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Bareilly-Lucknow NH-24, Bareilly

Diploma in Mechanical Engineering

Vision of the Institute

To develop responsible citizens who would 'think global and act local' and become the change agents of society to meet the challenges of future.

Mission of the Institute

To impart high quality Engineering and Management education to the budding professionals and provide the ambience needed for developing requisite skills to make a mark of excellence in Education, Business and Industry.

Departmental Vision

To produce a new generation of Mechanical Engineers by providing state-of-the-art education in Mechanical Engineering recognized worldwide for excellence. This would be guided by extensive research in technology and management for industrial and social needs for sustainabledevelopment.

Departmental Mission

Our endeavor is to make the department the highest seat of learning, prepare Engineers equipped with strong conceptual Foundation coupled with practical insight meet global Business changes.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) FOR DIPLOMA MECHANICAL ENGINEERING

The Diploma program aims to:

PEO1 Develop competent Mechanical engineering technicians with professional skills, knowledge, abilities & attitude for wage employment and/or to become entrepreneur.

PEO2 Provide opportunities and develop competence to work as a leader, manager or team member in multidisciplinary Mechanical engineering works and projects.

PEO3 Develop effective communication skills - Verbal, Written and Graphical, to justify technical solutions for diverse targets associated with mechanical engineering works.

PEO4 Provide opportunities and develop students in terms of social, economic and environment sensitive as responsible professionals.

PEO5 Develop understanding towards use of different codes - local, national and international, for execution of mechanical engineering works.

PEO6 Encourage and provide necessary knowledge, skills and opportunities for higher education and exploring different learning strategies for life-long learning.

PEO7 Provide opportunities and develop responsible professionals in terms of ethics and value systems.

PROGRAM OUTCOMES (POs) FOR DIPLOMA MECHANICAL ENGINEERING

After successful completion of the Diploma program, learners shall be able to:

PO1 Demonstrate the application of fundamental knowledge of mathematics, science, and mechanical engineering to solve simple problems related to mechanical engineering works.

PO2 Plan, design, develops and maintains mechanical engineering automobile parts and vehicles.

PO3 Supervise and manage mechanical engineering project related activities /practices/ resources effectively.

PO4 Collect samples, conduct experiments / tests and report results pertaining to mechanical engineering for execution of quality work

PO5 Communicate effectively through verbal, written and graphical presentations to diverse personnel

PO6 Understand the importance of ethical and professional responsibility and practices as mechanical engineer.

PO7 Ensure optimum use of resources in the context of environmental sensitivity, sustainable development and occupational safety.

PO8 Exhibit effective team work and function as leader & members in multidisciplinary mechanical engineering projects

PO9 Realize the habit of lifelong learning to stay abreast of the latest developments in mechanical engineering and allied field

PO10 Demonstrate necessary knowledge, skills and attitudes required to become an entrepreneur in mechanical engineering related business.

PO11 Appreciate and apply modern techniques, materials and tools for mechanical engineering automation work

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	Learners will be able to apply technical skills and modern engineering tools for mechanical engineering day to day practice
PSO2	Learners will be able to participate in practical aspects and problem solving of mechanical engineering field that requires analytical and design requirements.
PSO3	Learners will be able to pursue of lifelong learning and professional development to face the challenging and emerging needs of our society.
PSO4	Learners will comply with small to large concepts of components and mechanical engineering practical and field works to bring out safer and aesthetic environment to live.

SCHEME OF INSTRUCTION

Diploma in Engineering First Year

I - YEAR, I-SEMESTER (Effective from the academic session 2013-2014)

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme					Total	Credit
			L	T	P	CT	TA	AT	Total	E-Sem		
	THEORY											
1	**DAS101**	**Mathematics-I**	4	0	0	20	10	10	40	60	100	4
2	**DAS102 OR DAS103**	**Physics OR Chemistry**	6	0	0	20	10	10	40	60	100	4
3	**DEE101 OR DMC101**	**Fundamentals of Electrical & Electronics Engineering OR Fundamentals of Mechanical & Civil Engineering**	4	0	0	20	10	10	40	60	100	4
4	**DCS101 OR DME101**	**Fundamentals of Computer OR Fundamentals of Mechanics**	4	0	0	20	10	10	40	60	100	4
	PRACTICAL/TRAINING/PROJECT											
5	**DAS152 OR DAS153**	**Physics Lab OR Chemistry Lab**	0	0	3	-	-		50	50	100	2
6	**DEE151 OR DMC151**	**Electrical & Electronics Lab OR Civil & Mechanical Lab**	0	0	2	-	-		50	50	100	2
7	**DCS151 OR DME151**	**Computer Concept Lab OR Workshop Practice**	0	0	2	-	-		50	50	100	2
8	**DCE151**	**Engineering Drawing**	0	0	2	-	-		50	50	100	2
9	**DGP101**	**Discipline & General Proficiency**	-	-	-	-	-		-	100	100	1
		Total	**18**	**0**	**7**				**360**	**540**	**900**	**25**

L-Lecture**, T**-Tutorial**, P**- Practical**, CT**-Cumulative Test**, TA**- Teacher Assessment, **AT-Attendance, E-Sem-** End Semester Marks

SCHEME OF INSTRUCTION

Diploma in Engineering First Year

I - YEAR, II-SEMESTER (Effective from the academic session 2013-2014)

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme					Total	Credit
			L	T	P	CT	TA	AT	Total	E-Sem		
	THEORY											
1	**DAS201**	**Mathematics-II**	4	0	0	20	10	10	40	60	100	4
2	**DAS203 OR DAS202**	**Chemistry OR Physics**	6	0	0	20	10	10	40	60	100	4
3	**DMC201 OR DEE201**	**Fundamentals of Mechanical & Civil Engineering OR Fundamentals of Electrical & Electronics Engineering**	4	0	0	20	10	10	40	60	100	4
4	**DME201 OR DCS201**	**Fundamentals of Mechanics OR Fundamentals of Computer**	4	0	0	20	10	10	40	60	100	4
	PRACTICAL/TRAINING/PROJECT											
5	**DAS253 OR DAS252**	**Chemistry Lab OR Physics Lab**	0	0	3	-	-		50	50	100	2
6	**DMC251 OR DEE251**	**Civil & Mechanical Lab OR Electrical & Electronics Lab**	0	0	2	-	-		50	50	100	2
7	**DME251 OR DCS251**	**WorkshopPractice OR Computer Concept Lab**	0	0	2	-	-		50	50	100	2
8	**DGP201**	**Discipline & General Proficiency**	-	-	-	-	-		-	100	100	1
		Total	**18**	**0**	**7**				**310**	**490**	**800**	**23**

L-Lecture**, T**-Tutorial**, P-** Practical**, CT**-Cumulative Test**, TA-** Teacher Assessment, **AT-Attendance, E-Sem-** End Semester Marks

STUDY AND EVALUATION SCHEME

Diploma in Mechanical Engineering

(Automobile Engineering/ Production Engineering)

(Effective from session 2014-2015) YEAR II, SEMESTER III

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DME301	Fluid Mechanics	3	1	0	20	10	10	40	60	100	4
2	DME302	Material Science and Engineering	3	1	0	20	10	10	40	60	100	4
3	DME303	Manufacturing Process 1	3	1	0	20	10	10	40	60	100	4
4	DME304	Strength of Material	3	1	0	20	10	10	40	60	100	4
*5	DME305 /DME306	Foundry , Forming and WeldingProcesses/ AutomobileEngine	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DME351	Fluid Mechanics Lab	0	0	4	-	-	-	50	50	100	2
7	DME352	Material Science and engineering Lab	0	0	4	-	-	-	50	50	100	2
8	DME353	Machine Drawing -I	0	0	4	-	-	-	50	50	100	2
*9	DME355/ DME356	Foundry , Forming and Welding Processeslab/ automobile EngineLab	0	0	4	-	-	-	50	50	100	2
10	GP301	Discipline & General Proficiency	-	-	-	-	-	-	100	-	100	1
		TOTAL	15	5	16	100	50	50	500	500	1000	29

L-Lecture, **T-** Tutorial , **P-** Practical , **CT –** Cumulative Test ,**TA –**Teacher Assessment , **AT –** Attendance , **E-Sem –** End Semester Marks

Note -*5 DME 305 Foundry, Forming and welding Processes for Mechanical Production / DME 306 Automobile Engine For Mechanical Automobile Engineering

Note -*9 DME 355 Foundry, Forming and welding Processes for Mechanical Production lab / DME 356 Automobile Engine lab For Mechanical Automobile Engineering

STUDY AND EVALUATION SCHEME

Diploma in Mechanical Engineering

(Automobile Engineering /Production Engineering)

(Effective from session 2014-2015)

YEAR II, SEMESTER IV

No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DME401	Thermal engineering	3	1	0	20	10	10	40	60	100	4
2	DME402	Measurement and Metrology	3	1	0	20	10	10	40	60	100	4
3	DME403	Machine Design	3	1	0	20	10	10	40	60	100	4
4	DME404	Manufacturing Process - II	3	1	0	20	10	10	40	60	100	4
5	*DME405 /DME406	Modern Manufacturing Process/ Automobile technology -I	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DME451	Thermal engineering lab	0	0	4	-	-	-	50	50	100	2
7	DME452	Measurement and Metrology Lab	0	0	4	-	-	-	50	50	100	2
8	DME453	Machine Drawing -II	0	0	4	-	-	-	50	50	100	2
9	DME455/ DME456	Modern Manufacturing Process lab/ Automobile Technology lab	0	0	4	-	-	-	50	50	100	2
10	GP401	Discipline & General Proficiency	-	-	-	-	-	-	100	-	100	1
		TOTAL	15	5	16	100	50	50	500	500	1000	29

L-Lecture, **T-** Tutorial , **P-** Practical , **CT –** Cumulative Test ,**TA –**Teacher Assessment , **AT –** Attendance , **E-Sem –** End Semester Marks

Note -*5 DME 405 Modern Manufacturing Process for Mechanical Production / DME 406 Automobile Technology-I For Mechanical Automobile Engineering

Note -*9 DME 455 Modern Manufacturing Process lab / DME 456 Automobile Technology lab For Mechanical Automobile Engineering

STUDY AND EVALUATION SCHEME

Diploma in Mechanical Engineering

(Automobile Engineering/ Production Engineering)

(Effective from session 2014-15)

YEAR III, SEMESTER V

No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DME501	Theory of Machines	3	1	0	20	10	10	40	60	100	4
2	DME502	Heat Transfer	3	1	0	20	10	10	40	60	100	4
3	DME503	Manufacturing Materials	3	1	0	20	10	10	40	60	100	4
4	DME504	Fluid Machinery	3	1	0	20	10	10	40	60	100	4
5	*DME505 /DME506	Machine Tools and Metal Cutting/ AutomobileTechnology -II	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DME552	Heat transfer Lab	0	0	4	-	-	-	50	50	100	2
7	DME553	Industrial Training Viva Voice	0	0	2	-	-	-	100	-	100	2
8	DME554	Fluid Machinery Lab	0	0	4	-	-	-	50	50	100	2
9	DME555/ DME556	Machine Tools and Metal Cutting Lab/ Automobile Technology lab-II	0	0	4	-	-	-	50	50	100	2
10	GP501	Discipline & General Proficiency	-	-	-	-	-	-	100	-	100	1
		TOTAL	15	5	14	100	50	50	550	450	1000	29

L-Lecture, **T-** Tutorial , **P**- Practical , **CT –** Cumulative Test ,**TA –**Teacher Assessment , **AT –** Attendance , **E-Sem –** End Semester Marks

Note -* DME 505 Machine Tools and Metal Cutting for Production Engineering/ DME -556 Automobile Technology -II for automobile engineering

Note -* DME 555 Machine Tools and Metal Cutting lab for Production Engineering/ DME -556 Automobile Technology Lab-II for automobile engineering

STUDY AND EVALUATION SCHEME

Diploma in Mechanical Engineering

(Automobile Engineering/Production Engineering)

(Effective from session 2014-2015)

YEAR III, SEMESTER VI

No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	Credit
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DAS604	Environment and Ecology	2	0	0	10	5	5	20	30	50	2
2	DME601	CAD/ CAM and CNC machines	3	1	0	20	10	10	40	60	100	4
3	DME602	Refrigeration and air conditioning	3	1	0	20	10	10	40	60	100	4
*4	DME603 /DME604	Production Management /Automobile Maintenance	3	1	0	20	10	10	40	60	100	4
PRACTICAL/TRAINING/PROJECT												
6	DME651	CAD/ CAM Lab	0	0	4	-	-	-	50	50	100	2
7	DME652	Refrigeration and air conditioning Lab	0	0	4	-	-	-	50	50	100	2
8	DME653	Project	0	0	8	-	-	-	150	200	350	10
9	GP501	Discipline & General Proficiency	-	-	-	-	-	-	100	-	100	1
		TOTAL	11	3	16	70	35	35	490	510	1000	29

L-Lecture, **T-** Tutorial , **P**- Practical , **CT –** Cumulative Test ,**TA –**Teacher Assessment , **AT –** Attendance , **E-Sem –** End Semester Marks

Note-*4DME-603Production Management for Production engineering / DME 604 Automobile Maintenance For Automobile Engineering

Detailed Syllabus of Diploma in Mechanical

DME 301	Fluid Mechanics	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 Generate mathematical models of fluid motion including steady and unsteady flow.
2. Recite fluid properties and fluid statics.
3. State and visualize fluid kinematics.
4. Design piping systems and network
5. Describe the fluid flow phenomenon of Newtonian fluids

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Apply the knowledge of basic governing equations of Fluid Mechanics, concept of static pressure, intensity of pressure and pressure head
CO2	Predict and analyze pressure, absolute pressure and gauge pressure and knowing the measurement of pressure, Gauges
CO3	Explain flow aspects which are largely governed by inviscid / potential / viscous flow theory.knowing the measurement of fluid discharge by venturimeter, orifices, Pitot tube.
CO4	,Discuss Laminar and Turbulent Flow, Derive Equation of motion for laminar flow through pipes, knowing flow transition, turbulent flow, losses in pipe flow
CO5	Explain dimensional analysis for fluid variables
CO6	Solve the fluid flim boundary layer problems.

Detailed syllabus:

Unit 1

Fluid Mechanics & Fluid Properties: Concept of fluid, fluid mechanics, properties of fluid i.e. viscosity, specific weight, specific volume, specific gravity

Static Pressure: Pascal's law, concept of static pressure, intensity of pressure and pressure head

Unit 2

Measurement of pressure: Concept of atmospheric pressure, gauge pressure, absolute pressure, vacuum, Measurement of pressure, Gauges: Piezometer, simple manometer, differential manometer.

Unit 3

Flow of fluids: Types of flow, laminar and turbulent, rate of discharge, law of continuity, energy of fluid - potential, pressure and kinetic, Bernoulli's theorem and its applications, discharge measurement by venturimeter and orifices, Pitot tube and Pitot static tube.

Unit 4

Dimensional Analysis: Dimensional analysis, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies

Unit 5

Laminar and Turbulent Flow: Equation of motion for laminar flow through pipes, Stokes‟ law, transition from laminar to turbulent flow, types of turbulent flow, isotropic, minor losses, pipe in series and parallel, power transmission through a pipe, siphon.

Recommended Books:

1 Fluid Mechanics by R.K. Bansal

2 Fluid Mechanics by Frank M White

3 Fluid Mechanics by E John Finnemore

4 Fluid Mechanics by R.S. Khurmi

5 Fluid Mechanics by A.K. Jain

DME 302	Material Science and Engineering	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 Know the fundamental science and engineering principles relevant to materials.
2 Understand the relationship between properties and processing and design of materials.
3 Have the experimental skills for a professional career or graduate study in materials
4 Be able to communicate effectively, to work in teams and to assume positionsas leaders

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Apply core concepts in Materials Science to solve engineering problems
CO2	Knowledgeable of contemporary issues relevant to Materials Science and Engineering
CO3	Select materials for design and construction and be able to undertand ferrous matels, steels and steel alloys.
CO4	Possess the skills and techniques necessary for the metallurgy of materials, structures nature and types of defects associated with material.
CO5	Able to understand the structures, nature and types of defects associated with material

Detailed Syllabus:

Unit 1

INTRODUCTION: Introduction to engineering materials, classification, various properties like thermal, chemical, electrical, mechanical properties, selection criteria.

FERROUS MATERIALS: Classification, ores, manufacture of pig iron, wrought iron, cast iron and steel (flow diagrams only), types of cast iron: white, malleable, grey, mottled, modular and alloy and their usage

Unit 2

STEELS AND ALLOY STEEL: different manufacturing methods; open hearth, Bessemer, electric arc. Availability, properties and usage of steels, specification as per BIS and equivalent standards, effect of various alloying element like Cr, Ni, Co, V, Mo, Si, Mn, S on mechanical properties of steel, use of alloy steels; high speed steel, stainless steel, spring steel, silicon steel.

Unit 3

METALLURGY: Crystalline nature of solids, Structure of atom, types of solids, space lattice arrangement of atoms in BCC, FCC and HCP crystals, Plastic deformation of metals, Mechanism of slipping and twinning, hot and cold working of metals and their effect on mechanical properties.

Unit 4

PHASE DIAGRAMS: Phases in metal system, solid solution, Hume-Rothery rules, solidification of pure metals and alloys, phase rule, equilibrium diagram, Iron-carbon equilibrium diagram, Effect of carbon on properties of steel.

Unit 5

HEAT TREATMENT PROCESSES: Principle of heat treatment of steels, TTT curves, Annealing, Normalizing, Hardening, Case hardening, tempering, Austempering, Martempering, Flame hardening, Induction hardening, Carburizing, Nitriding, cyaniding of steels, Precipitation hardening with reference to Copper and Aluminum.

Recommended Books-

1 Material science and engineering by William Callister
2 Material science and engineering by R.K Rajput

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DME 303	Manufacturing Processes I	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 To analyze, design, implement, and maintain practical mechanical and manufacturing systems.
2 To communicate effectively and work well on team-based engineering projects.
3 To succeed in manufacturing and mechanical engineering technology positions.
4 To pursue continued professional development**.**

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Understand the basic ideas of forming processes.
CO2	Understand the basic ideas of welding processes
CO3	Understand the basic ideas of press tool works viz turning shaping planning.
CO4	Knowing the Principle, types, specifications of milling and drilling machines
CO5	Knowing the Principle, types, specifications of Boring machines.

Detailed Syllabus:

Unit-1

Foundry: Introduction to casting, advantages & limitations. Introduction to moulding processes. Sand moulding- materials, properties of moulding sand, sand moulding procedure, Pattern- types & materials, Pattern allowances, core prints, cores, Elementary & brief description of various melting furnaces.

Unit-2

Welding: Welding processes - classification of welding processes. Gas welding, tools & equipment, types of flames, filler rods, flux. Arc welding, procedures, equipment, application, type of electrodes, specification of electrode, selection of electrode, flux, welding parameters &equipments. Introduction to SMAW, GTAW, GMAW & submerged arc Welding. Introduction to Resistance welding, Spot, Seam, Projection & Percussion, Pressure, friction welding.Introduction to Soldering and Brazing.

Unit-3

Turning, Shaping & Planning: Principle, description & functions of lathe, specifications, work holding devices, tools & operations. Working principle of shaper, planer and slotter, Specification of shaper, planer and slotting machine Quick return mechanism, types of tools Speed and feed used in above processes. Commonly used cutting tool materials.

Unit-4

Milling &Drilling : Milling; principle, types of milling machines, specifications of milling machine, Introduction to indexing, Multipoint cutting tool, Types of milling cutters. Principles,Classification of drilling machine, Different operations on drilling machine, Speed and feed indrilling

Unit-5

Boring: Principle of boring, classification of boring machine Specification of boring machine, boring tools, boring bars & boring heads, alignment of bores & its importance.

Recommended Books-

1 Manufacturing Process by V raghvan
2 Manufacturing Process by Sidney H Avner
3 Manufacturing Process by OP Khanna

DME 304	Strength of Material	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

To provide basic knowledge in mechanics of materials so that the students can solve real life engineering problems and design and analyse engineering systems.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Analyse and design of structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials
CO2	Utilize appropriate materials in design considering engineering properties, sustainability, cost and weight
CO3	Perform engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts
CO4	Understand the types and industrial uses of springs, stresses developed in Springs, Concept of strain energy.
CO5	Determine and analyse the streses developed due to thermal loading

Detailed Syllabus:

Unit 1

Introduction with Subject**,** Review of stress and strain, Types of Stresses-Strain, Elastic Limit, Hooke's Law, Ultimate Stress, Working Stress, stress strain curve for Mild Steel Factor of safety Stresses in Composite Members Elastic constants and their relationship, Lateral strain, poisons ratio, volumetric strain, bulk modulus Shear stress- shear strain, modulus of rigidity Problem connecting lateral and linear deformation.

Unit 2

Thermal stress and Strain:

Introduction, Determination of Thermal stress and Strain, Temperature Stress in Bars of Varying section Temperature Stress in Composite Bars.

Unit-3

Torsion:

Theory of torsion and assumptions, derivation of torsion formula, polar modulus, torsional rigidity Polar moment of Inertia, solid and hollow shafts, power transmitted by shafts, combined bending and torsion.

Unit-4

Bending Stress:

Theory of Pure Bending and assumptions, Moments of Inertia, Bending Stresses, Stress Concentrations in Bending, Combined Bending and Direct Stress.

Unit-5

Springs:

Types of springs, uses closely coiled helical spring subjected to axial load, shear stress, deflection, stiffness, strain energy stored for closely coiled helical spring, Simple problem.

Books and References:

1. Strength of Materials by R.K.Rajput

2. Strength of Materials – Dr. Sadhu Singh

3. Strength of Materials by R.S.Khurmi

4. Strength of Materials ByS.S.Bhavikatti

5. Strength of Materials by S.Ramamrutham&R.Narayanan.

DME 305	Foundary,Forming and Welding Processes	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

Students will have the industrial based understanding of manufacturing methods viz. Casting welding and forming processes etc

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Understand the Casting, pattern making allowances and various types of casting methods. Basic idea of die casting, investment, and centrifugal casting.
CO2	Understand the Welding and the physics of gas and arc welding processes in details. Knowledge of Specifications of electrodes, Selection of electrode, flux. Current and equipment Resistance Welding, Soldering and Brazing methods.
CO3	Knowledge of advance welding process such as Thermit welding, MIG welding, TIG welding, Atomic hydrogen welding, Electron beam welding, and Laser beam welding.
CO4	Knowing Die stamping, Drawing, Spinning, Rolling
CO5	Dsecribe Extruding, Forging, Tube drawing .Presses and Press Tools

Detailed Syllabus:

Unit -1

Foundry: Pattern Making, Types of patterns, Pattern materials, Pattern allowances, Colouring of patterns, introduction to cores, Core materials and types of cores, Moulding, Introduction to moulding, Types of moulding sand and their properties, Sand mixing and mould preparation, Moulding defects, Melting and pouring, Types of meting furnaces (pit, lifting, cupola) used Closing and pouring of mould 1 4 Special Casting Methods, Introduction to die casting, investment, and centrifugal casting.

Unit-2

Welding, Soldering and Brazing: Gas Welding, Brief description of gas welding ,as welding fools and, equipment, Different types of flame, Selection of filler rods, flux and torch, Electric Arc Welding, Introduction to arc welding with procedures, applications, Types of arc, Types of electrode used, Specifications of electrodes, Selection of electrode, flux. Current and equipment Resistance Welding, spot welding, Seam welding, Projection welding, Percussion welding, Principle of soldering and brazing, Types of solders and soldering fluxes and their uses, Brazing process, Description of brazing tools and equipment, Brazing filler alloys and fluxes, Advantages, limitations and applications of soldering and brazing.

Unit-3

Advanced Welding: Working principle, process details, equipment details, limitations and applications of the following welding processes; Thermit welding, MIG welding, TIG welding, Atomic hydrogen welding, Electron beam welding, and Laser beam welding.

Unit-4

Forming: Forming, General idea of stress and plastic deformation, Hot working and cold working. Details and applications of lolloping processes: Die stamping, Drawing, Spinning, Rolling, Extruding, Forging, Tube drawing .

Unit-5

Presses and Press Tools : Types of presses, their applications, Types of dies, Types of die sets, Punches, Pads, Die clearance, Stripper plates, Stops, Pilots, MO Stock layout.

Recommended Books:

1 Foundry Forming & Welding Process by P.N. Rao

2 Foundry Forming & Welding Process by OP Khanna

3 Foundry Forming & Welding Process by PL Aggarwal and T Mag

4 Foundry Forming & Welding Process by KP Sinha, D B Goel

DME 306	Automobile Engines	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 Describe how the steering and the suspension systems operate.
2 Understand the environmental implications of automobile emissions
3 Develop a strong base for understanding future developments in the automobile industry
4 The location and importance of each part of engine.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Knowing the anatomy of the automobile in general The location and importance of each automobile parts
CO2	Describe the functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels

CO3	Under the basics of IC engines, parts, construction and material of Piston and connecting rod Assembly, operating mechanisms of various parts, concept of knocking.
CO4	Understand the mechanism of fuel supply and ignition system in Automobile.
CO5	Understand methods of Lubrication in IC Engines.

Detailed Syllabus:

Unit-1

General concept of automobiles: Their classification name and make of some India made Automobiles layout of chassis. Meaning of the terms: Front wheel drive, Rear wheel drive, four wheel drive, Front and Rear wheeled vehicles. Basic requirements of an automobile study of specifications different engines used in Indian vehicles.

Unit-2

I. C. engine: Multi cylinder engine, Construction and material of its Piston and Connecting rod Assembly; Crank shaft, Fly wheel and Bearings; Engine valve and Valve operating mechanism (Cam shaft, Valve timing gears, Tappet, Push rod, Rocker and Valve springs).Advantage of multi cylinder engine for automobiles use, firing order, arrangement of cylinders. Valve positions and design of combustion chamber cylinder head and gasket, Wankle rotary engine.Idea of super charging, its advantages phenomenon of knocking or detonation, its cause and effect on engine. Octane number and octane number

Unit-3

Fuel supply and ignition system:

Petrol engine: Construction and working of two stroke and four stroke petrol engine. Fuel supply circuit components (fuel tank to engine), their function.Exhaust pipe and silencer.Construction and working of mechanical and electrical fuel pumps, carburetor, its function.Simple carburettor, its limitations.Modified carburettor-Zenith, Carter, Solex and S.U. carburetors, their construction and working.Carburetor Controls-Throttle, Choke (Conventional, Automatic). Air fuel ratio, its variation with speed. Magneto and Coil Ignition Systems-Working of coil ignition system for multi cylinder engine and electronic ignition system, Ignition timing, Ignition advance and retard-Their need and factors on which they depend.Spark Plugs-their types as used in automobile engines.Location of spark plug.

Unit-4

Lubrication system of automobile engines: Principle of lubrication on multi cylinder petrol/diesel engine. Types of lubrication systems-Splash type, Pressure type and Combined. Types of lubrication pumps pump drive, Relief valves, Oil pressure, Oil filters and their location in lubrication system, Crank case ventilation, Crank case dilution.

Unit-5

Diesel engine: Construction and working of two stroke and four stroke diesel engine. Fuel supply circuit for Diesel engine, Primary and secondary fuel filter, their positioning in the circuit. Construction and working of fuel pump and fuel injection pump. Governor and injector, Solid and Air injection in Diesel engine. Distributor types of diesel injection pump. Turbulence in filters wet and dry types. Inlet and exhaust main folds arrangement.Exhaust pipe and silencer.

Recommended Books:
1 "Automobile engineering" by Singh K
2 "Automobile engineering" by P.K Mishra
3 "Automobile engineering" by S.K.Gupta

DME 401	Thermal Engineering	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 This course aims to provide platform to mechanical engineering students to understand, model and concept of dynamics involved in thermal energy transformation.

2. To prepare them to carry out experimental investigation and analysis at later stages of graduation.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Knowledge of the first and second laws of thermodynamics and their applications
CO2	Understanding of the first law of thermodynamics, various forms of work and heat interactions associated with a prescribed process path, and to perform a first law analysis of a flow system
CO3	Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations. Calculate efficiencies of heat engines and other engineering devices
CO4	Test the effectiveness of simple and complex one-component pressure-temperature diagrams, the volume-temperature and pressure-volume phase diagrams, the steam tables into engineering devices and systems.
CO5	Classify equilibrium states of a wide range of systems ranging from mixtures of gases, mixtures of gases and pure condensed phases, and mixtures of gases, liquids, and solids that can each include multiple components

Detailed Syllabus:

Unit I

Introduction: Boyle‟s Law, Charle‟s Law, characteristics gas equation, universal gas constant Properties; intrinsic and extrinsic, system; open, closed and isolated.

Unit II

Laws of thermodynamics: Thermodynamic equilibrium, Zeroth law of thermodynamics, first law of thermodynamics, concepts of enthalpy, internal energy, specific heat, work and heat, concept of entropy, clausius and Kelvin plank statement of second law of thermodynamics, Equivalence of Kelvin plank and clausius statements. Throttling and free expansion, non-flow work done under isothermal, polytropic, adiabatic, isobaric, isochoric processes, simple problems steady flow energy and its applications.

Unit III

Formation of Steam and Steam Boilers: Steam formation, wet steam, dry steam and saturated steam, dryness fraction, superheated steam; degree of superheat, latent heat of vaporization, Enthalpy of steam, entropy; entropy increase during evaporation, temperature entropy diagram mollier diagram (H-S diagram) Steam generator, Classifications, comparison of fire tube and water tube boilers, construction and features of Lancashire boiler, locomotive and Babcock and Wilcox Boilers, Introduction to modern boilers. Rankine cycle.

Unit IV

I.C Engine and Cycles : Types, classification, CI and SI engines, Mechanical constructionaldetails of two stroke petrol engine and diesel engine, four stroke petrol and diesel engines, valve timing diagrams, Carnot cycle, Otto Cycle, diesel and dual cycle, derivation of efficiency and comparison of these cycles.

Unit V

Performance of IC engines: Brake, indicated, frictional powers, brake mean effective pressure ,indicated map, engine efficiencies, air standard, brake, indicated, mechanical, volumetric ,scavenging, efficiency, characteristics of power, fuel consumption with engine speed, calculation of powers, efficiency and SFC for two and four stroke engine. LCV, HCV

Recommended Books:

Thermal Engineering by R.K.Rajput

Thermal Engineering by PL Ballany;

Thermal Engineering by Domkundwar

Thermal Engineering by Kumar and Vasandani

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DME 402	Mesurement and Metrology	3 1 0	4 credits

Pre-requisites: None

Course Objectives:

1. To introduce measuring equipments used for linear and angular measurements.
2. To familiarize students with surface roughness measurements on machine components.
3. To educate students on different measurement systems and on common types of errors.
4. To introduce different types of sensors, transducers and strain gauges used for measurement.
5. To give knowledge about thermocouples, thermometers and flow meters used for measurements.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Know about measurement systems, economics of measurement and necessity of measurement in industry.
CO2	Understand the different measurement devices utilizing in industries
CO3	Do calculation based on measurement systems, efficiency of measuring instruments, selection of measuring instruments
CO4	Design and implement state space based controller designs to regulate and control various processes and systems into different industries like petrochemical, fertilizer and steel plant etc.

CO5	Develop ability to set up measurement systems with a control environment.
CO6	Develop an ability to design and utilize advanced control systems.

Detailed Syllabus:

Unit I

Introduction: Metrology and its objectives, need of inspection, physical measurement, precision and accuracy, accuracy and cost, trace- ability, selection of instruments, sources of errors, calibration, sensitivity, and readability, classification of methods of **measurements.**

Unit II

Standards of measurements: Introduction, standards and line standard, yard, meter, end standards, end bars, transfer from line standard to end standards..

Unit III

Linear measurements: Introduction, non- precision measurements, steel rule, calipers, outside inside, surface plate, angle plate, V-block, straight edges, combination set, precision linear measurements, vernier instruments, micrometer, depth and height gauge, thread micrometer, caliper, slip gauges and their uses.

Unit IV

Limits, fits and tolerances: Introduction, tolerances, concept of inter change ability, limits of sizes, Indian standard tolerance zone shaft, hole, basic shaft, basic hole, clearance, interference, commonly used fits, Taylor‟s principle, " Go "and "No Go "gauges, plug gauges, ring gauges, snap gauges, limit gauges, gauges for tapers, Measurements of work properties, Straightness, flatness, squareness, parallelism, circularity, surface finish, their tests and measurements

Unit V

Comparators: Introduction, mechanical and electrical comparator, their uses, advantages and disadvantages.

Metrology of screw thread: Introduction , screw terminology, pitch errors in screw threads,aggressive pitch error, measurement of elements of screw threads, major diameter, minor diameter, thread micrometer, two wire method, three wire method.

Recommended Books:

1 Material Science & Engineering by Mahajan

2 Material Science & Engineering by Jain RK

3 Material Science & Engineering by MACDONALD

DME 403	Machine Design	3 1 0	4 credits

Pre-requisites: Strength of Material

Course Objectives:

1 To give the fundamental concepts of machine design and its importance.
2 To identify the role of machine design in mechanical engineering.

3 To study about design of various power transmission elements, joints andbearings.
4 To understand and learn the design of helical springs

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Define design, properties of materials, notch sensitivity, endurance limit, factor of safety, various mechanical components like rivets, springs, shafts, keys and couplings.
CO2	Understand the general concepts of machine design. Describe various stresses, stressconcentration, caulking and fullering. Classify machine design, types of loading, riveted joints
CO3	Calculations related toaxial loading, bending, torsion and the combinations of these, calculate the efficiency of riveted joint. Draw various cyclic stresses.
CO4	Analyze various factors considered in design. Distinguish between static and dynamic loading, caulking and fullering.
CO5	Judge the appropriateness of various theories of failure.
CO6	Design carbon and alloysteels as per Indian standards designation, various mechanical components like rivets, shafts, keys, springs and coupling

Detailed Syllabus:

Note: Design data handbook is allowed in examination.

Unit I

Introduction to Design: Design philosophy, Basic concept of design in general, Concept of machine design and their types, Factors to be considered in machine design. Important mechanical properties of materials, Properties and applications of common engineering materials .Indian Standards designation of carbon & alloy steels

UNIT II

Fundamentals of machine design: Simple stresses in machine elements; tensile stresses, compressive and shear stresses. Design of members subjected to combined bending, torsion and axial loading, Factor of safety.

Unit III

Design for Strength: Types of loading on machine elements**,** Concept of yielding and fracture Different theories of failure, cyclic stresses, Stress concentration and Stress concentration factors for various machine parts, Notch sensitivity, Fatigue Failure, Endurance Limit

Design of Riveted Joints: Basic types of riveted joints, Different important design parameters of a riveted joint, Uses of riveted joints. Basic failure mechanisms of riveted joints, Concepts of design of a riveted joint. Caulking and Fullering, Efficiency of riveted joint, Design of lap and butt joints, Procedure for designing riveted joint under eccentric loading

Unit IV

Mechanical Springs: Mechanical Springs, Helical Springs-Stress Equation, Helical Spring-Deflection Equation, Spring Materials, End connections for compression and tension helical springs, Design against Static Load, Design against Fluctuating Load, Helical Torsion Springs.

Unit V

Shafts, Keys and Coupling: Transmission Shafting, failure in shafts, Materials for shaft, Stresses in shafts. Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Design for Torsional Rigidity.

Keys, Design of Square and Flat Keys, splines, Couplings, Design of rigid and flexible couplings

Books and References:

1. Machine Design-Sharma and Agrawal, S.K. Katara& Sons

2. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co

3. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications

4. Machine Design by Khurmi& Gupta

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DME 404	Manufacturing Processes II	3 1 0	4 credits

Pre-requisites: Knowledge of basic manufacturing processes.

Course Objectives:

1 To learn the non conventional manufacturing processes.
2 To understand the manufacturing of products from high temperature materials.
3 To understand the planning of manufacturing systems.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Define basic manufacturing processes, metal forming processes, press working process, jigs and fixture and various machining.
CO2	Understand the properties of powder metallurgy, function of jigs and fixture , different metal finishing processes and Classify manufacturing process, types of grinding, forming, and unconventional machines.
CO3	Calculate speed and feed in various unconventional machining processes
CO4	.Analyze grinding and powder metallurgy process used. Distinguish between various forming process and metal finishing process, wheel dressing, loading and truing. Advantage and disadvantages of powder metallurgy.
CO5	Judge the appropriateness of grinder, basic manufacturing processes and efficiently of each process. Detect the appropriate jigs and fixture tools and its ability to produce required part.
CO6	Design and plan the manufacturing of a system with the help of manufacturing processes

Detailed Syllabus:

Unit I

Metal Forming: Metal forming Processes. Die Stamping, Drawing, Spinning and Tube drawing. Rolling, extruding and forging.

Press Working: Types of presses, press working operations; shearing, blanking, piercing, coining, swaging, embossing and upsetting. Types of dies, punches, punch holders & strip Layout.

Unit II

Grinding: Types of grinding machines.Shapes of grinding wheels.Various elements of grinding wheel.Codification and selection of grinding wheel.Balancing of wheel.Wheel dressing, loading and truing.

Metal Finishing and Coating: Purpose of super finishing, surface roughness. Introduction of Honing, Lapping Polishing, Buffing and super-finishing.Metal Spraying.Metal Coating; galvanizing, electro-plating and anodizing.

Unit III

Powder Metallurgy: Principle. Methods of making powder from metal. Processes involved; Compacting, Sintering and finishing operations. Advantages and Disadvantages of powder metallurgy.

Unit IV

Jigs and Fixtures: Considerations in Jigs and Fixtures design. Main elements of jigs and fixture, Principle of location, locating and clamping devices, jig bushes.

Unit V

Non-Conventional Machining: Concept of non-conventional machining. Principle and Working of EDM, wire cut EDM. Introduction to other non-conventional machining methods; ECM, LBM and explosive forming.

Recommended Books:

1 Manufacturing Processes by Bageman

2 Manufacturing Processes by R.K. Jain

3 Manufacturing Processes by Hazara Chaoudhary

DME 405	Modern Manufacturing Processes	3 1 0	4 credits

Pre-requisites: Knowledge of basic manufacturing processes

Course Objectives:

1 To give the fundmental understanding of plastics processing.
2 To study superfinishing methods
3 To learn unconventional manufacturing methods in detail.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Understand various Unconventional machining processes
CO2	Understand various methods of gear cutting operations.
CO3	Understand the processing of plastics, concept and method of powder mettallurgy
CO4	Understand superfinishing processes, spraying, electroplating, galvanizing etc and itsapplications

Detailed Syllabus:

Unit I

Gear Cutting and Finishing Processes: Gear tooth elements, Gear milling, Introduction to gear shaping, Working principle of gear shaping machine Gear shaping cutters, Working principle of gear hobbing machine Introduction to gear finishing operations.

Unit II

Unconventional Machining Processes: Principles of working, advantages, limitations and applications of the following processes, Electro die & charge machining, Wire cut EDM, Electric chemical machining, Chemical machining, Ultrasonic machining, Laser beam machining, Plasma arc machining.

Unit III

Processing of Plastic and Rubber, Powder Metallurgy: Industrial uses of plastics and rubber; Situation where for Machining and forming plastics, Potential and limitations in the use of plastics and rubber, Introduction to powder metallurgy.

Unit IV

Surface finishing & roughness: Purpose of finishing surfaces, Surface roughness, Honing process; its applications, Description of hones, Brief idea of honing machines, Lapping process; its application.

Unit V

Description of lapping compounds and tools Brief idea of lapping ,machines, Super finishing process; its applications, Use of super finishing attachment on centre lathe Polishing, Buffing, Metal coating processes – types, Metal spraying, Galvanizing, Electroplating, Anodizing.

Recommended Books

Modern Manufacturing by P.K Sharma

Modern Manufacturing by R.K.Jain

DME 406	Automobile Technology I	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

To get the basic understanding of Automobile functioning and parts of engine. To get the exposure of functioning of important engine elements.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Understand the description of Auto transmission system.
CO2	Description and mechanism of Gear Box, function of propeller shaft.
CO3	Mechanism of Steering system, Braking System and Suspension system.
CO4	Construction and functional details of battery.

Detailed Syllabus:

UNIT-I

Auto transmission system:

Clutch: Function of clutch in an auto mobile, Construction detail of single plate and multi plate friction clutches, Centrifugal and semi centrifugal clutch. Construction and working of fluid flywheel.

UNIT-II

Gear box: Its function, Assembly detail and working of sliding Mesh, constant mesh, Synchromesh and epicyclic gear boxes.Simple concept of over drive, over running clutch, transfer case and torque converter.

Propeller shaft: Its function, Universal joint and slip joint, Hotchkiss drive and Torque tube drive.

Final drives: Concept of tail pinion, Crown wheel, Differential type rear axle.

UNIT-III

Wheels and tyres: Sizes of tyres used in Indian vehicles, over inflation, under inflation and their effect. Causes of tyre wear, Tyre retreading, idea of Toe in, Toe out, Camber, Caster, King pin inclination. Advantages of tube less tyres, over tyres with tubes. Wheel alignment and balancing, Tyre rotation, Difference between radial and cross ply.

Steering system: Its function, Principle of steering. Ackerman and Devis steering gears, Steering gear types, Worm and nut, Worm and wheel, Worm and roller, Rack and pinion type. Concept of steering system commonly used in Indian Vehicles. Concept of steering locking assembly, introduction to power steering.

UNIT-IV

Braking system: Construction details and working of mechanical, Hydraulic and Vaccum brakes, disc brake, air brake, Introduction to power brake. Details of master cylinder, Wheel cylinders , Concept of brake drum and brake linings and brake adjustment.

Suspension system Function of suspension system. Types of suspension systems, working of leaf springs, Coil springs. Shock absorbers, torsion bar suspension and stabilizers.Mac phersion system.

UNIT-V

Storage battery: Storage Battery constructional detail of lead acid cell battery. Specific gravity preparation of electrolyte, effect of temperature, charging and discharging on specific gravity of electrolyte.Capacity and efficiency of battery. Battery charging from D.C. mains, A.C. mains, Battery charger-Charging circuit, care and maintenance of batteries. Checking of cells for voltage and specific gravity of electrolyte.

Recommended Books:

1 Automobile Technology" by Singh K
2 "Automobile Technology" by P.K Mishra
3 "Automobile Technology " by S.K.Gupta

DME 501	Theory of machines	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 To give the basic knowledge about mechanical system behaviour and
2 To apply principles of physics, kinematics and kinetics, for the analysis, synthesis and design of machinery.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Understand kinematic linkage, mechanism and machine, degrees of freedom, I instantaneous centre of mechanism.
CO2	Understand the concepts analysis of displacement, velocity and acceleration of various mechanism
CO3	Analyse the mechanism of braking, clutch, bearing
CO4	Design or create a cam profile as per follower movement.

Detailed Syllabus:

Unit I

Simple mechanism: Link, kinematic Pair, Kinematic chain, structure, mechanism, machine, inversion, simple example of mechanism with lower pairs four bar chains, slider crank chains, double slider crank chain example of mechanism with higher pairs.

Unit II

Velocity and acceleration in mechanism: Velocity diagrams of four bars and single slider crank mechanism by relative velocity method and instantaneous center method. Acceleration diagram of four bar chain and reciprocating engine mechanism.

Unit III

Dynamics of reciprocating parts: Analytical method for velocity and acceleration of piston, piston effort, crank pin effort, turning moment diagram, fluctuation of energy and speed, energy of a flywheel, calculation of weight of flywheel. Friction and lubrication: Friction of collars and pivots, friction clutches; plate clutch, conical clutch and Centrifugal clutch, friction in journal bearings, film lubrication, rolling friction, ball and roller bearings, prony brake, rope brake and froud‟s hydraulic dynamometer.

Unit IV

Transmission of power: Flat and V-belt drives, velocity ratio of belt drives, slip in belt, creep in belt, length of open and cross belt drives, power transmitted by a belt, ratio of driving tension, centrifugal tension. Condition for the transmission of maximum power.Initial tension in belt. Chain drives-type of chain drives roller chain and inverted tooth chain. Gear drivers; types of gear wheels. Proportions of gear tooth, gear trains-simple gear trains, compound gear trains; reverted gear train and simple epicyclic gear train (velocity ratio by tabular method)

Unit V

Cams: Cam –follower's mechanism, different types of cams and followers, displacement diagrams of SI simple harmonic motion, uniform velocity motion, uniform acceleration and retardation motion, cycloidal motion.

Recommended books:

R K Bansal Theory of Machines Laxmi
S.S.Rattan Theory of Machines TMH
Jagdish Lal Theory of Machines Standard.
Beven Theory of Machines TMH
Ballaney P L Theory of Machines & mechanism

DME 502	Heat Transfer	3 1 0	4 credits

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Pre-requisites: None.

Course Objectives:

To introduce a basic study of the phenomena of heat and to understand the methodology to solving practical engineering problems related to heat transfer.A knowledge-based design problem requiring the formulations of conduction,convection and radiation.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Basic heat transfer mechanisms (conduction, convection and radiation).
CO2	Heat transfer by conduction in solids for steady-state and transient conditions
CO3	Heat transfer by convection in closed conduits and on external surface.
CO4	Surfaces heat transfer by thermal radiation.
CO5	Constructional details of various Heat exchangers, mechanism of heat exchange .

Detailed Syllabus:

UNIT-I

Modes of Heat Transfer: Conduction, convention and radiation Conduction: Fourier‟s Law, Thermal resistance, thermal conductivity of materials, onedimension steady state heat conduction through composite walls, cylinders, spheres.

UNIT-II

Insulation and insulating materials, critical thickness of insulation, physical properties of insulating materials.Concept of unsteady state heat transfer.

UNIT-III

Convection: Concept of heat transfer coefficient, Free and forced convection, Significance of dimensionless groups such as Reynolds number, Prandlt‟s number, Nusselt‟s Number, Stanton number and Grashof number. Empirical correlations for free and forced convection. Heat transfer with phase change.

UNIT-IV

Radiation: Laws of radiation, Black body, Grey body, angle factor, view factor. Exchange of radiant heat between black bodies, grey bodies.Radiation from gas and vapour, Radiant exchange between gray surfaces, Radiant flux, Radiation intensity.

UNIT-V

Heat Exchange Equipments: General discussion about various types of heat exchangers, evaporators, condensers and furnaces.

Textbook:

Heat & Mass Transfer by D.S. Kumar, S.K. Kataria& Sons

Reference Books:

1. Process Heat Transfer by Kern, McGraw Hill Pub.

2. Heat Transfer by McAdams, McGraw Hill Pub.

3. Principles of Heat Transfer by Kreith, Harper & Row Publications.

4. UNIT Operations of Chemical Engineering by McCabe & Smith, McGraw Hill Pub.

5. Heat Transfer by Chapman, Macmillan Publications

6 Heat & Mass Transfer by D.S. Kumar, S.K. Kataria& Sons

DME 503	Manufacturing Material	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

This course is design to get the exposure about various materials use in industries for the manufacturing of products.one can understand the processes by which the material is strengthened to improve its mechanical properties

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Introduction and classification of various engineering materials
CO2	Knowledge of various Ferrous and non-ferrous metals. Knowledge of insulating materials
CO3	Industrial application uses and processing of plastics and fibres
CO4	Understanding of Heat Treatment methods in ferrous metals, strengthening mechanisms

Detailed Syllabus:

UNIT I

General:

Introduction and classification of manufacturing materials, Thermal, chemical, electrical, mechanical properties of steels, cast iron, aluminum and its alloys, Selection criteria of material

UNIT II

Ferrous Materials:

Classification of iron and steel, Sources of iron ore and its availability, Manufacture of pig iron, wrought iron, cast iron and steel (flow diagrams only), Types of cast iron: white, malleable, grey, mottled, modular and alloy and their usage, Steels and alloy steels, Classification of steel, Different manufacturing methods of steels, Availability, properties and usage of steels, Specifications as per BIS and equivalent standards, Effect of various alloying element like Cr, Ni, Co, V, W, Mo, Si, Mn, S on mechanical properties of steels, Use of alloy steels – stainless steel, spring steel, silicon steel Cutting tool material (HSS, Carbide, Ceramics, Cast alloys, Diamond).

UNIT III

Non ferrous material:

Important ores and properties of aluminum, copper, zinc, tin, lead, Properties and uses of al alloys, copper alloys, bearing material, solders

Engineering plastics and fiber:

Important sources of plastics, Classification – thermoplastic and thermosetting, various trade names of engineering plastics, Fiber and their classification: Inorganic and organic fibers, Usage of fiber.

UNIT IV

Insulating materials: Various heat insulating materials like asbestos, glass wool, thermocole, cork, PUF, china clay, their usage, Various electrical insulating materials like china clay, leather, bakelite, ebonite, glass wool, rubber, felt and their use

Testing of metals and alloys: Identification tests: appearance, sound, spark, hardness tests

UNIT V

Fundamental of heat treatment:

Purpose of heat treatment, Iron – carbon equilibrium diagram, Time Temperature Transformation" curve in steels and its importance, Various heat treatment processes – hardening, tempering, annealing, normalizing, case hardening (elementary idea), composites

Recommended Books:

1 Manufacturing Material by Raghvan
2 Manufacturing Material by Srivastava
3 Manufacturing Material by R.K.Rajput

DME 504	Fluid Machinery	3 1 0	4 credits

Pre-requisites: Fluid Mechanics

Course Objectives:

1 Understanding basic laws, principles and phenomena applied in fluid machinery
2 to get the understanding of working of fluid machinery

3 Theoretical and practical preparation enabling students to apply the acquired knowledge and skills in professional and specialist courses.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Mechanism of fluid impactand application of impulse momentum principle on hydraulic turbines, constructional details of Hydroelectric power plant.
CO2	Working principle and constructional details of Pelton, Francis and Kaplan turbine
CO3	Explain characteristics, construction and operating principle of centrifugal pump and reciprocating pumps.
CO4	Understand the working and Construction of various Hydraulic Machines.

Detailed Syllabus:

UNIT I

Impact of jet: Impact of jet, Impulse momentum principle, Force exerted on fixed and moving flat plate and curved vanes under different orientation of jet.

UNIT II

Hydraulic turbines: Classification of turbines, Impulse & Reaction turbines;

UNIT III

Constructional details, working principle, Power, efficiency of Pelton wheel, Francis and Kaplan turbines.

UNIT IV

Pumps: Classification of pumps, working principle, Discharge, work done and power requirement of reciprocating & Centrifugal pump, Effect of air vessels, Cavitations

UNIT V

Hydraulic Machines: Working principles, description and application of hydraulic accumulator, hydraulic intensifier, hydraulic lift, hydraulic jack, hydraulic ram, hydraulic press, hydraulic

Recommended Books:

Hydraulics & Fluid Mechanics Hydraulic Machines Modi & Seth Standard Publishers
Fluid Mechanics & Hydraulic Machines R.K Rajput S.Chand& Company
Fluid Mechanics & Fluid Machinery D. S. Kumar S.K Kataria& Sons
Hydraulics & Hydraulic Machines Jagadish Lal Metropolitan
Fluid Mechanics A.K Jain Khanna Publisher

DME 505	Machine Tools and Metal Cutting	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

To make student familiar with fundamentals of cutting mechanics, kinematics, constructional features and selection criterion for various basic machine tools.To understand various conventional work holding devices and cutting tools and tool holders used on the same machines.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Understand the basic concept of machining, mechanics of chip formation,tool life.
CO2	Describe the function, specifications of Lathe and various operations performed on lathe machine
CO3	Knowledge of Working principle and classification of Drilling, Boring, Shaping, Plaining and Slotting
CO4	Understanding the constructional details of Milling and Drilling machines. Knowing the Application of Jigs and Fixtures in machine operations.

Detailed Syllabus:

UNIT I

Introduction to Machining: Basic Concepts: machining, mechanics of chip formation. Application of coolants, cutting forces during machining, mach inability and tool life.

UNIT II

Turning: Principle; lathe, description, function, specifications, work holding tools, cutting tools. Operations - plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, cutting fluid-its purpose and types, lathe accessories (steady rest, taper turning attachment, tool post grinder), types of lathes, brief description of capstan and turret lathes.

UNIT III

Drilling: Principle, classification description, operations of drilling machines reaming, counter boring, counter sinking, hole milling, tapping, types of drills and their features, drill holding devices.Boring: Principles, classification, description & specification of boring machine, tools, alignment of bores and its importance. Shaping, Planning and Slotting: Working principle of shaper, planer and slotter, quick return mechanism, tools & specifications

UNIT IV

Milling: Introduction, types, constructional features, specifications of knee type milling machine, milling operations, milling cutters types, cutting speed and feeds, indexing simple, job handling devices, introduction to machining centre Grinding: Types and working of cylindrical, surface, centre less grinding. Tool and cutter grinder, various elements of grinding wheel abrasive, grade, structure, bond, codification of grinding wheel, selection of grinding wheel, dressing,.

UNIT V

Broaching: Introduction, types of broaching machines, types of broaches and their use. Jigs and Fixtures: Importance and use of jigs and fixtures, principles of location, locating devices, purpose of clamping elements, types of clamping elements, types of drilling jigs, turning, milling and welding fixtures, fixture design consideration (elementary).

Recommended Books:

Workshop Technology M. Adithan and AB Gupta Dhanpat Rai and Sons
Workshop Technology Chapman CBS
Production Engineering PC Sharma S Chand and Company

DME 506	Automobile Technology-II	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 Course is design to understand the mechanism of functioning of staring, lightning system, air-conditioning of automobile.

2 Description of layout of the connections inside the engine of automobile.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Knowledge of working principle of Dynamo and Alternators.
CO2	Understand the mechanism of Engine Starting
CO3	Understanding of Automobile and lighting system
CO4	Describe the Air conditioning systems of the Automobile

Detailed Syllabus:

UNIT-1

DYNAMO AND ALTERNATOR: Introduction to Dynamo and its details, RegulatorsVoltage, current and compensated types. Cut out Construction working and their adjustment. Alternators-Construction and working, charging of battery from alternator.Use of batter, dynamo/ alternator in an automobile.

UNIT-II

ENGINE STARTING: Engine starting circuit, Drive motor and its characteristics, Conditions of starting and behavior of motor at starting. Starter Drive-Bendix pinion, Torsion, compression, Clutch and sliding armature type. Starter Switch-Manual, over running, solenoid and vacuum switches.Turbo charging and inter-cooling.

UNIT-III

AUTOMOBILE WIRING & LIGHTING SYSTEM: Earth return and insulated return systems-6 volts, 12 volts and 24 volts systems, Positive and negative earthing, Fuse in circuit, Automobile cables-Specifications and colour code. Diagram of typical wiring systems. Principle of auto illumination, Lighting requirement-Head lamp mounting and construction, sealed beam lamp, Asymmetrical head lights, dip and full beam type bulb, auxiliary type lights. Polarized head light, Flesher unit, Warning lights and panel lights. Fore head lamp systems. Other lampsPass lamps, Fog lamp, reversing lamps.Switching of lamps.Parking brake, Direction indicators. Electric horns, Revolution counter, Speedometer, Fuel gauge, Pressure gauge, Temperature gauge, Wind screen wipers, stereo system and speaker, introduction to remote sensing devices. Microprocessor control of automobile. UNIT-IV VEHICLE AIRCONDITIONING: Meaning of air-conditioning and its applications, brief idea of various type heat loads in vehicles, concepts of room air conditioner, fundamental of comfort air conditioning and its conditions, brief idea of air-conditioning cycle and its layout, fundamental and working of compressor magnet clutch, condenser, evaporator, expansion valve, thermo switch, three way solenoid valve, check valve, fan assembly and air conditioners relay, H.V.A.C.

UNIT-V

STUDY OF SPECIFICATION FOR DIFFERENT UNITS: Clutch, Gear Box, Propeller Shaft, Final Drive, Wheel and tyre manufactured in India.

Recommended Books:

1 Automobile Technology" by Singh K
2 "Automobile Technology" by P.K Mishra
3 "Automobile Technology " by S.K.Gupta

DME 601	CAD-CAM and CNC machines	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 It is aimed to provide writing and reading principles of engineering drawing which is graphical universal language used in technical world for describing the shape and size of an object via supplying orthographic views and/or solid models associated with all the necessary dimensions, associated tolerances and annotations created in CAD-CAM environment.
2 Prepare production drawings using computer and relevant software and following standards codes and norms.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Define the basic concepts of CAD, CAM, CIM and CAE, essential requirements of CAD and CAM, concepts of integrated CAD/CAM, necessity and its importance in engineering applications
CO2	Describe the importance of graphics standards, importance and their functions, geometric transformations such as translation, scaling, shearing, rotation, reflection and composite transformation operations using matrix representation
CO3	Develop intuitive problem solving technique for transformation of an object using various geometric transformations and to develop the importance of coding techniques for programming.Apply knowledge of curve design to various practical situation, programming on different application programs
CO4	Explain curves representation, curve design and representation, parametric representation of synthetic curves, blending function and properties of Hermite cubic spline, B-spline and Bezier curves.
CO5	To judge the significance, importance and use of designing and programming in product design and its validation for practical situation and conditions.
CO6	To predict the accuracy in product design and correlation between practical calculations and software approach

Detailed Syllabus:

Unit I

Introduction: Computer applications in manufacturing-introductory concepts of control and support applications. Basic design process and application of computer at different stages in the design process.

Unit II

Basic concepts of NC, CNC, DNC and adaptive control, advantages of CNC machines, application of NC in industry.

Unit III

CNC machines: Components of CNC system, machine control UNIT, machine tool, different types of NC control systems and their applications, classification of NC control system, Special constructional requirements of CNC machines, machine bed, slide ways, bolt, screw and nut assembly, lubrication and cooling system, spindle, spindle motors and axis drive motors, automatic tool changes, multiple pallets, swarf, removal mechanism, safety provisions.

Unit IV

Part programming: Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rotational and pneumatic components, part programming using canned cycles, sub routines and do loops, tool off-sets, cutter radius compensation and wear compensations.

Unit V

Sensors and feedback mechanisms: Sensors, relays, cut outs and feedback mechanism used in CNC machines, Common problems in mechanical, electrical, electronic and PC components of CNC machines, diagnosis of common problems and remedies, use of on-line fault diagnosis tools in CNC Machine

Recommended Books:
Pabla BS and Adithan
Reference book
1 CAD/CAM by Grover and ZimmersPrentice
2 CAD/CAM by Pabla BS and Adithan

DME 602	Refrigeration And Air Conditioning	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

This course gives the knowledge of refrigeration system and principles use in several applications. It explains about the working of various air-conditioning equipment and aids including ducts and fans and design of these euipments against themal load.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Get the knowledge of different refrigeration cycles and refrigerant used.
CO2	Understand the basic functions and working of a refrigeration system.
CO3	Apply the thermodynamic principles and laws on refrigeration systems.
CO4	Analyze problems occurred in refrigeration systems and air conditioning systems
CO5	Evaluate the efficiency and performance of real refrigeration systems.
CO6	Design refrigeration systems, air conditioning system and ducts

Detailed Syllabus:

UNIT I

Carnot cycle, simple vapor compression cycle, vapor absorption cycle, Meaning, refrigeration methods, UNITs of refrigeration, heat pump, coefficient of performance, rating of refrigeration machines, Important properties of refrigeration, properties and applications of commonly used refrigerants such as R-11, R-12, R-22,NH3,other refrigerants like R-134, R-512.

UNIT II

Compressors: types, reciprocating compressor, constructional details, general maintenance, fault diagnosis and trouble shooting, rotary compressor, centrifugal compressor (elementary knowledge of constructional details only).

UNIT III

Condensers: types of condensers, mechanical details, and general maintenance fault diagnosis and trouble shooting.

UNIT IV

Capillary tube, matching of compressor and capillary tube, thermostatic expansion valve, automatic expansion valve, float valve, high pressure valve, general maintenance and fault diagnosis, Types, constructional details, general maintenance, Tools, installation, operation, execution and dehydration, removing the air, dehydration testing for leaks, charging the system, charging through suction valve, charging through discharge valve, adding oil.

UNIT V

Various terms, dry and wet bulb, saturation, dew point, adiabatic saturation temperatures, relative humidity, absolute humidity, humidity ratio, sensible heating and cooling, Description of room air conditioning, central air conditioning, round the year air conditioning system, common fault diagnosis and remedies in window, spilt package and central air conditioning system

Reference Books-

1 Refrigeration and air conditioning by PL Ballaney Khanna Publisher

2 Refrigeration and Air Conditioning by Arora and DomkundwarDhanpat Rai

DME 603	Production Management	3 1 0	4 credits

Pre-requisites: None.

Course Objectives:

1 To introduce the students with the concepts of production management.
2 To make them familiar with the organisational structure and dynamics.
3 To make them realise the need, importance and functions of EOQ, PERT/CPM.
4) To learn various decision making techniques used in production environment.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Define production,planning and management.Forecasting, inventory and value engineering.
CO2	Classify forecasting techniques and different routing sheet, types of schedule
CO3	Calculate forecasting, EOQ, inventory control techniques and PERT/CPM.
CO4	Analyze value engineering and aims of material management. Distinguish between PERT and CPM, and different forecasting techniques
CO5	Judge the forecasting techniques, basic inventory level and efficiently of each process. Detect the appropriate make or buy decision.
CO6	Design and plan the routing sheet and lay out and also draw network diagram for PERT/CPM practice

Detailed Syllabus:

UNIT I

Introduction: Types of production, necessity of production planning and control, Process Planning, procedures of process planning, process planning sheet, uses of process sheet Importance of forecasting, techniques for forecasting.

UNIT II

Production Control: Routing purpose, route sheet, loading and scheduling purpose, types of schedules, and techniques of scheduling. Dispatching purpose and function follow up purpose and functions.

UNIT III

Materials Management: Introduction, Need and aims of materials management, material procurement, make or buy decision, sources of material, purchase, procedures.

UNIT IV

Store keeping- principles of storage, location and layout of stores, methods of storing, store procedures, physical verification of stores, inventory control-importance and function, various stock levels, EOQ, physical control of inventory, inventory control techniques.

UNIT V

Value Engineering Concept of value engineering and value analysis. PERT/CPM: Introduction to PERT/CPM practice on drawing simple network.

Textbook:
Production Management by AP Verma ,SK Kataria
Reference Book:
1 Production Management by AP Verma ,SK Kataria
2 Production Management by KC Jain and NL Aggarwal Khanna
3 Production Management by RN Nauhria and R Parkash

DME 604	Automobile Maintenance	3 1 0	4 credits

Pre-requisites: Basic Understanding of Automobile engine Functioning

Course Objectives:

This course is design to understand the faluts and trouble shooting in engine.One can get the basic knowledge of maintenance of the automobile parts.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	Basic understanding of Repairing of Engine parts
CO2	Knowledge of Repair and maintenance of radiator and lubricating system ,chaisis
CO3	Understanding the Source ,cause and control of automobile air pollution
CO4	Trouble shooting for faults in engines.
CO5	Detection and rectification of faults using different gauges.

Detailed Syllabus:

Unit I

Engine maintenance & repairing: Maintenance, Maintenance schedule, Routine Maintenance schedule for petrol engine and diesel engine, lubricating chart, cleaning and adjustment, preventive maintenance, trouble shooting for faults in engines. Overhauling of engines, Adjusting the engine timing, Maintenance and adjustment of carburettor and fuel injection pump. Checking the valve clearance and adjustment, valve grinding and lapping, engine tuning, detection and rectification of faults use compression gauge and vacuum gauge, general methods of predelivery inspection of vehicle**.**

Unit II

Repairing processes Cylinder reboring and relieving, Removal of liners and fitting, inspection; Repair and fitting of valve and valve guides, checking the connecting rod for bending and) connecting rod alignment, inspection of crank shaft for joviality and regrinding, Phasing and calibration of fuel injection pump, nozzle testing, cleaning and grinding.

Unit III

Repair and maintenance of radiator and lubricating system: Radiator repair and maintenance, Maintenance of lubricating system, Flushing the lubricating system, Change of used lubricating oils, clearing and fitting of oil filter lubrication of water pump, grades of oils, multi grade oil, additives for improving the quality of oil.

Unit IV

Chassis repair and maintenance Grease and greasing points requiring greasing, specifications of greases to be used for different parts, repair of tires and tubes, greasing of wheel bearing, rotating schedule for front and rear tires, bleeding of brakes, pedal play adjustment in clutch and brakes, adjustment, change of brake lining, testing of brakes, dissemble greasing and recambering of leaf spring.

Unit V

Automobile pollution & control: Source and control of automobile air pollution, causes of automobile pollution and their remedies monitoring and analysis of auto exhaust mission, legislative action, judicial response, Introduction to energy conservation.

Reference book;

1 Automobile Maintenance" by Singh K
2 "Automobile Maintenance" by P.K Mishra
3 "Automobile Maintenance " by S.K.Gupta

DME 604	Environment & Ecology	2 0 0	2 credits

Pre-requisites: None

Course Objectives:

1 To improve the quality of life of the local community through management and conservation of natural resources.
2) To ensure that the natural environment is used wisely and continues to be available for the benefit and enjoyment of future generations.
3) To decrease vulnerability and improve adaptation capacity among poor local communities associated with Climate Change.

Course Outcome: At the end of the course**, the student will be able to:**

CO1	To describe the principle of Ecosystems, Biodiversity, Material cycles – carbon, nitrogen and sulphur cycle. Concept, structure and functions of restoration of damaged ecosystems
CO2	To understand the concept of ecosystem, Environmental Changes and Human Health, Environmental Pollution.
CO3	To determine the causes and effects & control measures for water, air, soil, noise, thermal pollution.
CO4	To differentiate Renewable and non-renewable and their equitable use for sustainability.
CO5	To judge the Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel.
CO6	To design systems pertaining to sustainable development minimizing rehabilitation, Environmental ethics.

Detailed Syllabus:

Unit-I

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems ,Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation.

Unit-II

Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel.

Unit-III

Transportation and industrial growth Social Issues Related to Environment–Sustainable development, reset lement and rehabilitation Environmental ethics.Unit-IV Environmental Changes and Human Health Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, noise, thermal pollution.

Recommended Books:

1 Environment & Ecology by, J Krishna wamy , R J Ranjit Daniels, Wiley India
2 Environment and Ecology, by R K Khandal, 978-81-265-4277-2, Wiley India.
3 Environment & Ecology by , Botkin and Keller, 9788126534142,Wiley India.
4 Environment & Ecology by , R Rajagopalan, 978-0195673937, Oxford University Press .
5 Environmental& Ecology by, M.Anjireddy, BS Publications.