Sri Ramakrishna Mission Vidyalaya College of Arts and Science Coimbatore – 641020

(An Autonomous College Re-Accredited with "A" grade by NAAC and Affiliated to Bharathiyar University, Coimbatore)

B.Voc., Degree course (Three years)

Production Technology (Tool & Die)

(An UGC sponsored DDU-KAUSHAL KENDRA Programme)

SYLLABUS

(ACADEMIC YEAR 2020-2021 Onwards)

Sri Ramakrishna Mission Vidyalaya College of Arts and Science
(AUTONOMOUS)

For Students admitted from 2020-2021 & onwards

COURSE OF STUDY

- Syllabus is framed for B.VOC in Production Technology (Tool & Die) according to UGC norms and National Vocational Education Quality Framework
- There are 2 components. They are General components of 24 credits and Skill components of 36 credits.
- One credit is equal to 15 hours for theory and 30 hours for practical. Practical could be either in the campus or in the working place of the Industry.

ELIGIBILITY:

- Candidates who have successfully completed their Higher Secondary (10+2) will be eligible for admission.

Programme Educational Objectives

The Department of Production Technology (Tool & Die) provides the best learning resources for the students which aimed at bridging the gap of industry requirement in the field of production and maintenance of tool and die by providing earn while you learn facility and OJT's.

The program educational outcomes are given below:

PEO1: Making students knowledgeable in basic science, mathematics and basic machining operations.

PEO2: Imparting analytic skills to develop initiatives and innovative ideas for industrial as well as societal needs.

PEO3: Providing students the required theoretical and practical knowledge in the field of tool and die making.

PEO4: Imparting the qualities of team work as well as social, interpersonal and leadership skills and an ability to adapt professional environment.

PEO5: Evaluating that the students have adequate knowledge and skills, so that they are work ready at exit point of the programme.

Programme Outcomes:

- Ability to apply the knowledge of basic engineering principles in tool and die making.
- Ability to analyze and solve the problems.
- An ability to use the techniques, skills and modern engineering tools.
- An ability to design a system, component or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
- An ability to function on multidisciplinary teams.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- Recognition of need for, and an ability to engage in life-long learning.

BASICS OF PRODUCTION ENGINEERING

Course code	20KUP1C01	Credits	04	Year	I
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	I

OBJECTIVES:

- Basic concepts of Production
- Casting Technologies
- Basic measurement and measuring instruments
- Properties of Materials

OUTCOMES:

CO1	Understand the basic concepts of Manufacturing	**K1 & K2**
CO2	Develop the knowledge in various casting technologies, measurement, properties of different materials, metal forming and powder metallurgy.	**K2 &K3**
CO3	Explain principles and process of Forging, Rolling, Extrusion, drawing and designing of die	**K2&K4**
CO4	Acquire an overview of mechanical measurement systems and principle of instruments for motion and dimension measurement.	**K2,K3&K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M		S	M	M	M	L
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	S	M	L		S	S	S	L	S
CO4	M	S	S	M	L		S	M	S	L	M

S – Strong; M – Medium; L - Low

Unit I

Introduction: Internal forces, Stresses and strains, Types of stress and strain, Elasticity, Hooke's law, Poisson's ratio, Elastic constants and their relationship. Stress-strain diagram for ductile materials. Definition of creep, fatigue and stress relaxation. Types of materials - Properties of materials : Hardness, ductility, weldability, machinability, elasticity, plasticity, malleability, etc.,

Unit II

Introduction - Casting - Casting types - procedure to make sand mould - types of core making - moulding tools - machine moulding - special moulding processes – CO2 moulding - shell moulding - investment moulding - permanent mould casting - pressure die casting - centrifugal

casting - continuous casting - casting defects - Basic steps in the process of metal casting; Patterns: Materials, types and design of Patterns, Pattern, Pattern allowances.

Unit III

Principles and applications of the following processes: Forging - Rolling - Extrusion - Wire drawing and Spinning - Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy.

Unit IV

Measurement – Types of measurement – Direct and indirect - Linear measurement - Angular measurement - Profile checking - Calipers : Vernier, inside, outside - Gauges : Plug, Ring, Thread, Slip, Feeler, Vernier height gauge, Vernier Depth gauge - Micrometer : Outside, Inside, Depth - Least count.

Unit V

Quality – Visual inspection – Measuring instruments – Types – Error – Calibration – Range – Selection - Measurements – System of measurement – Imperial system – Metric system – Quality standards - Quality control procedures – Inspecting equipments – Inspection – Hazards – Equipments.

REFERENCE:

- Complete casting handbook 1st and 2nd Edition by John Campbell, Aug 2011 and 2015.
- Applied metrology for Manufacturing Engineering by Ammar Grous.
- Engineering Metrology and Instrumentation by R.K.Rajput.
- Materials Science and Engineering by Callister.
- Powder Metallurgy Technology by G S Upadyay.

PRODUCTION TECHNOLOGY - I

Course code	20KUP1C02	Credits	04	Year	I
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	I

OBJECTIVES:

- Safety in working environment
- Fitting and its Types
- Importance of Lathe
- Types and various operations performed in a Lathe
- Safety in Lathe
- Various special attachments in Lathe

OUTCOMES:

CO1	Develop the ideas to do any type of fitting in metal components.	**K1 & K2**
CO2	Gain knowledge to operate a lathe to produce any component.	**K1, K2, K3**
CO3	Understand the importance to work safety in a workshop.	**K1, K2, K3**
CO4	Deliberate features and applications of reciprocating machine tools like shaper, planer andslotting machine	**K1,K2&K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M		S	M	M	M	L
CO2	S	S	S	S	M		S	S	S	S	M
CO3	S	S	M	S	S		S	S	S	S	M
CO4	M	M	S	S	L		S	S	M	S	S

S – Strong; M – Medium; L - Low

Unit I:

Working safety – Health and safety – environmental and operating conditions – Safety considerations – Personal protective equipment (PPE) – Safety regulations – Tools and equipments – Hand tools – Machine tools - Safety Instructions.

Unit II

Fitting – Types of fitting – Fitting tools – Equipments – Reporting – Preparation of work area – Selection of raw materials – Inspection - Selection of tools and equipments – Work holding devices – Marking – Templates – Transfer / Trace – Hand tools and manually operated machine tools for fitting – Assembling – Inspection.

Unit III:

Various operations in fitting – Drilling, Reaming, Boring, Tapping – Assembling equipments – Fasteners – Adhesives – Soldering – Brazing – Dismantling and assembling – Problem solving – Tool and die – Measure – Inspect – Procedure.

Responsibility – Allocation of responsibility – ensure and inspect – Release drawings, machining specifications, process planning, production planning to operators – Selection of tools – Selection of equipments – Selection of materials.

Unit IV

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

Unit V

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle.

REFERENCE:

- Fitting and machining by Ron Culley published by TAFE Publications.
- Mechanical Technology Grade 10: Fitting and machining learner book by D Meyer and BH Van Der Westhuizen.
- Fitter trade theory by Balbir Singh.
- The Lathe book : A complete guide to the machine and its accessories by Ernie Conover
- The metal Lathe by David J Gingery

PRODUCTION TECHNOLOGY - II

Course code	20KUP2C03	Credits	04	Year	I
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	II

OBJECTIVES:

- Various machineries used in production.
- Various types of milling and grinding machines.
- Importance of special machines in production.

OUTCOMES:

CO1	Gain knowledge to operate all the special machines used in production.	**K1 , K2, K3**
CO2	Understand concepts of machining for selection of appropriate machining parameters, and cutting tools for Milling Machine.	**K1, K2, K3**
CO3	Gain the knowledge to utilize the tools of grinding wheels.	**K1, K2, K3**
CO4	Exhibit operation such as Turning, Facing, Threading, Knurling and Grooving onCentre Lathe.	**K1, K2, K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M		S	M	M	M	L
CO2	S	S	S	S	M		S	S	S	S	M
CO3	M	S	S	M	L		S	S	S	M	L
CO4	M	S	M	M	L		S	S	M	S	S

S – Strong; M – Medium; L - Low

Unit I

Milling – Types of milling – Milling machine – Types – Constructional features – Main parts – Working principle – Inspection of machine – Cutters – Types – Work holding devices – Cutter holding devices – Flexibility of machine – Various operations – Gear cutting – Indexing head - indexing mechanism - Cutter - Types of cutter - Selection of cutter.

Unit II

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding - Typical applications - Grinding wheel – Designation – Preparation – Abrasives and types.

Unit III

Bond - Types of bonds – Materials – Preparation – Types – Various operations – Mounting of grinding wheels – Steps in mounting - Safety considerations – Speed – Feed – Depth of cut –

Surface finish – Factors affecting surface finish - Dressing and truing of wheels – Cutter – Diamond cutter.

Unit IV

Work holding devices – Selection – Set – Mark – Prepare the work – Selection of tool – Stone – Wheel – File – Abrasives – Specification of grinding wheel – Factors considered for selection – Bond – Types – Wheel types – Cut-off discs (Diamond blade) – Abrasive grinding discs – Grinding stones – Wire brush wheels.

Unit V

Control setting – Work handling – Grinding machine – Types – Angle grinders – Bench grinders – Straight grinders – Rotary die grinders – Disc grinder – Electronic grinder – Electric grinder – Hydraulic grinder – Pneumatic grinder – Pedestal grinder – Cylindrical grinder – Inspection – Surface finish – Geometric dimensions – Common surface imperfections – Errors – Texture – Roughness – Secure tools and equipments – Repairing – Maintenance – Types – Documentation – Job card – Progress reports – Incident reports – Support – Monitor.

REFERENCE:

- Machinist handbook for the apprentice by David B Smith
- Fundamentals of Machining processes : Conventional and Nonconventional Processes by Hassan Abdel - Gawad Ei-Hofy.
- Milling - A complete course by Harold Hall
- Grinding Technology 2nd Edition by Stephen Malkin and Changsheng guo, May 2007.
- Handbook of machining with grinding wheels by by Ioan D. Marinescu, Mike P. Hitchiner, Eckart Uhlmann, W. Brian Rowe.

ADVANCED PRODUCTION TECHNOLOGY

Course code	20KUP3C04	Credits	04	Year	II
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	III

OBJECTIVES:

- Understand concepts of Computer Numerical Control.
- Fundamentals of CNC, EDM, IM and AM.
- Understand the conventional and unconventional machining processes.
- Importance of CNC, EDM, IM and AM.

OUTCOMES:

CO1	Recognize commonly used terminology and componentry utilized in injection molding.	**K1,K2&K4**
CO2	Develop knowledge to operate CNC machines, EDM and IM machines.	**K1,K2&K3**
CO3	Learning a part program for any component and setting up in machines.	**K1,K2, K3&K4**
CO4	Understand and find the ideas to select the AM process for a particular job.	**K1,K2&K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1											
CO2	M	S	M	S	M		S	M	M	M	L
CO3	S	S	S	S	M		S	S	S	S	M
CO4	S	S	M	S	S		S	S	S	S	M

S – Strong; M – Medium; L - Low

Unit - I

Types of plastics - Characteristics of the forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of Injection moulding – Plunger and screw machines – Blow moulding – Rotational moulding – Film blowing – Extrusion - Typical industrial applications – Processing of Thermosets – Working principles and typical applications - Compression moulding – Transfer moulding.

Unit II

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 III

Introduction - Co-ordinate positioning (Absolute, Incremental), use of sub routines, macros and canned cycles- CAD/CAM CNC Program – Tooling and work holding devices – Symbols used in program – Address characters function – G codes and M codes- identify different parts of the CNC turning machine - Carry out setting for CNC turning center – Set up of machine – Perform the necessary checks before allowing the machine to operation in full program run mode – Checks – Measure all dimension as per specification – Basic maintenance activities.

Unit - IV

CNC Machines – 2 axis CNC m/c – 3 axis m/c centre (VMC,HMC) terms in programming – Checks – CNC Programming operation – Preparing, Loading, storing in appropriate format providing part program, trial runs – Simulation [Command and format] – Reference position – Cutter radius offset – Tool length offset] – Cutter compensation function.

Turning operations : straight turning, taper turning, facing, grooving, parting off, thread cutting, drilling, reaming, boring, etc.,

Milling operations: e.g. milling of flat services; gang and straddle milling; milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, slitting, key way cutting, face slot cutting, woodruff cutting, dovetail cutting, etc.

Unit - V

Overview **–** Need - Development of Additive Manufacturing Technology -Principle **–** AM Process Chain- Classification **–**Rapid Prototyping- Rapid Tooling **–** Rapid Manufacturing **–** Applications- Benefits **–** Case studies - Basics of Photo polymerization - Powder Bed Fusion - Extrusion Based System - Sheet Lamination Process - Droplet formation technologies - Three Dimensional Printing - Beam Deposition Process.

REFERENCE:

- Injection Molding Reference Guide by Jay.W.Carender
- CNC Machines by B.S.Pabla and M.Adithan : New age international publishers
- CNC Programming handbook by Peter Smid
- EDM handbook by E.Bud Guitrau
- Electrical Discharge Machining by Dr M P Jahan
- Tom Page “Design for Additive Manufacturing” LAP Lambert Academic Publishing, 2012.
- Andreas Gebhardt “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing” Hanser Gardner Publication 2011.

TECHNICAL DRAWING

Course code	20KUP4C05	Credits	4	Year	II
No. of Lecture Hours	60	No. of Practical Hours	-	Sem	IV

Objectives:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

Course Outcomes (CO)

CO1	Apply the Skill in the Geometric construction.	**K3**
CO2	Understand and Develop the Orthographic and Isometric projections.	**K2 &K3**
CO3	Remember the symbols widely used in Electrical and Electronics circuits.	**K1**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	M	S	M	L	M		M	S	M	L	L
CO2	M	S	M	L	M		M	S	M	L	L
CO3	S	S	M	L	S		M	S	M	L	L

S – Strong; M – Medium; L - Low

Unit I - Geometrical construction

Triangle (Equilateral triangle, Right angle triangle, Isosceles triangle, Acute triangle) -Rectangle, Rhombus, Trapezium, Circles -Regular Polygons (Square, Pentagon, Hexagon, Heptagon, Octagon)-Parabola (Tangent method, Offset method)-Ellipse (Parallelogram method, Four centre method, Concentric circles method)-Hyperbola-Cycloids -Involutes -Helix -Spiral curves.

Unit II-Projections

Orthographic (first angle and third angle) (10 simple exercises each) - Isometric (5 simple exercises) - Oblique (2D and 3D wire frame models) (3 simple exercises) - Blue print reading (Missing views - Missing Lines - Missing dimensions)

Unit III- Sectional View

Types of sectional view (Full section, Half section, Aligned section, Offset Section, Revolved Section, Removed section) - Detailing view.

Unit IV -Electrical and Electronics Symbols

Symbols of – DC armatures – alternators – field winding shunt, series and compound – relays – contactors – fuses – main switch – electric bell – earth – aerial – DPST – DPDT – TPST – Network link – ammeters – voltmeters – wattmeter – energy meters – frequency meters – power factor meters – timers – buzzers – transformers – auto transformers- Incandescent lamp- Fluorescent Lamp -Signal lamp- Push button- Fire alarm – Siren- Water Heater- Ceiling Fan- Exhaust Fan –

Resistors – inductors – capacitors - diodes – transistors – FET – SCR – UJT – DIAC – TRIAC – MOSFET'S - LOGIC GATES – AND – OR – NOT – NAND – NOR – EXOR

Unit V- Introduction to AutoCAD

History of AutoCAD-Applications- Advantages over manual drafting - hardware requirements – software requirements – window desktop – AutoCAD screen interface – menus – toolbars - How to start AutoCAD – command groups – How to execute command – types of coordinate systems – absolute-relative-polar- Simple sketches (lines and curves)

Text Books:

1) Gopalakrishnan K.R., "Engineering Drawing" (Vol I & II combined), Subhas stores, Bangalore -2007

2) Shah M.B., and Rana.B.C., " Engineering Drawing", Pearson, 2nd edition, 2009.

Open Elective - I

1. **Principles of management**
2. **Personality Development and Human Behaviour**

Open Elective I- PRINCIPLES OF MANAGEMENT

Course code	20KUG4EA1	Credits	4	Year	II
No. of Lecture Hours	60	No. of Practical Hours	-	Sem	IV

Objectives:

- Study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

Course Outcomes (CO)

CO1	Understand the basic managerial functions of an organization	**K1**
CO2	Develop the leadership qualities and planning attitude	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	L	L	L	S	M		L	M	M	S	S
CO2	M	M	M	S	M		L	S	S	S	S

S – Strong; M – Medium; L - Low

UNIT I: INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

Definition of Management – Science or Art – Manager – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises –Current trends and issues in Management.

UNITII: PLANNING

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning Tools and Techniques – Decision making steps and process.

UNIT III: ORGANISING

Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management.

UNIT IV: DIRECTING

Meaning, Principles and Functions- Motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V: CONTROLLING

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – direct and preventive control – reporting.

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, " Management", Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

Open Elective I - PERSONALITY DEVELOPMENT AND HUMAN BEHAVIOUR

Course code	20KUG4EB1	Credits	4	Year	III
No. of Lecture Hours	60	No. of Practical Hours	-	Sem	VI

Objectives:

- To update the knowledge of schools of psychology and recent trends of psychology.
- To be familiarized with the developmental changes in various development stages across the life span.
- To equip the knowledge of personality, intelligence, motivation, perception, learning and attitude.
- To understand the importance of developmental stages of psychology and Health Psychology in social work practice and be able to know the real life situations.

Course Outcomes (CO)

CO1	Enhance the knowledge in the field of psychology.	**K1 &K2**
CO2	Importance of personality, intelligence, motivation, perception, learning and attitude in day to day life.	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	L	L	L	S	M		L	S	M	S	S
CO2	L	L	L	S	M		L	S	M	S	S

S – Strong; M – Medium; L - Low

UNIT – I

Psychology: Definition - **Schools of Psychology:** Structuralism, Functionalism and Gestalt - **Recent trends:** Biological, Psychodynamics, Cognitive, Behavioural, Humanistic – Branches of psychology, Application of Psychology in Social Work.

UNIT – II

Evolution of human life: Conception – Stages of Prenatal development a) Period of Ovum, b) Period of embryo, c) Period of Fetus – Birth and its types - Pre and Post natal care –

Human growth and development: Developmental tasks, Hazardous, Physical, Social, Emotional and Cognitive development of Infancy, Babyhood, Childhood, Puberty, Adolescence, Adult, Middle age, Old age (Applicable wherever relevant).

UNIT – III

Personality: Definition and Characteristics - **Major approaches to personality:** Trait, Learning, Biological, Humanistic, Freudian and Neo Freudian - Assessment of personality - Influence of Heredity and Environment in one's personality development

Intelligence: Definition - **Theories of intelligence:** Unitary, Multi-faction, Two factor, Group factor, Hierarchical – Types of intelligence **-** Measurement of intelligence – Classification of I.Q – Mentally retarded – Gifted - **Motivation**: Definition, Human needs and motivation – Interaction of motivation – **Theories of motivation:** Instinct, Drive reduction, Arousal, Incentive, Cognitive, Maslow's Hierarchy.

UNIT – IV

Perception: Definition, Characteristics, Perceptual processes, Factors influencing perception, Depth perception and Motion perception, Perceptual illusion, Subliminal perception and Extra sensory perception - **Learning**: Concept and **types of learning:** Cognitive, Sensory, Motion and Verbal learning – **Theories:** Trial and error, Classical conditioning, Operant conditioning, Insightful – Transfer of learning - **Attitude:** Definition, Nature, Components of attitude and their Consistency, Prejudice, Process of attitude change.

UNIT – V

Health Psychology: Stress, Factors influencing stress, Stress reduction strategies (Coping, relaxation, Meditation, Group, Music, exercise and relationship therapies) – Defense mechanisms – A brief idea on major psychiatric illness – Significance of mental health – Role of social workers in promoting mental health.

REFERENCE:

1. Feldman Robert. S. (2006). *Introduction to Psychology*. New Delhi: Tata Mc Graw Hill.
2. Mangal. S.K. (2007). *General Psychology*. New Delhi: Sterling.
3. Pankajam. G. (2005). *Know your Child*. New Delhi: Concept.
4. Pathak Shalini. (2007). *Human Development*. New Delh:,Sonali.
5. Sharma. K.K. (2003). *Principles of Developmental Psychology*. Jaipur: Sublime.

DRAFTING AND PLOTTING

Course code	20KUP4C06	Credits	04	Year	II
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	IV

OBJECTIVES:

- To understand the need of Drafting and plotting
- To understand the design requirements
- To create and modify the design

OUTCOMES:

CO1	Developing the knowledge to create and edit the designs.	**K1 & K2**
CO2	Appreciate the standard drawing codes and practices which is required for producing engineering drawings.	**K1K2,K3&K4**
CO3	Understand the concepts of design outputs.	**K2, K3&K4**
CO4	Relate AutoCAD knowledge to current applications used in the modern world.	**K2,K3&K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M		S	M	M	M	L
CO2	S	S	S	S	M		S	S	S	S	M
CO3	M	S	S	S	L		S	S	M	M	S
CO4	S	S	S	S	L		S	S	M	M	S

S – Strong; M – Medium; L - Low

UNIT - I

Intro of CAD - CAD Workspaces - Using The Application Menu, Ribbon And The QAT-Command Line, Dynamic Input And Auto Complete- Toolbars, File Tabs And The Menu bar-Pallets And Short Cut Menus-Using Function Keys And Command Aliases- The Status Bar-An Introduction To Model Space And Paper Space- Quick Access the Drawings

UNIT - II

Start and Quitting CAD-Object Selection Methods, Undo Command- Working With Specific Units- Working With The Coordinate System- Using The Grid System With The Snap Feature-Pan , Zoom, Osnap, Ortho and Grips- Project related to until this Chapter

UNIT – III

Lines, Polylines and Their Uses-Arcs, Circles and its types-Points and Their Styles- Polygons , Rectangles And Ellipses- Methods To Create Precise Objects- Project related to until this Chapter. Trim and Extend Lines- Delete - The Move And Copy Commands - Stretching, Rotating and Scaling Objects- Offset and Mirror- Fillet And Chamfer- Types of Arrays and Object Properties- Project related to until this Chapter

UNIT – IV

Creating and Editing Layers- Layer Properties and Manager- Freeze, Thaw, On, Off, And Lock Dimensions and its Styles- Dimensioning Tools And Settings- Multi leaders- Single and Multiline Text- Text Styles and Tables- Chapter Project

UNIT – V

Intro about Blocks and its uses- Creating Blocks and Editing Blocks- Inserting Blocks And Using Them- Attributed and Dynamic Blocks- The Effect Of Exploding Blocks- Chapter Project
The Difference between Model Space And Paper Space - Viewports , Page Setup and Plotting- Export Your File

REFERENCE:

- A text book of Engineering drawing by Roop Lal and Ramakant Rana
- Engineering graphics with Autocad by D.M.Kulkarni, A.P.Rastogi, A.K.Sarkar

Open Elective II- TOTAL QUALITY MANAGEMENT

Course code	20KUG5EA2	Credits	04	Year	III
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	V

Objectives:

- To facilitate the understanding of Quality Management principles and process.

Course Outcomes (CO)

CO1	Gain the knowledge of Quality management principles and Techniques.	**K1**
CO2	Understand the importance of the Quality and apply in industry.	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	L	M	L	S	S		L	M	M	S	S
CO2	L	M	L	S	S		L	M	M	S	S

S – Strong; M – Medium; L - Low

Unit - I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention - Costs of quality.

Unit - II TQM PRINCIPLES

Leadership- Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDSA cycle, 5s, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

Unit - III TQM TOOLS & TECHNIQUES I

The seven traditional tools of quality - New management tools - Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT

Unit - IV TQM TOOLS & TECHNIQUES II

Control Charts - Process Capability - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

Unit - V QUALITY SYSTEMS

Need for ISO 9000 - ISO 9001:2015, ISO 29990:2010 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TEXT BOOK

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).
2. Janakiraman,B and Gopal, R.K, "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. L

Open Elective II- BUSINESS ORGANIZATION

Course code	20KUG5EB2	Credits	04	Year	III
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	V

Objectives:

- To understand the different types of business organizations.
- To understand the process of formation of business organization.

Course Outcomes (CO)

CO1	Understand the concept of business.	**K2**
CO2	Gain knowledge to start and run a business effectively in the modern society.	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	L	M	L	S	S		L	M	M	S	S
CO2	L	M	L	S	S		L	M	M	S	S

S – Strong; M – Medium; L - Low

Unit-I

Business: Concept- Objectives - Characteristics - Types and Qualities of a good Businessman. Business Organization**:** Concept- Characteristics of an ideal form of Business organization.

Unit-II

Forms of Business Organisation : Sole Trader, Partnership, Joint Stock Companies, Cooperative Organisation and Public Utilities - Merits and Demerits - Memorandum of Association and Articles of Association.

Unit-III

Company Management-Shareholders: Powers, Duties, Responsibilities and Functions-Composition of Board- Board of Directors: Functions -Chief Executive-Managing Director-Legal Restrictions-Provisions in the Companies Act.

Unit-IV

Methods of raising funds: Need and importance of ST & LT finance - Issue of Shares, issue of Debentures- Public deposits - assistance from Govt. and Industrial Financial Institutions borrowings from banks

Unit-V

Rationalisation: Definition- Objectives - Measures -Advantages-Automation- Business Combination: Concept– objectives - Causes - Types – Forms.

Books Recommended:

1. Y.K. Bhushan, Fundamentals of Business organization and Management, Sultan Chand & Sons, 2012.
2. N.Vinayagam, A Text Book of Business Organisation. Emarald Publications. 2011.
3. P.N.Reddy&S.S.Gulshan, Principles of Business Organization and Management, Eurasia Publishing House Pvt. Ltd., 2009.
4. KathiresanRatha, Business Organisation– Prasanna Publications. 2006.

CORE VIII: ORGANIZATIONAL BEHAVIOUR

Course code	20KUP5C07	Credits	04	Year	III
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	V

Objectives:

- To develop a sound theoretical knowledge and understanding of organizational behavior.
- To know how the people at work in an organization could be motivated to work together in harmony.
- To orient the student about leadership and perspective of organizational behavior.

Course Outcomes (CO)

CO1	Understand the values and importance to behave in an organization.	**K2**
CO2	Develop the skill of harmony to work together in the organization.	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	L	L	L	S	M		L	M	L	S	S
CO2	L	L	L	S	M		L	M	L	S	S

S – Strong; M – Medium; L - Low

UNIT – I

Organizational Behavior: Concept, Historical background, Approaches and Models of OB - Challenges and Opportunities for OB –**Behavioral Science foundation:** Sociology, Psychology & Anthropology.

UNIT – II

Individual Dimension of OB: Personality: Self–esteem, Self-efficacy, perception, values – **Attitude:** Job satisfaction, job involvement, Organizational commitment – **Work Motivation:** Theories (Content, process) – **Job Design:** Job rotation, Job enlargement, Job enrichment– **Learning Theories:** Behaviorist, Cognitive and Social learning, Principles of learning - Punishment & Reinforcement.

UNIT – III

Dynamics of OB: Groups & Teams - Conflict & Negotiation - Stress & Stress management – **Leadership:** Types (Charismatic, Transformational and Substitute), Approaches (Managerial grid approaches, Likert's four system approaches), Skills - Emotional intelligence and managerial test.

UNIT – IV

Perspective of OB: Use and Types of Information Technology in Communication (MIS, Telecommunication, E-mail & Voice messaging) – **Non Verbal Communication:** Body

Language & Paralanguage - **Decision making:** Group decision making, Delphi technique, Nominal group technique – Organizational Design – **Organizational culture and climate:** Definition and Characteristics.

UNIT – V

Organizational Change and Development: **Change:** Concept, Planned change, Resistance to change, Merges and Acquisitions - A**nalysis:** Tools, techniques - **Development:** Concept, ESOP (Employee Stock Ownership Plan), Downsizing, Smart sizing

Reference:

1. Amrik Singh Sudan & Kumar N. (2003). *Management Process and OB*. Delhi: Anmol Publications.
2. Don Hellriegel, John (etall). (1995). *Organizational Behaviour*. New York: West Publishing Company.
3. Jit S. Chandan. (1999). *OrganisationalBehaviour*. N. D: Vikas Publishing House.
4. Mishra M.N. (2001). *Organizational Behaviour*. Mumbai: vikas.

TOOL DESIGN - I

Course code	20KUP5C08	Credits	05	Year	III
No. of Lecture Hours	75	No. of Practical Hours	--	Sem	V

OBJECTIVES :

- Identify the Difference between Jig & Fixtures
- Explain possible freedom of movement of job in a jig, fixtures
- Study locating of work piece in a jig, fixture
- Explain mounting of jig on a machine tool
- Explain mounting of fixtures on the machine tool
- Design jig and fixtures
- Design of plug and snap gauges

OUTCOMES:

CO1	Understand clearly the tool design parameters of Jigs, fixtures and Gauges	**K1 & K2**
CO2	Develop the knowledge to differentiate jig and fixture	**K2 & K3**
CO2	Create ideas to draw the design of jig or fixture for a special purpose	**K2 & K3**
CO3	Understand the different types of Fixtures and Gauges	**K1 & K2**

- K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M		S	M	M	M	L
CO2	S	S	S	S	M		S	S	S	S	M
CO3	M	S	S	M	M		S	S	S	M	M
CO4	M	S	M	S	M		S	M	M	M	L

S – Strong; M – Medium; L - Low

UNIT - I

Introduction – Jigs and Fixtures – Difference between Jigs and Fixtures – Advantages of Jigs and Fixtures – Elements of Jigs and Fixtures – Fool Proofing – Materials used in Jigs and Fixtures – Degrees of Freedom - 12 degrees of freedom – 6 points location principle (or) 3-2-1 principle of location - Essential features of Jigs and Fixtures– General Design Principles – Design steps – Common defects in Jig Design.

UNIT - II

Principles of location – location point – types of locators – pins and studs – V block – cup and cone location points – adjustable locating points – special adjustable stops – location from

finished holes in the work – Diamond pin locator – types of clamps – lever clamp – hinged clamp – two way clamp – Swinging clamp – wedge clamp – eccentric clamping arrangement – Quick action clamp – Pneumatic and Hydraulic clamps.

UNIT - III

Materials for Jig bushing – press fit bushings – Fixed renewable bushings – slip renewable bushings – Liner bushings – screw bushings - miscellaneous type of drill bushings – bushing specifications.

Open drill jig – plate drill jig – template drill jig – channel drill jig – turn over drill jig – angle plate drill jig – closed box drill jig – leaf drill jig – Post jig – Pot jig - indexing drill jig – universal drill jig – design of template and leaf jigs.

UNIT - IV

Introduction: principles of fixture design – elements of fixtures – design consideration of locators and clamps for fixtures – types of fixtures – Design of turning fixtures - Mandrels – Type of mandrels - Boring fixtures – Milling fixtures – essentials of milling fixtures - method of locating milling fixtures with respect to cutter position – Grinding fixtures – surface grinding and cylindrical grinding.

UNIT - V

Introduction – limit gauges –Taylor's principle of limit gauging – Application of limit gauges – gauge makers tolerance – allowance for gauge wear – material for limit gauge – three basic types of limit gauges – Disposition of gauge tolerance and wear allowance – plug gauge – snap gauge – ring gauge – thickness and length gauges – recess gauge – step gauge – position and receiver gauges – IS specifications for gauges – Design of plug and Snap gauges.

Text Books:

1. Donoldson.C and Others, "Tool Design", Tata McGraw Hill, 1978

2. Kempster, "Introduction to Tool Design and Jigs and Fixtures", ELBS

Reference Books:

1. ASTME, "Hand book of Fixture Design"

2. Korsakov, "Fundamental of Fixture Design", MIR Publication, Moscow

3. Goroshkin.A.K., "Jigs and Fixtures Handbook", MIR Publication, Moscow

Houghton, "Jigs & Fixture Design

Open Elective III - PROFESSIONAL ETHICS AND HUMAN VALUES

Course code	20KUG6EA3	Credits	4	Year	III
No. of Lecture Hours	60	No. of Practical Hours	-	Sem	VI

Objectives:

- To understand what morality is and how it connects to professional ethics.
- To understand the features of moral reasoning, moral explanations and the role of moral theories.
- To develop a case resolution model for resolving moral dilemmas faced by professionals.

Course Outcomes (CO)

CO1	Create awareness of Ethics and moral values.	**K1 &K2**
CO2	Understand the importance of Ethics and code of conduct in business.	**K2 &K3**
CO3	Understand social responsibility in business and importance of human values	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	L	L	L	S	M		L	L	L	S	S
CO2	L	L	L	S	M		L	L	L	S	S
CO3	L	L	L	S	M		L	L	L	S	S

S – Strong; M – Medium; L - Low

Unit I:Business Ethics

Conceptual approach – Emerging issues – Importance of Ethics – Understanding Ethics – Ethical decision making – Moral problem

Unit II: Managing Ethical Organization

Elements of ethical organization – Manager's role in influencing ethical climate - Codes of ethics – Codes of Contact – Ethical leadership – Ethical organization.

Unit III: Business ethics in Profession

Ethical concern in Human Resource Management (HRM) – Ethical issue in marketing and advertising – Marketing ethics – Ethics in production management – work ethics.

Unit IV: Corporate Governance and social responsibility:

Corporate Governance – Company management – Factors for success – Social responsibility towards stakeholders – Social responsibility of business.

Unit V: Human Values

Wisdom Management – A person of character – Knowledge Management – Understanding success – Stress management

Text Book:

1. Business Ethics and Global Values by S.K Bhatia, Deep & Deep Publication Pvt. Ltd., New Delhi

SAFETY ENGINEERING

Course code	20KUP6C09	Credits	04	Year	III
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	VI

Objectives:

- To follow standard safety rules and concepts.
- To understand the Safety procedures in material handling.
- To understand the Road and Electrical Safety.

Course Outcomes (CO)

CO1	Understand the importance of safety.	**K2**
CO2	Able to handle the materials and tools safely.	**K2 &K3**
CO3	Follow the road and electrical safety.	**K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	M		M	M	M	S	S
CO2	S	S	S	S	S		S	S	S	S	S
CO3	S	S	S	S	S		S	S	S	S	S

S – Strong; M – Medium; L - Low

Unit-I Introduction

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety - Risk assessment & management - Safety Education and training- Importance, various training methods – First Aid, Resuscitation, Bleeding, management of shock, Burns, scalds and accidents caused by electricity, Rescue and transport of casualty Role of management and role of Govt. in industrial safety, safety analysis.

Unit-II Safety prevention

Definitions and theories, Accident, Injury, unsafe condition, Dangerous occurrence- Cost of accidents- Accident prevention- Safety performance - Personal protective equipment- survey the plant for locations and hazards, part of body to be protected - Economic importance of accidents, Analysis of accident records, accident investigations.

Unit-III Safety in Material Handling

General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, electrical

guards, work area, material handling, inspection - Heat treatment operations, paint shops, sand and shot blasting, safety in inspection and testing, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards.

Unit-IV Shop floor Safety

Automotive vehicle design, selection, operation and maintenance of motor vehicle - Basic automotive road Signals, Symbols, Rules and Regulation - safety on manual, mechanical handling equipment operations - Servicing and maintenance equipment grease rack operation wash rack
operation - battery charging - gasoline handling - other safe practices - preventive maintenance - check lists - motor vehicle insurance and surveys.

Unit-V Electrical Safety

General principles of electric safety - Preventive maintenance - Electricity & Human body - Earthing / Grounding - Safety against over voltage, extra-low and residual voltages - Hazardous areas, Electrical insulation - Energy leakage - Electrical fires and Arc flash - Electrical causes of fire and explosion - National electrical Safety code - Safety in the use of portable tools.

Text Books:

1. C.RayAsfahl ,*Industrial Safety and Health management,* Pearson Prentice Hall,2003.
2. N.V Krishnan. *Safety Management in Industry* Jaico Publishing House, Bombay, 1997.

Open Elective IV - ENTREPRENEURSHIP DEVELOPMENT

Course code	20KUG6EA4	Credits	04	Year	III
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	VI

Objectives:

- To understand the concept of Entrepreneur and entrepreneurship.
- To gain the knowledge about financial institutions.
- To understand the institutional setup, incentives and subsidies.
- To evaluate business ideas and to prepare the project report.

Course Outcomes (CO)

CO1	Understand concept of finance institutions, project report, incentives and subsidies.	**K2**
CO2	Develop the qualities to become an entrepreneur	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	M	L	S	M		L	M	M	S	S
CO2	M	M	M	S	M		L	M	M	S	S

S – Strong; M – Medium; L - Low

Unit I: Entrepreneurship

Meaning, Definition, Characteristics and Functions-Role of Entrepreneur in economic development -Types-Qualities of an Entrepreneurs - Classification of Entrepreneurs-Factors Influencing Entrepreneurship – Entrepreneurship development programme – Self Employment schemes – Government policies on Entrepreneurial development.

Unit II: Institutional Finance to Entrepreneurs

State Level Financial Institutions: State Financial Corporation (SFCS) - State Industrial Development Corporation (SIDCS) – Tamilnadu Industrial Investment Corporation (TIIC) - Small Industries Promotion Corporation of Tamilnadu (SIPCOT).

All Indian Financial Institutions:

Industrial Development Bank of India (IDBI) – Industrial Finance Corporation of India (IFCI) – Industrial Credit Investment Corporation of India (ICICI) – Industrial Rural Development Bank of India (IRDBI).

Unit III: Institutional Setup to Entrepreneurs

District Industries Centre (DIC) – National Small Industries Corporation (NSIC) – Small Industries Development Corporation (SIDC) – Small Industries Service Institute (SISI) – Indian Investment Centre – Kadhi and Village Industries (KVIC).

Unit IV: Incentives and Subsidies of State and Central Government

Subsidy For Market – Capital Assistance - Subsidized Services – Taxations, Benefits to SSI – Transport Subsidy – Seed Capital Assistance – Special Facilities for imports.

Unit V: Sources of Ideas

Preliminary Evaluation and Testing of ideas – Demand based industries and Resource based industries - Project Formulation - Project Identification-Evaluation-Feasibility Analysis-Project Report.

Text Books:

1. Radha V, Entrepreneurship Development, Prasanna Publication House, 2008.
2. KhakaSS, Entrepreneurship Development, S. Chand & Co. Ltd. 2010.
3. Vasant Desai. The Dynamics of Entrepreneurship Development and Management.
4. Gupta C. B, Srinivasan N.P. Entrepreneurship Development, S. Chand & Co. Ltd. 2011.

Open Elective IV -HUMAN RESOURCE MANAGEMENT

Course code	20KUG6EB4	Credits	04	Year	III
No. of Lecture Hours	60	No. of Practical Hours	--	Sem	VI

Objectives:

- To achieve a sound theoretical understanding about Human Resource Management.
- To develop knowledge and skill in handling Human Resource in an organization.
- To orient the student about the social compliance & Social Audit followed by an organization.
- To acquaint the student with the goals of the organization

Course Outcomes (CO)

CO1	Basic understanding and gain knowledge about the role and responsibilities of HR Manager.	**K2**
CO2	Develop the problem solving attitude.	**K2 &K3**
CO3	Develop the qualities to become an HR manager.	**K2 &K3**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	L	L	L	S	M		L	M	M	S	S
CO2	L	L	M	S	M		L	S	M	S	S
CO3	L	L	M	S	M		L	S	M	S	S

S – Strong; M – Medium; L - Low

UNIT – I: Introduction to Human Resource Management:

Human Resource Management: Definition, Objectives, Importance and Functions (An overview of Operative and Managerial) **– HRM Models:** Rational model, Social system model, Human resource development model - **Human Resource Policies**: Meaning, importance, types and formulation - Role of human resource manager.

UNIT – II: Acquiring Human Resources:

Human Resource Planning: Definition, Need, Process **– Job analysis:** Job Description, Job specification **– Recruitment:** Meaning, Sources of Recruitment (internal and external) – e recruitment - Recent trends in Recruitment - **Selection:** Meaning and Steps – Placement and Induction.

UNIT – III: Developing Human Resources:

Employee Training: Meaning, Objectives, Importance, Types, Methods, Needs for Training and Evaluation of Training effectiveness – **Human Resource Development:** Concept, Need, Interventions – **Performance Appraisal:** Objectives, Uses and **Methods:** Traditional and Modern methods (720 Degree performance appraisal system), Barriers of performance appraisal - Career planning, Succession planning and Competency map.

UNIT – IV: Compensation, Retaining and Controlling of Human Resource:

Wage and Salary Administration: Concept and Methods of Wages – Theories - Incentives – Job evaluation - Employee Benefits and Services. **Retaining of Human Resource**: Promotion: Meaning, purpose, types – Demotion – Transfer – Separation. **Controlling of Human Resource**: Human Resource Records: Meaning, objectives, importance, types and Principles of Record Keeping – Human Resource Reports – Human Resource Audit : Meaning, objectives, importance and scope – Human Resource Research: Meaning, objectives and techniques.

UNIT – V: Strategy of quality management:

Social Compliance: Definition, Meaning and Significance – **Social Compliance Audit:** Purpose, Obligations of employers, Audit process – **Social Compliance Standard:** SA 8000 (Social Accountability 8000) – **Social Compliance Training:** GSCP (Global Social Compliance Programme) – **Social Compliance Certification:** Principles, Significance of WRAP (Worldwide Responsible Accredited Production).

Strategy of quality management: Six Sigma, Keizen, TQM, TPM, QMS - ISO Systems, ISO Certification Schemes, **ISO types:** ISO 9001, 14001, ISO/TS 16949– Preparing an Organization for ISO Certification - **Quality assurance:** Mckinesey's 7s frame work, HR out sourcing – People Capacity Maturity Model (PCMM).

REFERENCE

1. Ahuja. (2002). *Personnel Management*. Luthian: Kalyani Publishing.
2. BiswajeetPattanayak. (2001). *Human Resource Management*. New Delhi: Prentice Hall of India Private Ltd.
3. Decenzo and Robbins. (2001). *Personnel/Human Resource Management*. New Delhi: Prentice Hall.
4. Jayagopal R. (1992). *HRD Conceptual Analysis and Strategies*. New Delhi: Sterling.
5. Lynton and Pareek. (1990). *Training for Development*. New Delhi: Vistar.

TOOL DESIGN - II

Course code	20KUP6C10	Credits	05	Year	III
No. of Lecture Hours	75	No. of Practical Hours	--	Sem	VI

OBJECTIVES:

- Explain the basics of Die casting process.
- Explain the working of die casting machines.
- Design die casting die
- Explain the design procedure for injection moulding.
- Explain the working of injection moulding machine
- Understand the intermediate injection moulding design concepts

OUTCOMES:

CO1	Understand the concepts of design for Die Casting Process.	**K1 & K2**
CO2	Analyze and access the use of casting processes in manufacturing andunderstand the working of various casting processes	**K2,K3 &K4**
CO3	Describe methods of Injection Moulding Processes.	**K1 & K2**
CO4	Developing the knowledge in design concepts for Injection Moulding Process.	**K2,K3 &K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze

	PSO1	PSO2	PSO3	PSO4	PSO5		PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M		S	M	M	M	L
CO2	M	S	S	M	M		S	S	S	M	S
CO3	S	S	S	S	M		S	S	S	S	M
CO4	S	S	S	M	M		S	S	S	M	S

S – Strong; M – Medium; L - Low

UNIT - I

Press Working Operations:- Operation for producing blanks – Shearing, cutting off, parting, blanking. Operation for cutting holes – Punching, piercing, slotting, perforating. Operations for progressive working – Notching, semi notching, lancing, parting, cutting off. Operations for size control – Trimming , slitting, shaving. Safety in press working.

Press Working Mechanism:- Presses according to their functions – energy producing press, force producing presses, stroke controlled presses. Press according to their energy supply –

Mechanical, hydraulic, Pneumatic, electromagnetic presses. Presses according to their construction – Solid or gap frame, open back inclinable, knee frame, horning, open end or end wheel. Press according to their operation – Single action, double action, triple action, multi slide press.

UNIT - II

Types of Die Construction:- Cut off, drop through, return type, compound, combination, continental, sub press, follow die, progressive die, transfer die, shuttle die. Function and nomenclature of die components:- Die, die set, die plate, punch, stripper plate, Die spring, rubber keeper, stripper bolt, solid stripper, knockout plate, hold down plate, pad plate, blank holder, pressure pin, die cushion. Attachment components – Dowel, screw, key. Miscellaneous components – Heal, stop block, bolster plate, backing plate, pilot, gauges, insert, cams, hinges and rockers.

UNIT - III

Die Casting Processes:- Hot chamber process, Cold chamber process, low pressure die casting process, advantages and disadvantages, comparison of hot and cold chamber processes, applications, heat transfer in the die and methods of controlling die temperature.

Die Casting Materials:- Types of die casting alloys –metallurgy, melting & casting procedure and application of zinc based die casting alloys, Aluminum base alloys, Magnesium base alloys, Copper base alloys , Lead base alloys and Tin base alloys.

Die Casting Machines:- Plunger machine, air machine, modern cold chamber machines. Die locking methods, injection systems, automatic cycle control, interlock and safety devices in die casting machines.

Die Casting Defects: Definition, causes and remedies of defects – Shrink holes, Gas holes, Segregation, Shrink cracks, Porosity, Cold shuts, Flow lines & Blooms, Foliations, Hard spots, Surface draws and Depressions, Soldering, sink mark and excessive flash.

UNIT - IV

Die Casting Die Design: Flow system – Importance, metal flow systems in die casting dies, goose neck, nozzle, sprue, runners systems, shock absorbers, gate, gate area, gate velocity, air vent, overflow, determination of gate area. Procedure to calculate runner and gating dimensions using PQ2 diagram, calculating runner and gating dimensions without PQ2 diagram. Consideration of specification of die casting machines. Ejection systems – need and working of ejection system, Types of ejection system – sleeve, ring, blade

Injection Moulding Machines: Basic parts and functioning of an injection moulding machine. Types of injection moulding machine (Screw type & Plunger Type) – Single stage and two stage – Clamping unit (Toggle & Hydraulic) - Types of nozzles – Typical injection. Moulding cycle, Cycle time - Machine specifications (Definition only).

UNIT - V

Functional systems of injection mould – Sprue and runner - Core and Cavity- Shrinkage calculation - Core and cavity dimension. Parting surface - clamping - direct, indirect - Cooling System – Cooling Integer type cavity plates – Cooling integer type core plate - Cooling bolster – Cooling cavity inserts – Cooling core inserts – Water connection and seals. (Concept & Description of design only) - Ejection system: Ejector grid - Ejector plates assembly – Ejector

rod, Ejector plate and ejector retaining plate - Methods of Ejection – Ejection from fixed half-Sprue puller.

Basic Procedure for Mould Design – Determination of mould size – Maximum number of cavities, Clamping force , Maximum clamping area, Required opening stroke. Computation of number of cavities, cavity layouts, number of parting lines, Design of runner and gate.

Alignment of Moulds: Functions of alignment, alignment with the axis of the plasticating unit, internal alignment and interlocking, alignment of large moulds. Changing of moulds – system for a quick change of moulds for thermoplastics, mould exchanger for elastomer moulds.

Text Books:

1. Pye.R.G.W., "Injection Mould Design", Affiliated East – west press pvt Ltd, 2000
2. Athalye.A.S., 'Injection Moulding", 2nd Edn., Multi Tech Publishing Co., 1998
3. George menges and Paul mohren, "How to make Injection moulds", Hawer publishers, 1991

Reference Books:

1. Briston and Gosselin, "Introduction to Plastics", Newnes-Butterworths, London, 1970
2. Mills.N.J., "Plastics", ELBS, 1986
3. Dominick V.Rosato and Donald V.Rosato., "Injection Moulding Hand Book", CBS Publishers & Distributors, Delhi, 1987
4. Athalye.A.S., "Plastics Materials Handbook", Multi Tech Publishing Co., 1995
5. Athalye.A.S., "Moulding of Plastics", Multi Tech Publishing Co., 1998