Scheme and Syllabus

of

Programme

on

DIPLOMA

IN

MECHANICAL ENGINEERING

(TOOL AND DIE)

(2023-2026)

By

Department of Automotive Studies

Skill Faculty of Engineering & Technology

SVSU

Programme Co-ordinator : Ms. Ekta

Shri Vishwakarma Skill University

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(P.C.)
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Scheme for Diploma Programme in Mechanical Tool and Die in the following Table 1.

SEMESTER-1

Subject Code	Course Name	Credits			Hrs			Marks						
								Theory(T)			Practical(P)			Total
		L	P	TO	L	P	TO	I	E	TO	I	E	TO	(T+P)
23DMTH01	Applied Mathematics I	2	0	2	60	0	60	30	70	100	0	0	0	100
23DPHY01 23DPHY02	Applied Physics	1.5	1	2.5	45	30	75	15	35	50	35	15	50	100
23DCSE01 23DCSE02	Fundamentals of IT	1.5	2	3.5	45	60	105	15	35	50	35	15	50	100
23DENG01 23DENG02	English and Communication Skills	1.5	2	3.5	45	60	105	15	35	50	35	15	50	100
23DMEE01	Engineering Graphics and EDUCAD	0	3	3	0	90	90	0	0	0	70	30	100	100
23DMEE02	Basics of Mechanical Engineering	1.5	0	1.5	45	0	45	15	35	50	35	15	50	100
23DMEE03	Workshop Technology -I	2	0	2	60	0	60	70	30	100	0	0	0	100
23DMEE04	Workshop Practice- I	0	2	2	0	60	60	0	0	0	70	30	100	100
		10	10	20	300	300	600	160	240	400	280	120	400	800

SEMESTER-2

Subject Code	Course Name	Credits			Hrs			Marks						
								Theory(T)			Practical(P)			Total
		L	P	TO	L	P	TO	I	E	TO	I	E	TO	(T+P)
23DMTH02	Applied Mathematics II	2	0	2	60	0	60	30	70	100	0	0	0	100
23DCHM01 23DCHM02	Applied Chemistry	1.5	1	2.5	45	30	75	15	35	50	35	15	50	100
23DELE01 23DELE02	Basics of Electrical and Electronics Engineering	1.5	2	3.5	45	60	105	15	35	50	35	15	50	100
23DMEE05 23DMEE06	Mechanics of Solids	2	1	3	60	30	90	15	35	50	35	15	50	100
23DMEE07	Mechanical Engineering Drawing	0	3	3	0	90	90	0	0	0	70	30	100	100
23DETH01	Value Education and Professional Ethics	1	0	1	30	0	30	30	70	100	0	0	0	100
23DMEE08	Workshop Technology – II	2	0	2	60	0	60	30	70	100	0	0	0	100
23DMEE09	Workshop Practice – II	0	3	3	0	90	90	0	0	0	70	30	100	100
Total		10	10	20	300	300	600	135	315	450	245	105	350	800

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SEMESTER-3

Subject Code	Course Name	Credits				Hrs/Week				Marks						
										Theory(T)			Practical(P)			Total
		L	T	P	C	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
23DMEE10	Workshop Technology - III	3	0	0	3	3	0	0	3	30	70	100	0	0	0	100
23DMEE11 23DMEE12	Materials and Metallurgy	2	0	1	3	2	0	2	4	15	35	50	35	15	50	100
23DMEE13 23DMEE14	Jigs, Fixtures and Gauges	2	0	1	3	2	0	2	4	15	35	50	35	15	50	100
23DMEE15 23DMEE16	CNC Machines	3	0	2	5	3	0	4	7	15	35	50	35	15	50	100
24DEVS01	Environmental Science	2	0	0	2	2	0	0	2	30	70	100	0	0	0	100
23DMEE17 23DMEE18	Metrology and Quality Control	3	0	1	4	3	0	2	5	30	70	100	0	0	0	100
Total		15	0	5	20	15	0	10	25	135	315	450	105	45	150	600

SEMESTER-4

Subject Code	Course Name	Credits				Hrs/Week				Marks						
										Theory(T)			Practical(P)			Total
		L	T	P	C	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
23DMEE19	Forging & Die Casting	3	0	0	3	3	0	0	3	30	70	100	0	0	0	100
23DMEE20 23DMEE21	Plastic Moulds	2	0	1	3	2	0	2	4	15	35	50	35	15	50	100
23DMEE22 23DMEE23	Press Tool	2	0	1	3	2	0	2	4	15	35	50	35	15	50	100
	*Entrepreneurship Development	2	0	0	2	2	0	0	2	30	70	100	0	0	0	100
23DMEE24	Industrial Engineering	3	0	0	3	3	0	0	3	30	70	100	0	0	0	100
23DMEE25	Minor Project	0	0	2	2	0	0	4	4	0	0	0	70	30	100	100
23DMEE26	Computer Aided Drafting	0	0	4	4	0	0	8	8	0	0	0	70	30	100	100
Total		12	0	8	20	12	0	16	28	120	280	400	210	90	300	700

SEMESTER-5

Subject Code	Course Name	Credits				Hrs/week				Marks						
										Theory(T)			Practical(P)			Total
		L	T	P	C	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
23DMEE27	OJT/Industrial Training	0	0	20	20	0	0	40	40	0	0	0	245	105	350	350
Total		0	0	20	20	0	0	40	40	0	0	0	245	105	350	350

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SEMESTER-6																
Subject Code	Course Name	Credits				Hrs				Marks						
										Theory(T)			Practical(P)			Total
		L	T	P	C	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
23DMEE28	OJT/Industrial Training	0	0	16	16	0	0	32	32	0	0	0	245	105	350	350
23DMEE29	Major Project	0	0	4	4	0	0	8	8	0	0	0	70	30	100	100
	Total	0	0	20	20	0	0	40	40	0	0	0	315	135	450	450

From 3rd semester onwards:
1 credit Theory and Tutorial= 15 Hrs.
1 Credit Lab = 30 Hrs.
***Course will be provided by SFMSR.**

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SYLLABUS
SECOND YEAR (SEMESTER-III)
DIPLOMA IN MECHANICAL ENGINEERING
(TOOL AND DIE)

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Course Title	Workshop Technology-III	Course Code	23DMEE10			
Specialization	Professional Core Engineering	Structure (LTPC)	3	0	0	3
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering And Technology	Type	New √		Modification	
Pre-requisite		To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	The aim of this course is to develop knowledge about various machining processes and modern machining methods is required to be imparted.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understand grinding and finishing processes. **CO2.** Understand the working principle of metal forming processes. **CO3.** Understand the principle of metallic coating and finishing processes. **CO4.** Understand the working principles and applications of Unconventional machining processes. **CO5.** Understand the basic powder metallurgy process.					
Contents of the course	**Unit 1:** **Grinding and Grinding Machines** Introduction to grinding, Abrasives: Natural & Artificial, Bond materials and bonds: Vitrified, silicate, shellac, rubber etc. Factors affecting the selection of grind wheels: size and shape of wheel, kind of abrasive, grain size, grade and strength of bond, structure of grain, spacing, kinds of bind material. Standard marking systems: Meaning of letters & numbers sequence of marking, Grades of letters. Truing, dressing, balancing and mounting of wheel. Grinding machines classification: Cylindrical, Surface, Tool & Cutter grinding machines; Construction details; Principle of centreless grinding; Advantages & limitations of centreless grinding **Unit 2:** **Metal Forming Processes** Press Working - Types of presses, type of dies and punches, selection of press die, die material. Press Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping. Forging processes: Open die forging, closed die forging, Press forging, upset forging, swaging, up setters, roll forging, Cold and hot forging. Rolling of metals: Types of Rolling, Flat strip rolling, shape rolling operations, Defects in rolled parts and remedies Extrusion and Drawing: Principle of rod and wire drawing, tube drawing, principles of extrusion, types of extrusion: hot and cold extrusion, Direct and indirect extrusion **Unit 3:** **Metal Finishing Processes** Purpose of finishing surfaces. Surface roughness: definition and units, Honing Process, its applications, Description of hones. Brief idea of honing machines. Lapping process.					

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	its applications. Description of lapping compounds and tools. Brief idea of lapping machines. Polishing, Buffing, Burnishing and super finishing **Metallic Coating Processes** Introduction to Metal spraying, powder coating, electroplating. Basic principles and applications. **Unit 4:** **Unconventional machining and fabrication** Introduction to unconventional manufacturing processes. Principle and working of Electric Discharge machining (EDM), Electro Chemical machining (ECM), Electron Beam Machining (EBM), Ultrasonic Machining (USM), Abrasive Jet machining (AJM) and their applications. Principle and working of Laser Beam Welding, Electron Beam Welding, Ultrasonic Welding, Plasma Arc Welding processes. **Unit 5:** **Powder Metallurgy** Basic concepts of powder metallurgy, Methods of powder metallurgy, Process for powder metallurgy, Secondary operations for powder metallurgy, Applications, merits and limitations of powder metallurgy.
Textbook	1. B.S. Raghuwanshi, "A Course in Workshop Technology (Vol. II Machine Tools)". Dhanpat Rai and Sons, New Delhi, 2017. 2. O. P. Khanna & Lal, "Production Technology (Volume I & II)", Dhanpat Rai Publications. 3. S. K. Choudhry, Hajra and Nirja Roy, "Elements of Workshop Technology (Vol. II Machine Tools)'', Media Promoters and Publishers Pvt. Ltd., Fifteenth Edition, 2016. 4. B. L. Juneja, "Fundamental of Metal Forming", New Age International Limited, Delhi.
References	1. P. C. Sharma, "A Text Book of Production Engineering'', S Chand and Company Ltd., Delhi, Eleventh Edition, 2013. 2. R. K. Jain, " Production Technology", New Delhi, Nineteenth Edition, 2019. 3. P. N. Rao, "Manufacturing Technology Volume –II'', Tata McGraw Hill, Delhi, Fourth Edition, 2019.

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Course Title	Materials and Metallurgy	Course Code	23DMEE11 23DMEE12			
Specialization	Professional Core Engineering	**Structure (LTPC)**	**2**	**0**	**1**	**3**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			

Course Objective:	The aim of this course is to teach students basics of metal structure, properties, usage and testing of various ferrous and non ferrous materials and various heat treatment processes for developing knowledge about the characteristics, testing and usage of various types of materials used in industries.
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Distinguish between metals and non metals and ferrous and non ferrous materials. **CO2.** Analyze microstructure and changes in microstructure due to heat treatment. **CO3.** Carryout various heat treatment processes **CO4.** Draw and interpret iron-carbon diagram. **CO5.** Distinguish various grades of Stainless steel and the relative selection of fabrication process depending upon the metallurgy of SS
Contents of the course	**Unit 1:** **Introduction** Material: Engineering materials, Overview of different engineering materials and applications, Importance, Classification of materials, Difference between metals and non-metals. **Unit 2:** **Crystallography** Fundamentals: Crystalline solid and amorphous solid, Unit Cell, Space Lattice, Arrangement of atoms in Simple Cubic Crystals, BCC, FCC and HCP Crystals, Number of atoms per unit Cell, Atomic Packing Factor, coordination number (without derivation), Defects/Imperfections, types and effects in Solid materials. **Unit 3:** **Metallurgy** Introduction, Cooling curves of pure metals, Fe-C phase diagram. Effect of grain size on material property, Deformation behavior of materials. **Unit 4:** **Metals and Alloys** Ferrous Metals: Steel and Cast Iron, their property and classification & applications in automotive industries. Effect of alloying elements on properties of. Steel. Applications of alloy steel and stainless steel. Non Ferrous Materials: Properties and uses of Copper, Aluminium and their alloy

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	Unit 5: **Heat Treatment** Definition and objectives of heat treatment. Various heat treatment processes- hardening, tempering, annealing, normalizing, surface hardening, carburizing, nitriding, cyaniding. Hardenability of Steels. Types of heat treatment furnaces (only basic idea)
Textbook	1. R.K. Rajput, "Text book of Material Science", Katson Publishers, Ludhiana. 2. V.K. Manchanda and GBS Narang, "Text book of Material Science", Khanna Publishers, New Delhi.
References	1. A.R. Gupta, "Introduction to Material Science", Satya Prakashan, New Delhi. 2. S. K. Hazra Chaudhary, "Material Science and Processes", India Book Distribution Co., Calcutta, First Edition, 1977.
Laboratory Content	**Group Activity:** 1. Classification of about 25 specimens of materials/machine parts into (i) Metals and non metals (ii) Metals and alloys (iii) Ferrous and non ferrous metals (iv) Ferrous and non ferrous alloys 2. Given a set of specimens of metals and alloys (copper, brass, aluminium, cast iron, HSS, SS, Gun metal); identify and indicate the various properties possessed by them. **List of Experiments** 1. a) Study of heat treatment furnace. b) Study of a thermocouple/pyrometer. 2. Study of a metallurgical microscope and a specimen polishing machine. 3. To prepare specimens of following materials for microscopic examination and to examine the microstructure of the specimens of following materials (At least any two): i) Brass ii) Copper iii) Cast Iron, iv) Mild Steel v) HSS, vi) Aluminium vii) Stainless steel 4. To anneal a given specimen and find out difference in hardness as a result of annealing. 5. To normalize a given specimen and to find out the difference in hardness as a result of normalizing. 6. To harden and temper a specimen and to find out the difference in hardness due to tempering. At least 5 experiments need to be performed.

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Course Title	Jigs, Fixture and Gauges	Course Code	23DMEE13 23DMEE14			
Specialization	Professional Core Engineering	**Structure (LTPC)**	**2**	**0**	**1**	**3**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			
Course Objective:	A diploma holder should be able to understand the basic concepts of Jigs and fixtures.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Classification of the different kinds of jigs and fixtures. **CO2.** Understand the working principle of various locating and clamping devices. **CO3.** Understand the drilling jigs. **CO4.** Understand the various machining fixtures. **CO5.** Understand the basic concepts of limit gauges.					
Contents of the course	**Unit 1:** **Jigs and Fixtures** Concept of jigs & fixtures, need and advantages, concept of interchangeability, classification of jigs & fixtures. **Unit 2:** **Locating and Clamping Devices** Basic principles of location, 3-2-1 principle of location, location for various services, location methods and devices. Concept of clamping and various clamping. **Unit 3:** **Drilling Jigs** Definition of drilling jig. Drilling jig, Drilling bushes & their function. Types of drilling jigs such as box type, channel jig, latch jig, indexing jig **Unit 4:** **Fixtures** Introduction to fixtures, types of fixtures such as milling fixture (single piece, gang milling) lathe and boring fixtures, grinding and welding fixture. Application of pneumatic in jigs and fixtures **Unit 5:** **Limit Guages** Introduction to plain limit gauges, classification of limit gauges such as plug, ring & snap gauges. Brief description of thread gauges. Material selection. Taylor's principle of maximum & minimum material condition. Go and not-go ends of gauges and selection of gauge for inspection.					
Textbook	1. Prakash H Joshi, Press tools design & construction, Wheeler Publisher. 2. Surrender Kr & Umesh Chandra, Production Engg. & Design, Satya Parkashan, New Delhi.					

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References	1. D. Engene Ostergard, Basic Die Making; Mc Graw Hill Book Co.. 2. Donaldson, Fundamental of tool design.
Laboratory Content	**List of Experiments:** 1. Manufacturing of simple drilling jigs 2. Manufacturing of simple fixtures for milling. 3. Manufacturing of simple limit gauges such as plug gauge, ring gauge and snap gauge.

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Course Title	CNC Machines	Course Code	23DMEE15 23DMEE16			
Specialization	Professional Core Engineering	**Structure (LTPC)**	**3**	**0**	**2**	**5**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			
Course Objective:	This course is intended to make student familiar with the CNC Machine for operating machine and producing components. To develop the CNC Machines Programming Skills in the students.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understanding of operational features of CNC lathe. **CO2.** Understanding of various turning operations and use of various work holding devices on CNC Machine. **CO3.** Preparations for Programming CNC machine for production. **CO4.** Carry out programming for CNC Machine. **CO5.** Test and prove the program on the CNC Machine.					
Contents of the course	**Unit 1:** **Introduction to CNC** Constructional Features of CNC Machine milling and turning. Working parts of CNC machine CNC Accessories. Machine zero, work piece zero, work offsets, tool offsets. Absolute and incremental systems of tool positioning and offsetting. Standard of procedures for operating CNC Machine **Unit 2:** **CNC Operations and work holding devices** Turning operations: Turning (OD and ID), facing, grooving (OD and ID), face grooving, thread cutting (OD and ID), drilling, boring and tapping. Correct techniques and procedures to carry out turning operations on a CNC lathe. Work-holding devices: chucks with hard jaws, chucks with soft jaws, fixtures, drive centres, collet chucks, faceplates, magnetic/pneumatic devices. Tool Holding Devices: Tool Holder nomenclature **Unit 3:** **Introduction to CNC Programming and part programming techniques** Introduction to Part Programming: Common terminologies used in CNC Programming: program number; part number and name; tool names; operation names; motion commands; tool change positions and commands; tool numbers and offset numbers; subprograms and canned cycles; tool nose radius compensation commands; spindle, feed rate and coolant commands etc. G and M Codes Operating Modes of CNC Machine, their importance and use. **Unit 4:** **CNC Turning Programming** Part Programming for different operations: Turning, Step turning, grooving, facing, threading, Introduction to Standardized Fixed cycles (Canned Cycles)- stock removal cycle,					

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	facing cycle, threading cycle, peck Drill Cycle, finish cycle, Dwell Cycle, Basic Mill Cycle, Peck Drill Cycle, Bore Cycle, Tap Cycle. **Unit 5:** **CNC Milling Programming** Part programming (point to point machining), Part Programming of drilling machine (point to point), Part Programming for machining along straight line and curved surface, part programming for milling machine operations: pocketing, surface milling, side milling, part programming for indexing operations, part programming in polar coordinates. Introduction to Standardized Fixed cycles (Canned Cycles)- Drill Cycle, Dwell Cycle, Basic Mill Cycle, Peck Drill Cycle, Bore Cycle, Tap Cycle.
Textbook	1. CNC Machines by By B. S. Pabla, M. Adithan(First Edition), New Age International (P) Ltd. 2. CNC Machines and Automation Paperback – 2014, by Khushdeep Goyal, Katson Books 3. CNC Machines by Sandeep Bajaj, Ishan Publication. 4. T. K. Kundra, P. N. Rao and N. K. Tiwari, "Numerical Control and Computer Aided Manufacturing", TMH 5. P. Radhakrishnan, "Computer Numerical Control Machine & Computer Aided Manufacturing", New, Academic Science Limited
References	1. CNC Technology & Programming by Tilak Raj, DhanpatRai Publication. 2. Tilak Raj, "CNC Technology & Programming", Dhanpat Rai publishing Company (P) ltd., N Delhi. Digital Content Links: 1. https://www.haascnc.com/content/dam/haascnc/en/service/reference/programming-workbooks/shopnotes---machinist%27s-cnc-reference-guide.pdf 2. https://academy.titansofcnc.com/files/Fundamentals_of_CNC_Machining.pdf 3. https://cache.industry.siemens.com/dl/files/554/74475554/att_56792/v1/PGsl_0313_en_en-US.pdf 4. https://cache.industry.siemens.com/dl/files/233/108869233/att_825441/v1/PG_0805_en.pdf 5. https://www.acemicromatic.net/sites/default/files/2018-02/cnc3.pdf
Laboratory Content	Safety Precautions and use of personal protective equipment (PPE), demonstration of tools and machines to be used in CNC Turning and VMC. Specifications of the CNC Turning and VMC availiable in the CNC Machine Lab. Demonstration of tools, equipment, accessories, and operations to be performed on the CNC Machines. **List of Experiments** 1. Demonstration of control Panel keys and various modes i.e. jog mode, edit mode, MDI of machine. 2. Perform turning operations on metal component using CNC Machine 3. Performing axis movement on CNC Machine. 4. Performing tool offset operation on machine before and after tool wear. 5. Performing work offset operation on CNC Machine. 6. Preparing machined components (as per the drawing) on CNC Turning of given quality standards which are free from false tool cuts, burrs and sharp edges, conforming to general dimensional tolerance +/-0.1mm 7. Preparing machined components (as per the drawing) on VMC of given quality standards which are free from false tool cuts, burrs and sharp edges, conforming to general dimensional tolerance +/-0.1mm

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	8. To study and navigate process of NC/CNC machine tools. 9. Troubleshooting of CNC Machine. 10. To perform setting and off-setting the component. 11. Understand Automatic tool changer and its relationship with program and putting the tool into ATC. 12. To learn and execute programming technique such as interpolation, helical, compensation and their application. 13. CNC Part programming, sub programming and execution of an operation on CNC Turning simulator. 14. CNC Part programming, sub programming and execution of an operation on VMC simulator. 15. CNC Part programming, sub programming and execution of an operation on simulator and Lathe Machine. 16. CNC Part programming by using Canned Cycles and execution of an operation on simulator/VMC. 17. CNC Part programming by using turning cycles and execution of an operation on simulator/CNC turning. 18. CNC Part programming for threading operation and execution of an operation on simulator/CNC Turning 19. CNC Part programming and execution on simulator and machine for different types of pockets. 20. Write and execute a program for CNC Machines for a process of a complex drawing part.

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Course Title	Metrology and Quality Control	Course Code	23DMEE17 23DMEE18			
Specialization	Professional Core Engineering	Structure (LTPC)	3	0	1	4
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	The aim of this subject is to develop knowledge and skills regarding various measuring instruments amongst the students for ensuring process and quality control by making measurements and carrying out inspection of various parameters					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understand the basic concepts of metrology. **CO2.** Perform the linear and angular measurements. **CO3.** Understand the various screw thread gauges and CMM. **CO4.** Understand the use of quality control charts, **CO5.** Understand the TQM, ISO-Standards and QC tools in manufacturing environment.					
Contents of the course	**Unit 1:** **Introduction** Definition of metrology, standard of measurement, Types of Errors - Controllable and random errors, precision, accuracy, sensitivity, hysteresis, response time, repeatability, calibration, uncertainty of measurement, interchangeability. standardization and standardizing organizations **Unit 2:** **Linear and Angular Measurement** Construction features and use of instruments for non precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block. Construction features and use of instruments for precision measurements: vernier calipers, vernier height and depth gauges, micrometers. Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges. Cylinder bore gauges, feeler and wire gauges. Checking flatness, roundness and squareness Comparators: Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic. Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, clinometer, angle dekker. Optical instruments for angular measurement, auto collimator. **Unit 3:** **Measurements of Screw threads and Gauges** Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.					

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	Measurements of gears (spur) – Measurement of tooth thickness, pitch, Gear Ball tester, Lead and Profile Testers. Profile projector, Coordinate Measuring Machine (CMM), Tool maker's microscope **Unit 4:** **Statistical Quality Control** Basic statistical concepts, empirical distribution and histograms, frequency, mean, mode, standard deviation, normal distribution, binomial and Poisson, Simple-examples. Introduction to control charts, namely, X and R, X and σ, P, ηρ, C charts and their applications. Sampling plans, selection of sample size, method of taking samples, frequency of samples **Unit 5:** **Modern Quality Concepts** Concept of total quality management (TQM), National and International Codes, concept and evolution of ISO-9000, QC tools, Introduction to Kaizen, 5S
Textbook	1. Engineering Metrology by RK Jain; Khanna Publishers, New Delhi. 2. A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi. 3. Statistical Quality Control by M.Mahajan: Dhanpat Rai and Sons, Delhi 4. Inspection and Quality Control by J.S. Narang & A. Gupta, Dhanpat Rai & Sons, Delhi.
References	1. Metrology Laboratory Manual by M Adithan and R Bahl; NITTTR, Chandigarh. 2. Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
Laboratory Content	**List of Experiments** 1. Internal and external measurements with vernier caliper. 2. Demonstration and use of external and internal micrometre for checking dimensions of given component. 3. Measurement of linear dimensions with height gauge and depth gauge. 4. Measurement of flatness, concentricity with dial indicator 5. Use of feeler gauge, wire gauge, radius gauge and fillet gauges for checking of standard parameters. 6. Use of plain plug and ring gauge, taper plug and ring gauge, thread plug and ring gauge and snap gauges. 7. Measurement of Angle using; i) Cylindrical rollers and spherical balls and slip gauges ii) Bevel protector iii) Sine Bar/Sine Table , Slip Gauges, Height Gauge and dial indicator 8. Demonstration and use of venires/digital/dial calipers, depth vernier for for checking dimensions of given component 9. Measurement of effective diameter of external threads by 2-wire and 3-wire method. 10. Measurement of co-ordinates of two or more than two holes using surface plate, angle plate, Height Gauge, dial indicator and slip gauges. 11. Plot frequency distribution for 50 turned components. 12. Plot X and R, P and C charts from the given data,

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SYLLABUS

SECOND YEAR (SEMESTER-IV)

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL AND DIE)

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Course Title	Forging & Die Casting	Course Code	23DMEE19			
Specialization	Professional Core Engineering	**Structure (LTPC)**	**3**	**0**	**0**	**3**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			
Course Objective:	To make students capable of understanding the die casting dies and forging dies.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understand the various casting processes. **CO2.** Understand the die casting machine components and its uses. **CO3.** Understand the various forging processes. **CO4.** Understand the various forging and die machine design specifications. **CO5.** Understand the basic process of maintenance of casting and forging dies.					
Contents of the course	**Unit 1:** **Introduction** Gravity die-casting, pressure die casting, examples of the component, machines used, various casting processes, i.e. investment casting, centrifugal casting, vacuum casting. Furnace and its types used for melting the metal. **Unit 2:** **Die Casting Machines and Die Casting Dies** **Die Casting Machines :** Classification & specification, parts and their functions, locking unit, injection unit, ejection unit. **Die Casting Dies** Gravity die casting: main parts, top gating, side gating, bottom gating, runner & risers, book type mould, rack and pinion mould, draft angle. Pressure die casting: Types, main parts- parting line, runner layout, gates, gating formula, location of gates, vents, core shrinkage, cooling methods, overflow, sprue, ejectors, ejector return mechanism, die lubricants, basic calculations, mould release agents. **Unit 3:** **Introduction to Forging** Various processes of forging, examples of components produced by forging processes, forging equipments and forging die features **Unit 4:** **Forging Machines and Dies** Types of machines, specification and various parts of machines, and their function **Types of forging dies** Closed die hammer forging, closed die press forging, upsetting die forging, cold forging, open dies, extrusion dies, design of component drawing, Design					

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	consideration of forging tools such as fuller, edger, bender, blocker, finisher. **Unit 5:** **Maintenance and Storage** Maintenance, safety and storage of forging die tools and material, handling of dies.
Textbook	1. Forging die design and practice by R. Sharam, S.N. Parsad, N.P. Saxena; S. Chand and Company. New Delhi. 2. Die, Mould and Jigs by V. Vladimi Rov, MIR. Publisher.
References	1. Forging handbook-forging methods by A. Thomas, Drop Forging Researchm Association, Sheffield Street, Sheffield. 2. Forging and Forming metal by S.E. Rusinoff, S. Chand and Company, New Delhi. 3. Forging handbook by T.E. Byrer, American Society for metal. 4. Handbook of Die Design by Ivana Suchy; Mc Graw Hill.
Activity	Industrial visit of the students to understand the manufacturing processes and exposure to pressure, die casting and forging die manufacturing processes.

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Course Title	Plastic Moulds	Course Code	23DMEE20 23DMEE21			
Specialization	Professional Core Engineering	Structure (LTPC)	2	0	1	3
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	To make students capable of understanding manufacturing processes of injection/compression/transfer moulds with proper dimensioning and calculations.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understand the plastic moulding process. **CO2.** Understand types of moulds as per the required application. **CO3.** Understand and perform pre and post-moulding operations **CO4.** Perform maintenance of moulding machines					
Contents of the course	**Unit 1:** **Introduction** Overview of mass production of moulded plastic components. Concept of classification of industrial application of plastics, plastics material and mould material, application of moulding machine and equipment, application of moulds. Classification of moulds **Unit 2:** **Moulding Operations** **Injection Moulding:** Principles of injection moulding machine, parts & function of injection moulding machine such as clamping, heating & feeding, ejection, injection moulding processes, parameters, selection of injection moulding machines. **Compression Moulding:** Parts & function of compression moulding machines such as clamping, heating, feeding. Compression moulding process elements: Machine, material & mould. **Transfer moulding:** Transfer moulding presses and processes, Parts and function of transfer moulding press, types of transfer moulding presses, process set-up data. Transfer moulding process elements with respect to press, material, and mould. **Blow Moulding:** Blow moulding machine and blow moulding process, Parts and function of blow moulding machines such as clamping, heating, ejection. Classification of blow moulding machines, and process set-up data. moulding process elements with respect to press, material, mould. **Rotational Moulding:** Rotational moulding machine and process, Parts and function of the rotational moulding machine, classification of rotational moulding machines, process setup data. moulding process elements with respect to press, material, mould. **Unit 3:**					

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	Design parameters for mould, material & machine Injection Moulds: Understand design parameters pertaining to mould, machine and material. Quality and quantity required. Properties of plastic material. Blow moulds: Understand design parameters pertaining to mould, machine and material. Quality and quantity required. Properties of plastic material **Unit 4:** **Pre & Post moulding operations** **Pre moulding :** Pre moulding techniques, Classification of polishing equipment: manual polishing kits, power assisted polishing kits. Classification of surface finishing: electro plating etching. Classification of surface roughness values. **Post moulding :** Post moulding technique Classification of post moulding techniques: trimming , use of fixtures, coating, surface decoration. Classification of related equipment, Principles of post moulding processing techniques, selection of related equipment. **Unit 5:** **Mould Maintenance** Concept and principle of safety, maintenance, storage . Maintenance, safety and storage with respect to mould and machine.
Textbook	1. Injection Mould design fundamentals by A.B. Glanvill, E.N. Denton, Industrial Press Inc. 2. Injection Moulding by A.S. Athalye, Multitech Publishers Co. Mumbai.
References	1. Plastic Material handbook Vol. I and II. by A.S. Athalye, Multitech Publishers Co. Mumbai. 2. Rubber and Plastic technology by Chandra and Mishra, CBS Publishers and Distributor, New Delhi 3. Plastics Mould Engineering Handbook by J. Harry Du Bois and Waynel Pribble; Van Nostrand Rehnhold Company. 4. Injection moulds by R.G.W. Pye
Laboratory Content	**Group Activities for the students:** A group of 4-5 students can be formed for the lab activities. **List of Experiments** Manufacturing of small mould as per the Drawing provided. Activity: Industrial visit of the students to understand the manufacturing processes of different types of moulds.

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Course Title	Press Tool	Course Code	23DMEE22 23DMEE23			
Specialization	Professional Core Engineering	**Structure (LTPC)**	**2**	**0**	**1**	**3**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite		To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			
Course Objective:	The subject is intended to make the students understand concepts, principles and procedures of manufacturing of press tool to be manufactured in workshop.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understand the principle of press tool operations. **CO2.** Differentiate different press tools and their working. **CO3.** Understand the design parameters of basic press tools.					
Contents of the course	**Unit 1:** **Introduction** Concept of mass production of sheet metal components, sheet material components and their applications, concept of press tools, press and their applications in mass production of components in industry. **Unit 2:** **Press Tool Operations** a) Concept and principle of shearing operations. Cutting operations and cutting dies such as blanking, piercing, trimming, notching and shaving. b) Concept and principle of non- cutting operations such as forming, bending, curling, coining, embossing **Unit 3:** **Elements of Press Tools** Press tool parts as Die-set, stripper plate, guiding plate, punch & punch plate, die plate. Selection of material for each element of press tool. BIS standards for die-sets such as Bottom Plate, Top plate, pillars, bushes and types of bushes. Ejection mechanism. **Unit 4:** **Press Tool and Presses** Classification of Press Tools, Concept and description: Cutting dies/tools such as blanking tool, piercing tool, compound tool, progressive tool. Notching tool, trimming tool and shaving tool. Bending tool, forming tool, draw tools. Classification of Presses, Concept and working of presses for press tools such as Hand Presses, Hydraulic and Pneumatic presses. Specification of presses. Selection of press for press tool operations **Unit 5:**					

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	Design Parameters in Press Tool Design Concepts of sheering force, stripping force, cutting clearance, angular clearance. Land and shear angle, concept of die life. Concept of strip layout classifications of strip layout such as piloting & stopping, strip guiding, material condition. Principle of grain direction. Material utilization, feeding mechanism.
Textbook	1. Dr. Ing Heinrich Makelt, "Mechanical Presses", Edward Arnold (Publishers) Ltd. 2. "Machine Tool Design hand book by Central Machine Tool Institute", Bangalore, Tata McGraw Hill Publishing Company Ltd, New Delhi. 3. D. Eugene Ostergaard, "Basic Die Making", McGraw Hill Book Co. 4. Prakash H. Joshi, "Press Tool Design & Construction", Wheeler Publishing.
References	1. F.W. Wilson, "Fundamental of Tool Design", Prentice Hall of India Pvt. Ltd., New Delhi. 2. Donaldson, "Fundamental of Tool Design", Tata McGraw Hill. 3. K. Venkataraman, "Design of Jigs, Fixtures and Press Tools", Wiley India.
Laboratory Course	**Group Activities for the students:** A group of 4-5 students can be formed for the lab activities. **List of Experiments** 1. Manufacturing of at least one simple press tool/compound tool /progressive tool. Activity: Industrial visit of the students to understand the manufacturing processes and working of different types of press tools.

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Course Title	Industrial Engineering	Course Code	23DMEE24			
Specialization	Professional Core Engineering	Structure (LTPC)	3	0	0	3
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite	NIL	To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	The aim of this course is to make students able to conduct time and motion study to improve the productivity and make them familiar with the concepts of production planning and control					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Use industrial engineering concepts to improve productivity **CO2.** Apply work and motion study techniques for improving production. **CO3.** Solve planning, scheduling and sequencing problems for shop floor. **CO4.** Locate suitable plant location and draw plant layout for different production system. **CO5.** Maintain inventory optimally and classify different types of inventory					
Contents of the course	**Unit 1:** **Productivity** Introduction to productivity, factors affecting productivity, practical measurement of productivity, difference between production and productivity, causes of low productivity and methods to improve productivity, contribution of standardization in improving productivity. **Unit 2:** **Work and Motion Study** Definition and scope of work study; factors for selection of work study job, uses and limitations of work study, Inter-relation between method study and work measurement; Human aspects of work study; Role of work study in improving productivity. Definition, Objectives and procedure for Method study analysis; Information collection and recording techniques through various diagrams. **Unit 3:** **Motion Analysis and Work Measurement** Principles of Motion analysis; Therbligs and SIMO charts; Normal work area (Principle of motion economy), design and arrangement of work place. Ergonomics, design of tools and equipments. Objectives of work measurement ,work measurement techniques, stop watch time study; principle, equipment used and procedure; systems of performance rating; standard elements of time, calculation of basic times; various allowances; guide for rest allowance in Indian conditions, calculation of standard time, work sampling, standard data and its usage. Work sampling.					

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	Unit 4: **Production Planning and Control** Production and its types- job order, batch type and continuous type of productions. Objectives and components (functions) of P.P.C, Advantages of production planning and Production Control, stages of P.P.C, process planning, routing, scheduling, machine loading chart,Gantt chart. **Unit 5:** **Store Management** Different Layout and structures of stores, Inventory control, calculation of EOQ, Bin cards and various forms required in stores for documentation.
Textbook	1. Industrial Engineering and Management by O.P. Khanna, Dhanpat Rai and Sons, Delhi. 2. Industrial Engineering and Management by M. Mahajan; Dhanpat Rai and Sons, New Delhi.
References	1. Work Study and Ergonomics by S Dalela and Sourabh 2. Introduction to Work Study, ILO Publication 3. Production and costing by GBS Narang; Khanna Publishers, New Delhi.
Classroom Exercises	**1.** Stop watch time study on any machine like lathe, drilling machine or milling machine **2.** Method improvement - Assembly of bolt, nut and 3 washers **3.** Determination of standard time for assembly of electrical switch **4.** Preparation of flow process chart **5.** Preparation of SIMO chart **6.** Preparation of flow diagram

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Course Title	Minor Project	Course Code	23DMEE25			
Specialization	Manufacturing	Structure (LTPC)	0	0	2	2
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite	Workshop, safety, Machine Tools	To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	The objective of this course is to prepare students to use applications of the theory and practical learned during the course					
Course Outcome:	By the end of this course, the student will be able to: Carry out project/studies in the field of tool and die manufacturing industry.					
Project Content	**Some of the suggested minor project/activities are as under:** • Drawing and manufacturing of jigs/fixtures. • Drawing and manufacturing of simple press tools.					

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Course Title	Computer Aided Drafting	Course Code	23DMEE26			
Specialization	Professional Core Engineering	Structure (LTPC)	0	0	4	4
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite	Engineering Graphics and Drawing	To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	The aim of this course is to make students familiar with the computer aided drawing software.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Understand and implement the commands and features of a CAD software . **CO2.** Carry out preparations for making 2D mechanical drawings. **CO3.** Develop new drawings and modify 2D mechanical drawings using CAD system. **CO4.** Develop assembly drawings as per specifications.					
Laboratory Content	• Understanding and use of equipment used for CAD and installation of software on computer • Understanding of tool bar commands and performing basic settings for creating drawing. • Create a drawing template to the required standards,using various drawing tools Drawing template details: layers of drawings, scale, paper size, color setup, line types, dimension system, title, drawing number, date, text styles. • Create a drawing template to the required standards using Drawing Tools: straight lines, hatching and shading on drawings, adding dimensions and text to drawings, producing layers of drawings, symbols and abbreviations, hidden detail, curved/contour lines, angled lines, circles or ellipses; parts lists, geometrical and dimensional tolerance, insertion of standard components, elevation, plane view, side view, sectional views, detail views • Preparing machine shop floor layout on drawing sheet. • Preparing drawing in first and 3rd angle projection with different views for regular solids. • Preapring sectional views for regular solids. • Draw temporary fasteners and rivets with dimensioning & labelling of the drawing. • Draw components assembly drawings with dimensioning & labelling of the drawing. • Draw piping layouts with dimensioning & labelling. • Draw gears with dimensioning & labelling of the drawing. • Draw machine foundation or base with dimensioning & labelling of the drawing. • Draw working drawings of jigs and fixtures with dimensioning & labelling of					

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	the drawing. • Draw simple dies with dimensioning & labelling of the drawing. • Draw simple moulds and press tools with dimensioning & labelling of the drawing. • Draw drawings of simple press tools with dimensioning & labelling of the drawing.
Textbook	1. Machine Drawing – P.S. Gill S. K. Kataria& Sons, Delhi., 17th Revised edition, 2001 2. Mechanical Draughtsmanship - G.L. TamtaDhanpat Rai & Sons, Delhi, 1992 3. Inside AutoCAD – D. Raker and H. Rice, BPB Publications, New Delhi, 1985
References	1. .CAD/CAM/CIM – P. Radhakrishnan, S. Subramaniyan& V. Raju, New Age International Pvt. Ltd., New Delhi, 3rd Edition, 2. Engineering AutoCAD, A.P. Gautam& Pradeep Jain, Khanna Book Publishing Co., Delhi..

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SYLLABUS
THIRD YEAR (SEMESTER-V)
DIPLOMA IN MECHANICAL ENGINEERING
(TOOL AND DIE)

Ekta
(Ms. Ekta - Prog. Co-ordinator)

Course Title	On Job Training	Course Code	23DMEE27			
Specialization	Tool and Die Manufacturing	**Structure (LTPC)**	**0**	**0**	**20**	**20**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite	Workshop, safety, Machine Tools	To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			
Course Objective	The aim of OJT is to acquire the skills related to the job roles defined for tool and die manufacturing industries and exposure to professional industry environments.					
Course Outcome	By the end of this course, the student will be able to: **CO1.** To perform basic manufacturing operations under supervision related to tool and die automotive manufacturing industry. **CO2.** Describe the standard operating procedures in a manufacturing setting **CO3.** Interpret technical drawings and specifications to produce mechanical components. **CO4.** Integrate safety and quality principles into everyday manufacturing tasks.					
Broad OJT Areas	Fitting and Assembly, Conventional/Unconventional Machining, CNC Machining, Press Shop, Die Maintenance, Tool Design, Process Planning, Quality Assurance and Tool & Die manufacturing.					

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SYLLABUS
THIRD YEAR (SEMESTER-VI)
DIPLOMA IN MECHANICAL ENGINEERING
(TOOL AND DIE)

(Ms. Ekta – Prog. Co-ordinator)

Course Title	OJT	Course Code	23DMEE28			
Specialization	Tool and Die Manufacturing	**Structure (LTPC)**	**0**	**0**	**16**	**16**
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite	Workshop, safety, Machine Tools	To take effect from	**2024-2025**			
Submission date	**24/07/2024**	Date of approval by BoS	**24/07/2024**			
Course Objective	The aim of OJT is to acquire the skills related to the job roles defined for tool and die manufacturing industries and exposure to professional industry environments.					
Course Outcome	By the end of this course, the student will be able to: **CO1.**To perform basic manufacturing operations under supervision related to tool and die automotive manufacturing industry. **CO2.** Describe the standard operating procedures in a manufacturing setting **CO3.** Interpret technical drawings and specifications to produce mechanical components. **CO4.**Integrate safety and quality principles into everyday manufacturing tasks					
Broad OJT Areas	Fitting and Assembly, Conventional/Unconventional Machining, CNC Machining, Press Shop, Die Maintenance, Tool Design, Process Planning, Quality Assurance and Tool & Die manufacturing.					

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Course Title	Major Project	Course Code	23DMEE29			
Specialization	Tool and Die Manufacturing	Structure (LTPC)	0	0	4	4
Offered for	Diploma	Status	Core √		Elective	
Faculty	Skill Faculty of Engineering and Technology	Type	New √		Modification	
Pre-requisite	Workshop, safety, Machine Tools	To take effect from	2024-2025			
Submission date	24/07/2024	Date of approval by BoS	24/07/2024			
Course Objective:	Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.					
Course Outcome:	By the end of this course, the student will be able to: **CO1.** Implement the understanding developed from the subject-based knowledge at the workplace. **CO2.** Apply the classroom knowledge and skills to solve practical problems related to the work.					
Project Content	**Some of the suggested major project/activities are as under:** • Project work related with repair and maintenance of machines • Designing of jigs / fixtures. • Projects related to quality control/ productivity/ calibration/ testing/ waste reduction/fabrication/ energy efficiency/ • Projects related to improving an existing system					

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EVS

Course Title	Environmental Science	Course Code	24DEVS01		
Specialization	Value Added Course	Structure (LTP)	2	0	0
Offered for	D.Voc./Diploma	Status	Core √	Elective	
Faculty	SFASH	Type	New √	Modification	
Credits	2	Marks	Internal	30	
Hours	30		External	70	
Pre-requisite	Nil	To take effect from	2024-2025		
Submission date	13-07-2024	Date of approval by BoS	23-07-2024		
Course Objective	To create awareness among the students about our ecosystem, related problems and our role in that.				
Course Outcome	**On completion of this course, students will be able to:** **CO1:** Understand our environment. **CO2:** Comprehend ecosystems and biodiversity. **CO3:** Analyze atmospheric and climate dynamics. **CO4:** Evaluate urbanization and agricultural practices. **CO5:** Develop strategies for environmental pollution control.				
Contents of the course	**Unit 1: Indian Knowledge System- Indigenous Practices, Understanding our Environment** Environment: Definition, Scope and Importance, Natural Resources management: Forest Resources, Water Resources, Mineral Resources, Energy Resources, Food Resources, Land Resources., Traditional agricultural practices - Organic farming, Crop rotation, Intercropping), Water management techniques - Stepwells, Tankas, Baolis, Forest management and conservation methods - Sacred groves, Agroforestry **Unit 2: Ecosystem** Ecosystem: Introduction, structure, functions & Kinds of ecosystem. Energy flow in ecosystem, Biogeochemical cycles, Habitat and Ecological Niche, Species Interactions, Bio-geographic zones of India. **Unit 3: Atmosphere and Environmental Pollution** Atmosphere: Introduction, layers of the atmosphere, Climate Change: Greenhouse effect, Global warming, Ozone layer depletion, Deforestation, Air pollution: major air pollutants, classification of air pollutants, impact of air Pollution, controlling measures. Acid Rain. Water Pollution: Introduction, causes, impacts & waste water treatment. **Unit 4: Urbanization** Urbanization: Introduction, Manifestations of Urbanization, social economic and environmental problems in urbanization, Agriculture: Introduction, unsustainable patterns of modern industrialized agriculture, Green revolution, Soil erosion				

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Field Work	• Visit to a local area to document environmental assets river/forest/grassland/hill/mountain • Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural • Participation in plantation drive and nature camps. • Campus environmental management activities such as solid waste disposal, water Management and sanitation, and sewage treatment.
Text Books	1. Singh, J.S., Singh, S.P. & Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications. 2. Odum, E.P., Odum, H.T. & Andrews, J. (1971). Fundamentals of Ecology. Philadelphia: Saunders. 3. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson).
References	1. Deevedi M. (2021). Environment and ecology in the Indian knowledge system Vidyanidhi prakashan. 2. Melissa K. Nelson and Daniel Shilling. (2018). Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability. Cambridge University Press. 3. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK. 4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press 5. Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards/ 6. Ahluwalia, V. K. (2015). *Environmental Pollution, and Health*. The Energy and Resources Institute (TERI).

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