Examination Scheme
ADVANCED DIPLOMA COURSE
(FOUR SEMESTER COURSE)
IN
MACHINING

First Semester

Courses/ Subject	Curriculum		Maximum Marks			Credits
A. University Examination/ Assessment						
	Subject [Hours per week (Credit)]		Internal	End semester Exam.	Total	(Total 30)
1. General Component	Theory	Professional Communication [04(04)]	30	70	100	04
		Basic Measuring Tools & Usage [04(04)]	30	70	100	04
		Computer and IT Fundamentals [04(04)]	30	70	100	04
2. Skill Component	Theory	Basic Welding Technology [02(02)]	30	70	100	02
		Lathe Machine Tool [02(02)]	30	70	100	02
		Drilling Machine Tool [02(02)]	30	70	100	02
	Workshop Practice /Lab.	Basic Welding Technology Practical [06(04)]	30	70	100	04
		Lathe Machine Tool Practical [06(04)]	30	70	100	04
		Drilling Machine Tool Practical [06(04)]	30	70	100	04
					SGPA:	

This is NSQF Level 4 Course: After the completion of this one semester course the candidate will get certificate in MACHINING (Lathe and Drilling.

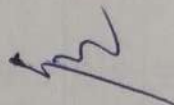For RAWAT ENGG.TECH.PVT.LTD.

Director

For SAMIKSHA INDUSTRIES

Proprietor

Syllabus for MACHINING (Lathe & Drilling) for Ist Semester Under Community College Scheme

Semester-I

GENERAL SUBJECTS	No. of Credits
Contents	
PROFESSIONAL COMMUNICATION	04
Communication- Meaning and objectives of communication, Channels of communication-Formal vs. Informal, Elements or Dimensions of Communication.	
Process of Communication. Elements of the communication process, Barriers in Business Communication and its classification, Modes of communication.	
Letter writing: Meaning, Parts of Letter, Different types of letters, Applications, Memo, Fax, and Internet, Resume writing.	
Report Writing- Meaning, Types of Report, Format of Report.	
BASIC MEASURING TOOLS & USAGE	04
Rule – purpose, types, description and method to use.	
Divider – purpose, types, description and method to use.	
Scriber – purpose, types, description and method to use.	
Marking Block – purpose, types, description and method to use.	
Punch – purpose, types, description and method to use.	
Micrometer – purpose, types, construction, calculation of least count, method to use and read, care and maintenance.	
Vernier Caliper – purpose, construction,	
Calculation of Vernier constant, method to use & read, care and maintenance.	
Vernier height gauge – purpose, types, construction, method to use and read, care and maintenance.	
Engineer's square– purpose, description and method to use.	
COMPUTER AND IT FUNDAMENTALS	04
Introduction: Computer history, Generations, Characteristic and Application of Computers, Classification of Computers, Basic computer organization and architecture.	
Computer Languages: Number system, Binary logical operations, Generation of Languages, Brief introduction to C/C++, Translators, Interpreters, Compilers, Flow Charts, Dataflow Diagram, Algorithms.	
Computer Networks and Internet: Elements of communication system, Brief introduction to Computer Networks- Introduction of LAN and WAN, Network Topologies, Layered Architecture, Internet & World Wide Web, Hypertext Markup Language, WWW, FTP, Telnet, Web Browsers	
Total No. of Credits	12

SKILL SUBJECTS	No. of Credits
Contents	
BASIC WELDING TECHNOLOGY	
Introduction, Classification of Welding, Importance of welding in engineering practice. General conditions for Welding, Common material that can be welded. Advantages and disadvantages of Welding over other joining methods. Various types of joints and end preparation. Electric arc welding, its principle, Arc welding machines and equipments, Classification of electrodes their specifications and selection, (AC and DC) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc Common welding defects and inspection. Introduction to gas welding, its principle of operation, types of gas welding flame and their applications, welding equipments used in gas welding and its demonstration, Common welding defects and inspections.	02
LATHE MACHINE TOOL	
Introduction to machining processes, Cutting tool materials, Lathe machnine tool introduction, Classification, Brief description of capstan and turret lathes, High performance Lathe. Working Principle of Lathe, Various parts of a Lathe and their functions, Accessories - Centres, dogs, chucks, collets, face plate, angle plate, mandrel, steady rest, taper turning attachment, tool post grinder, Specifications of Lathe, Lathe tools- Tool Holders, Chip, Breakers, Care of Lathe, Safety in using Lathe, Lathe Tools, Parameters/Nomenclature and applications. Lathe machine operations –plain and step turning, facing, parting off, Taper Turning, eccentric turning, drilling reaming, boring, threading and knurling. Setting of cutting parameters– Speed, feed and depth of cut for various materials and calculation machining time.	02
DRILLING MACHINE TOOL	
Introduction, Basic principles of drilling. Classification of Drilling Machines, Operations Performed on drilling machine -drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping. Speeds and feed during drilling, impact of these parameters on drilling, machining time. Specifications of Drilling Machine, Various types of Drills and their features, Tool holding Devices, Work holding Devices, Drill wear and Sharpening, Precautions in Drilling Operations. Types of reamers.	02
Total No. of Credits	06

SKILL SUBJECTS PRACTICALS	No. of Credits
Contents	
BASIC WELDING TECHNOLOGY PRACTICAL	
Safety, precautions and hazards of welding and its remedies in welding. Practice of striking arc while using electric arc welding set. Welding practice job on arc welding for making uniform and straight weld beads. Preparation of lap joint by arc welding. Preparation of Tee joint by arc welding. Preparation of geometrical edges/bevelling for butt joint for arc welding. Practice of single V/double V butt joint by using electric arc welding. Precautions while using Gas welding. Practice for ignition of different gas flames of welding. Preliminary joining practice by gas welding. Exercises of gas welding on Aluminium, Brass, Copper, C.I.	04
LATHE MACHINE TOOL PRACTICAL	
Setting of jobs on lathe machine. Familiarization with the gearbox and drivers used on the machine. Methods of holding work piece and tool using different devices. Two exercises on simple turning	04

Exercise based Step turning. Exercise based Taper turning. Thread cutting and knurling. Exercises in internal turning and threading. Advanced exercises in the use of different types of tools on the lathe. Drilling operation on Lathe machine with the help of the attachment	
DRILLING MACHINE TOOL PRACTICAL	
Use of simple measuring instruments such as steel rule, Vernier alliper, Inside/Outside Micrometer and calculations of least count of these instruments. Exercises on measurement of various geometrical shapes with help of Vernier alliper, Inside/Outside Micrometer. Making and drilling practice on mild steel pieces. Job setting on drilling machine and setting of cutting parameters. Practice of drilling, tapping. Counter boring, spot facing and counter sinking.	04
Total No. of Credits	12
Total Credit of the Semester	30

Examination Scheme
ADVANCED DIPLOMA COURSE
(FOUR SEMESTER COURSE)
IN
MACHINING

Second Semester

Courses/ Subject	Curriculum		Maximum Marks			Credits
University Examination/ Assessment	**Subject [Hours per week (Credit)]**		Internal	End semester Exam.	Total	(Total 30)
1. General Component	Theory	Mathematics [04(04)]	30	70	100	04
		Engineering Drawing and AutoCAD-2D [04(04)]	30	70	100	04
		Basic Electrical Machines[04(04)]	30	70	100	04
2. Skill Component	Theory	Basic of Milling Machine [02(02)]	30	70	100	02
		CNC Fundamentals [02(02)]	30	70	100	02
		Grinding [02(02)]	30	70	100	02
	Workshop Practice /Lab.	Milling Machine practicals [06(04)]	30	70	100	04
		Numeric Control Lab. [06(04)]	30	70	100	04
		Grinding Practicals [06(04)]	30	70	100	04
					SGPA:	

This is NSQF Level 5 Course: After the completion of this semester course the candidate will get Diploma in MACHINING

Syllabus for Machining (Milling & CNC Basics) for IInd Semester Under Community College Scheme

Semester-II

GENERAL SUBJECTS

Contents	No. of Credits
Mathematics	
Matrix: Algebra of matrices, inverse, elementary row/column transformation, linear dependence, rank of matrix, type of matrix, Eigen Pairs. Determinants: Elementary properties of determinants of second and third order, multiplication system of algebraic equation. Vector Algebra: Definition of vector and scalar quantities, addition and substration of vectors. Dot and cross product of two vectors. Angle between two vectors, applications of dot and cross product in Engineering problems. **Co-Ordinate Geometry** Straight Line: Equation of straight line in various standard forms Circle, Parabola, Ellipse, Hyperbola.	04
Engineering Drawing and AutoCAD-2D	
First and third angle projection of point, line and solids. Orthographic Projections of machine elements in first angle projection, selection of views, sectional views. Isometric views of solids. INTRODUCTION: Concept of AutoCAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode Drawing commands – point, line, arc, circle, ellipse, Editing commands – scale, erase, copy, stretch, lengthen and explode. Dimensioning and placing text in drawing area Sectioning and hatching Inquiry for different parameters of drawing entity. Assembly and detail drawings of the following using AUTOCAD: Tool post, Tail stock, Screw jack, Safety valves, Stuffing Box, Bench vice	04
Basic Electrical Machines	
Electric charges and their conservation. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor. Electric current, flow of electric charges in a metallic conductor, Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity. Series and parallel combinations of resistors; temperature dependence of resistance.	04
Total No. of Credits	12

SKILL SUBJECTS

Contents	No. of Credits
Basic of Milling Machine	
Specification and working principle of milling machine, Classification, brief description and applications of milling machines, Details of column and knee type milling machine. Milling machine accessories and attachment – Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment, spiral milling attachment, slotting attachment and rack milling attachment. Milling methods – up milling and down milling, Identification of different milling cutters and work mandrels Work holding devices. Milling operations – face milling, angular milling, form milling, straddle milling and gang milling. Cutting speed and feed, simple numerical problems. Indexing on dividing heads, plain and universal dividing heads. Gear Manufacturing Processes: Gear hobbing, Gear	02

shaping.	
CNC Fundamentals	
Introduction to Numerical Control of Machine NC Machines, CNC Machines, Direct numerical control, advantages of CNC Machines, Disadvantages of CNC machines, Parts suitable for CNC Machines. **Components of Numerical Control Systems** Basic components of Numerical Control system, Program of instructions, NC coding, Machine Control Unit, Machine tool, Numerical Control procedure **Classification of Numerical Control Machines** Classification based on feedback control- Open loop control, closed loop control, Classification based on control system, Features, Point to point control system, straight line control system, Continuous path or contouring control system, Method of listing coordinates of a point in NC/CNC system, Axis identification in NC/CNC machines.	02
Grinding	
Purpose of grinding, Various elements of grinding wheel – Abrasive, Grade, structure, Bond, Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS. Truing, dressing, balancing and mounting of wheel. Grinding methods – Surface grinding, cylindrical grinding and centre less grinding. Grinding machine – Cylindrical grinder, surface grinder, internal grinder. centreless grinder, tool and cutter grinder. Selection of grinding wheel.	02
Total No. of Credits	**06**

SKILL SUBJECTS PRACTICALS	No. of Credits
Contents	
Milling Machine practicals:	
To produce a rectangular block by face milling. Exercise on milling- slab milling, Gang milling and straddle milling. To produce internal threads on milling machine. To produce external threads on milling machine. To produce a gear by indexing device on a milling machine.	04
Numeric Control Lab.	
1. Study about CNC. 2. Study about DNC. 3. General flow of operation of CNC machine tool. 4. Study OF Parts suitable for CNC machine. 5. Open loop control of CNC. 6. Closed loop control of CNC.	04
Grinding Practicals	
1. Perform surface grinding operation on a rectangular bar. 2. Perform cylindrical grinder operation on a cylindrical bar. 3. Perform grinding operation on Lathe tools. 4. Perform grinding operation on drill bit. 5. Perform grinding operation on milling cutter.	04
Total No. of Credits	**12**

Total Credit of the Semester	
	30

Third Semester

Courses/ Subject	Curriculum		Maximum Marks			Credits
	Subject [Hours per week (Credit)]		Internal	End semester Exam.	Total	(Total 30)
1. General Component	Theory	Environmental Sciences [04(04)]	30	70	100	04
		Machine Drawing and AUTOCAD 3D [04(04)]	30	70	100	04
		Basic Production & Industrial Management [04(04)]	30	70	100	04
		Fundamentals Of Shaper Machine [02(02)]	30	70	100	02
2. Skill Component	Theory	Constructional Details of CNC Turning [02(02)]	30	70	100	02
		Fundamentals of Part Programming-I [02(02)]	30	70	100	02
	Workshop Practice /Lab.	Shaper Machine Lab [06(04)]	30	70	100	04
		CNC based practical's [06(04)]	30	70	100	04
		Fundamentals of Part Programming-I Lab. [06(04)]	30	70	100	04
					SGPA:	

Syllabus for Machining(CNC) for IIIrd Semester Under Community College Scheme

Semester-III GENERAL SUBJECTS	No. of Credits
Contents	
Environmental Sciences	04
Definition, scope and importance (the multidisciplinary nature of environmental science), Need for public awareness on environment, Role of individual in environmental Protection. Natural Resources Conservation Concepts. Forest Resources: Present status, uses and over-exploitation, deforestation, consequences of deforestation, forest and tribal people. Concept, structure, and components of an ecosystem. Abiotic and biotic variables. Definition, causes, *effects* and control measures *of* Air pollution Water pollution and thermal pollution, Marine pollution Noise and radioactive pollution Solid waste and their management (municipal, industrial (hazardous and non-hazardous), problems *of* solid waste disposal in Uttaranchal and Integrated Solid Waste Management (ISWM),Environmental hazards in Himalaya (floods, river blockades, cloud burst, landslides, earthquakes). Anthropogenic and natural environmental problems. Environmental ethics: issues and possible solutions. Climate change, global warming: causes, *effects* and mitigation (national and international efforts) Ozone layer depletion: causes, effects and mitigation (national and international efforts). Environmental Protection- Role of Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environmental Education, Women Education.	
Machine Drawing and AUTOCAD 3D	04
Screwed fasteners Thread nomenclature, Forms of thread, Thread series, designation, Representation of threads, Bolted joints, locking arrangement of nuts. **Keys and Cotters and Pin joint** Types of keys, Cotter joint or Knuckle joint **Shaft Couplings** Introduction, Rigid coupling or Flexible coupling **Riveted joints** Introduction, rivets and riveting, Types of rivet heads, Types of riveted joints, Boiler joint. **Assembly Drawing** Introduction, Engine parts-stuffing box, cross head **AUTOCAD 3D** Isometric Drawings by CAD :Drawings of following on computer: Cone, Cylinder, Isometric view of objects 3D Modelling: 3D modelling, Transformations, scaling, rotation, translation	
Basic Production & Industrial Management	04
Organization: Basics of Factory system, Principles of organization, types of organization. Plant Layout: Site selection, types of layout, factors affecting layout, plant building, materials handling devices in plant. **Production Management:** Basic Concept, Objectives and components of Production management, Production as a conversion process, Roles of Production manager. **Materials Management :** Definition and purpose of inventory, Different types of Inventory cost, Different types of Inventory systems, Basic concept of Economic Order Quantity, Inventory control method and Supply chain management, **Man Power Planning:** Basic concepts of Man Power Planning, Features, objectives, requirement and importance of man power planning.	

Contents	No. of Credits
Quality Management: Total quality management, ISO 9000 and ISO 14000, Basic concepts of Quality control. **Waste Management:** Introduction to waste management, Classification of waste, Waste reduction. **Production Planning & Control (PPC):** Introduction to PPC, Definition, objectives and importance of PPC, Functions and components of PPC, Demand management- Methods of demand forecasting, Basic concepts of Master production schedule (MPS), Introduction to JIT, KANBAN.	
Total No. of Credits	12

SKILL SUBJECTS

Contents	No. of Credits
Fundamentals Of Shaper Machine: Shaping, Planning and Slotting, Working principle of shaper,. Quick return mechanism applied to shaper machine. Types of tools used and their geometry. Specification of shaper machine. Speeds and feeds used for various processes.	02
Constructional Details of CNC Turning Machine structure, Slideways, Spindle, Drive units, Elements of motion transmission, location of transducer/control elements, Tool and work holding device, Swarf removal, Guarding and Safety. **Tooling for CNC Machines** Cutting Tools- index table inserts, tool holders, Work holding devices in CNC, Automatic tool changers, Multi pallet machines. CNC Machine control system	02
Fundamentals of Part Programming-I NC words- rapid transverse function (G00), Linear interpolation Function (G01), Circular interpolation function (G02/G03), Dwell function (G04), Programming formats, writing a part program, Machining in point to point, Machining along a straight line, Lathe operation, Programming for CNC milling machine operations, Cutter radius compensation.	02
Total No. of Credits	06

SKILL SUBJECTS
PRACTICALS

Contents	No. of Credits
SHAPER MACHINE LAB 1. Perform horizontal cutting operation on shaper. 2. Perform Vertical cutting operation on shaper. 3. Make angular surfaces with the help of shaper. 4. Perform irregular cutting operation on shaper. Make a keyway with the help of shaper.	04
CNC based practical's Various operation on Cutting Tools- index table inserts, tool holders, Work holding devices in CNC, Automatic tool changers, Multi pallet machines. CNC Machine control system.	04
Fundamentals of Part Programming-I Lab. Various Programming formats, Writing a part program, Programming for Machining in point to point, Programming for Machining along a straight line, Programming for Lathe operation	04
Total No. of Credits	12
	30

Total Credit of the Semester

Fourth Semester

Courses/ Subject	Curriculum		Maximum Marks			Credits
University Examination/ Assessment						
	Subject [Hours per week (Credit)]					(Total 30)
			Internal	End semester Exam.	Total	
1. General Component	Theory	Maintenance And Safety [04(04)]	30	70	100	04
		Introduction to Materials [04(04)]	30	70	100	04
		Basic Mechanics [04(04)]	30	70	100	04
2. Skill Component	Theory	Fundamentals of Part Programming-II [02(02)]	30	70	100	02
		CNC Tooling [02(02)]	30	70	100	02
		Fundamental of CNC Milling [02(02)]	30	70	100	02
	Workshop Practice /Lab.	Fundamentals of Part Programming-II Lab.[06(04)]	30	70	100	04
		CNC Tooling Lab. [06(04)]	30	70	100	04
		Various Operations on CNC Milling [06(04)]	30	70	100	04
					SGPA:	

This is NSQF Level 6 Course: After the completion of this semester course the candidate will get ADVANCE DIPLOMA in MACHINING (CNC).

Semester-IV GENERAL SUBJECTS	No. of Credits
Contents	
Maintenance And Safety Introduction: Necessity and advantages of testing, repair and maintenance, Economic aspects, manpower planning and materials management, Lubrication Systems: Lubrication methods and periodical lubrication chart for various machines (daily, weekly, monthly), Handling and storage of lubricants, Lubricants conditioning and disposal, Lubricant needed for specific components such as gears, bearings, and chains, Purpose and procedure of changing oil periodically (like gear box oil). Repairing: Common parts which are prone to failure, reasons of failure, Repair schedule, Parts that commonly need repair such as belts, couplings, nuts, and bolts. Maintenance: Definition, advantages, limitations and types of maintenance viz. preventive, breakdown, predictive Organization of maintenance. Accidents and Safety: Classification of accidents based on nature of injuries, event and place. Causes and effects of accidents. Accident-prone workers. Action to be taken in case of accidents with machines, electric shock, fires.	04
Introduction to Materials Introduction: Historical perspective, importance of materials, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bonding. Introduction to Crystallography and Imperfections. Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs. Strength, Toughness, Hardness, Fracture, Fatigue and Creep. Testing's such as Strength tastings, Hardness testing, Impact tastings, Fatigue testing Creep testing, Non-destructive testing (NDT).	04
Basic Mechanics **Introduction:** Definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics. Definition, basic quantities and derived quantities of basic units and derived units Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration Concept of rigid body, scalar and vector quantities **Laws of forces** Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, and characteristics of a force. Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces; resolving a force into two rectangular components. Free body diagram. Equilibrant force and its determination. Lami's theorem (concept only)	04
Total No. of Credit	12