, Selection of maintenance systems.

Unit - 2 **08**

Maintenance planning and scheduling, establishing a maintenance plan, Safety precautions Characteristics of items to be maintained, Classification of items, Maintenance procedure, Guidelines for matching procedures to items, Maintenance organization, Resource characteristics, Resources structure, Maintenance control, Administrative structure, Training of maintenance personnel.

Unit - 3 **07**

System operations and documentation, Documenting maintenance operations, Record keeping, Data collection and analysis, Failure statistics, Planning and scheduling plant shutdowns, Depreciation and Machine Life, Replacement policies, Spares and types of spares, spares planning.

Unit - 4 **07**

Network techniques in maintenance activities, Evaluation of maintenance performance. Total productive maintenance – development and scope, Basic systems of TPM, Procedures and steps. Productivity circles, TPM as a part of TQM, benefits of TPM

References:

1. Maintenance Planning and Control- A. Kelly, East West Press.
2. Mechanical Fault Diagnosis- R.A. Collacott, Chapman and Hall.
3. Managing Maintenance Resources- A. Kelly, Butterworth-Heinemann.
4. Handbook of Maintenance Management- Levitt Joel, Industrial Press

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BVPDT503
QUALITY CONTROL

Course Objectives:

- Understand the terms like quality, quality control, inspection, value of quality, and cost of quality.
- Know about reliability and statistical quality control.
- Construct and draw control charts.
- Understand different sampling methods and draw OC curve.
- Understand ISO certification procedure and quality system.

Unit - 1 **06**

Concept of Quality: Definition of quality cost of quality, value of quality. Quality control, objectives of quality control, quality control and inspection.

Unit - 2 **06**

Statistical concepts and Reliability: Definition of probability, laws of probability. Normal and Binomial probability distributions. Statistical Quality Control, Definition of reliability, basic concept. Failure patterns for complex product, designing for reliability, System reliability.

Unit - 3 **06**

Control Charts for Variables and Attributes: Introduction, objectives, theories of control charts for averages, ranges, standard deviations. Process capability study, Fraction defectives and number of defects. Interpretation of control charts.

Unit - 4 **06**

Acceptance Sampling by attributes: Concepts of acceptance sampling, advantages and limitations, sampling methods, single, double and- multiple sampling plants. operating characteristic curves.

Unit - 5 **06**

Total Quality Management and ISO 9000 Quality System: Concept of Total Quality management, Principle objectives of TQM, History of ISO: 9000, ISO: 9000 series in general, benefits by becoming an ISO: 9000 company, steps to registration, India and ISO: 9000.

References:

1. Statistical Quality Control
2. Quality Planning and Analysis
3. M. Mahahjan - J.M. Juran & Frank M Gryna
4. Statistical Quality Control by Eugune L.Grant & Richard S Leaven worth
5. Total Quality Management by John M Kelly
6. TQM by R.P. Mohanty & R.R. Lakhe.

KALINGA UNIVERSITY
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BVPDT504
LEAN AND AGILE MANUFACTURING

Unit - 1 **06**

Introduction-

Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

Unit - 2 **06**

Waste Identification-

Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

Unit - 3 **06**

Value stream mapping-

Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

Unit - 4 **06**

Lean manufacturing tools-

Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

Unit - 5 **06**

Agile manufacturing-

Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

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SEMESTER-06

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BVPDT601
PRODUCTION AUTOMATION AND COMPUTER INTEGRATED MANUFACTURING

Unit - 1 **06**

General:

Automation-Definition, Scope, its types and their merits, reasons for automation, Its appreciation and criticism, Meaning of the term Computer Integrated Manufacturing (CIM CAD/ CAM Relationship between CIM and Automation

Fundamentals of Manufacturing and Automation:

Types of Industries- Manufacturing, Processing; Basic producers, Converter, Fabricators. Types of Production-Job shop production, Batch production Mass production (Quantity Production and Flow production). Manufacturing - Functions - Processing - Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations, Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view, Automation of welding Manufacturing Process Inputs - Raw materials, Equipments (Machine Tools), Tooling and fixtures, Energy and Labour, Outputs - Finished product and Scrape/Waste. Plant Layout - Its meaning and concept of fixed position layout, Process Layout, Product layout and Group technology layout, Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control

Unit - 2 **06**

Production Concept:

Such as Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems Automation Strategies and Their Effect - Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, computer integrated manufacturing.

Production Economics:

Methods evaluation investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing, lead time and work in process.

Unit - 3 **06**

Assembly System and Line Balancing:

The assembly process, Assembly system, Manual assembly lines, Line balancing problems, Computerised line, balancing methods, Other ways to improve the line balancing, flexible manual assembly line

Automated Assembly Systems:

Design for automated assembly, Types of automated assembly systems, Parts feeding devices, analysis of multi-station Assembly machines, Analysis of single station assembly machines

Unit - 4 **06**

Numerical Control Production System:

Numerical controlling, Coordinate system, and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS

Unit - 5 **06**

N.C. Part Programming:

Tape and Tape format, Methods of N.C. part programming, Computer assisted part programming, The APT Language, Manual data inputs, N.C. part programming using CAD/CAM and Computer automated part programming.

DNC, CNC & Adaptive Control:

Direct Numerical Control (DNC), Computer Numerical control (CNC), Adaptive Control Machining, Current trends in N.C., introductory idea of FMS (Flexible Manufacturing System)

References:

1. Numerical Control Machines: NK Mehta
2. Production Automation & Computer Integrated Manufacturing: MP Groover

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BVPDT602
PLANT LAYOUT AND PRODUCT HANDLING

Unit - 1 **06**

Objective of Facility Design:

Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services;

Unit - 2 **06**

Computerized handling of layout algorithms; Algorithms for computerized Layout Planning, Construction and Development type of computerized Layout Planning Techniques i.e. CRAFT, ALDEP, CORELAP etc.;

Unit - 3 **06**

Product handling; Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, fork lifters;

Unit - 4 **06**

Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

Unit - 5 **06**

Application of pneumatic and hydraulic system in transportation and handling of products, Design of integrated plant layout for product handling systems

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BVPDT603
NON-CONVENTIONAL MACHINING

Unit - 1 **06**

Introduction:

Limitations of conventional manufacturing processes, need of unconventional manufacturing processes and its classification.

Unit - 2 **06**

Un-Conventional Machining Processes: Principle and working and applications of unconventional machining processes such as Electric Discharge machining (EDM), Electro- Chemical machining (ECM), Ultrasonic Machining (USM), and Abrasive Jet machining (AJM)

Unit - 3 **06**

Un-Conventional Welding Processes: Principle and working and applications of unconventional welding processes such as Laser Beam Welding, Electron Beam Welding, Ultrasonic Welding, Plasma Arc Welding processes.

Unit-4 **06**

Explosive Welding: Cladding etc. Under water welding, Metalizing Theory, Process and applications

Unit - 5 **06**

Un-conventional forming processes: Principle and working and applications of high energy forming processes such as Explosive forming, Electromagnetic forming. Electro discharge forming Water hammer forming, Explosive Compaction

References:

1. Modern Machining Process, P.C. Pandey
2. Un-conventional machining, V.K. Jain

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BVPDT604
RELIABILITY, MAINTENANCE AND SAFETY ENGINEERING

Unit - 1 **06**

Reliability-

Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability

Unit - 2 **06**

Constant Failure rate model-

Exponential Reliability function, Failure Modes, CFR model, memory lessness, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement.

Unit - 3 **06**

Design for reliability-

Reliability specifications and system measurements, System Effectiveness, redundancy, Classification of Redundancy, Introduction of failure mode and effect analysis (FMEA)

Unit - 4 **06**

Maintainability-

Analysis of Downtime, repair time distribution, stochastic point processes.

Unit - 5 **06**

Safety engineering-

Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipments, Safety targets, standards, objectives

References:

Reliability Engineering, S.C. Sharma, Khanna Publishing House

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BVPDT605P
INDUSTRIAL TRAINING/ON JOB TRAINING/ WORKSHOP

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